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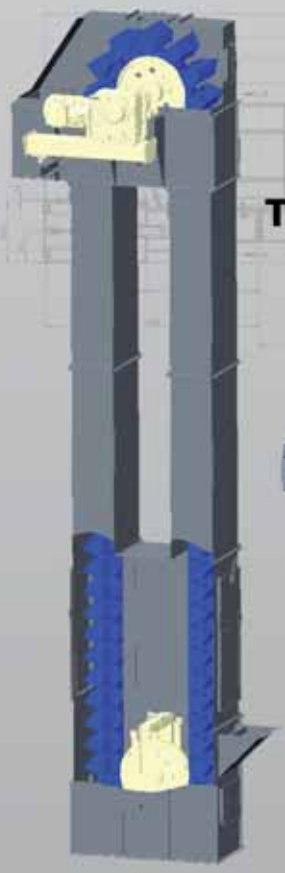

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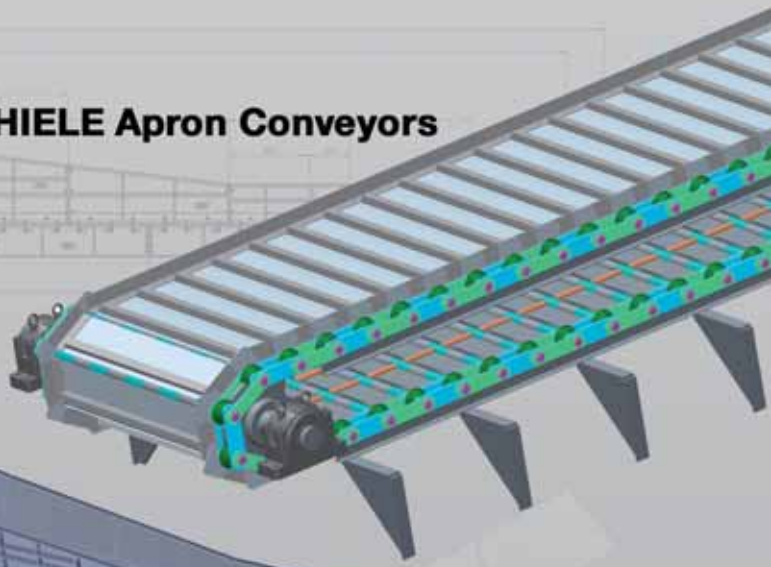

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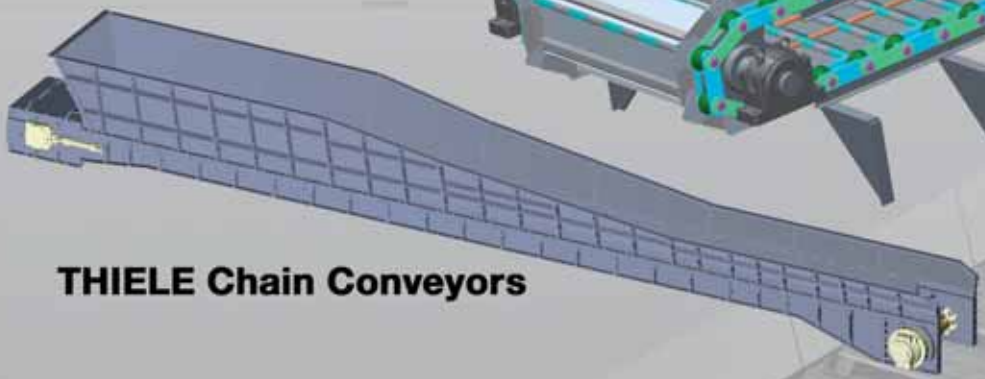

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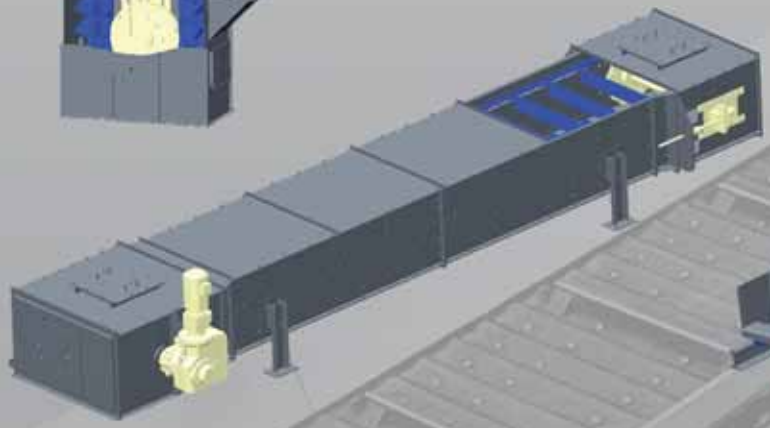

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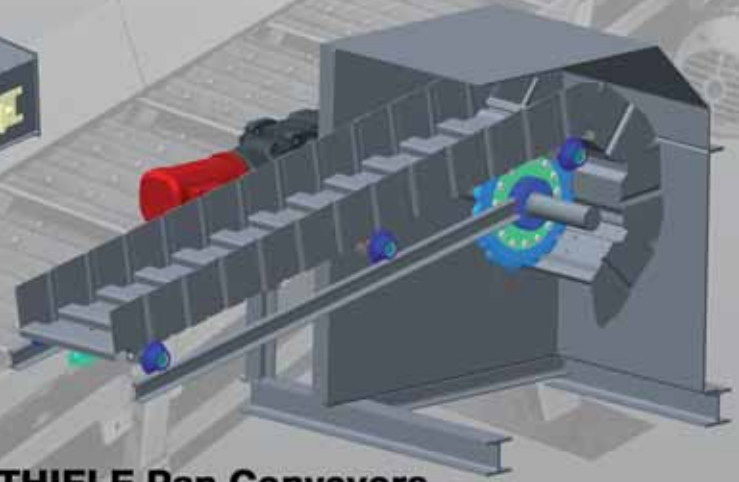

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Limited optimism for dry bulk trade

Prospects for further growth in global seaborne dry bulk trade seem to be quite limited. Indications of rising import demand for commodities are still visible, around the world, but many are not very prominent. In some of the largest individual trade movements, flat or reduced volumes in 2016 are foreseeable.

One aspect is the subdued progress of several key economies. Forecasts continue to be downgraded. In the USA, Eurozone and Japan, this year's GDP growth could be slightly slower than seen in the previous twelve months, at 2.2%, 1.6% and 0.3% respectively, according to recent IMF calculations. By contrast, estimates of China's economic output expansion this year have been raised slightly, to 6.6%.

Iron ore

World seaborne iron ore trade, the largest commodity movement, is expected to increase modestly again in 2016. As shown in table 1, a 2% rise to 1,380mt (million tonnes) appears achievable, mainly resulting from the continued upwards trend in China's purchases, comprising a high proportion of the global total. Elsewhere, positive signs are less visible.

Among other major importers — Japan, South Korea and the European Union — flat or weaker steel production seems set to result in similar changes in raw materials imports. While in China lower domestic production of iron ore benefits import demand, which consequently can strengthen even when steel output declines, a similar pattern is not evident elsewhere. Minor importers are not likely to provide a large boost either.

Coal

After last year's large reduction and a previous smaller decline, seaborne coal trade may continue diminishing during 2016. Estimates contained in table 1 show a marginal 1% global decrease to 1,103mt, although there is much uncertainty about both the direction and magnitude of change in several key importing countries.

Negative influences affecting coal trade are highly visible. In many countries a long term shift towards cleaner energy sources is well under way. But annual changes in coal import demand are still difficult to predict. Lower imports, especially of steam coal used in power stations — which comprise three-quarters of total trade — are likely in Europe, Japan and India this year. By contrast, China's imports may be higher.

Grain

Compared with last year, changes in import demand strengthening global seaborne grain trade (comprising wheat, corn and other coarse grains plus soyabeans) seem to be less pronounced. Signs of weakness in some importing countries are also evident. The result may be a slight overall 2% increase in 2016, raising the total, to 462mt.

Grain trade estimates are usually somewhat speculative, since calculations are based partly on unpredictable weather conditions affecting domestic harvests in importing countries as well as production in exporting countries.

Since the mid point this year has now passed, the pattern of import demand has become clearer. One of the main changes restraining trade is an expected reduction of China's grain (but not soyabeans) imports due to very high corn stocks.

Minor bulks

Over one-third of all dry bulk trade consists of minor bulk commodities, a varied and extensive group. Commodities related to construction and manufacturing comprise the largest part, with the remainder related to agriculture. Last year the global total appears to have increased, reaching around 1,800mt, and some elements could see further growth in 2016.

Bulk carrier fleet

The capacity of the world fleet of bulk carriers has continued to slow, and another deceleration is predicted, as shown by table 2. In 2016 the growth rate is estimated at under 2%. Despite the possibility of higher newbuilding deliveries adding to the fleet this year, scrapping of old or uneconomical ships is set to rise, resulting in a smaller net increase in deadweight cargo-carrying capacity.

TABLE 1: WORLD SEABORNE DRY BULK TRADE IN 3 MAJOR COMMODITIES (MILLION TONNES)

	2011	2012	2013	2014	2015	2016*
Iron ore	1,048	1,105	1,183	1,330	1,355	1,380
Coal	1,014	1,111	1,191	1,172	1,117	1,103
Grain (including soyabeans)	343	361	390	428	452	462
Total three major bulks	**2,405**	**2,577**	**2,764**	**2,930**	**2,924**	**2,945**
% growth from previous year		7.2	7.3	6.0	-0.2	0.7

source: Bulk Shipping Analysis estimates and forecasts **forecast*

TABLE 2: WORLD BULK CARRIER FLEET (MILLION DEADWEIGHT TONNES)

	2011	2012	2013	2014	2015	2016*
Newbuilding deliveries	100.0	100.3	62.9	48.1	49.3	52.0
Scrapping	23.3	33.4	23.1	16.3	30.5	38.0
Losses	0.5	0.1	0.5	0.1	0.2	0.2
Other adjustments/conversions	4.3	-0.4	0.0	0.0	-0.5	0.0
Net change in fleet	80.5	66.4	39.3	31.7	18.1	13.8
Fleet at end of year	**621.0**	**687.4**	**726.7**	**758.4**	**776.5**	**790.3**
% growth from previous year		10.7	5.7	4.4	2.4	1.8

source: Clarkson Research (historical data) & BSA 2016 forecast **forecast*

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Positive surprises among China's dry bulk imports

Briskly reviving growth in key elements of China's dry bulk commodity imports this year has been a big surprise. At the beginning of 2016 there were not many signs of a rebound; consequently, optimism was very limited. After last year's 2% reduction in the overall total, further weakness seemed likely. But both iron ore and coal, by far the largest of the country's dry bulk imports, have proved stronger than envisaged.

For global dry bulk commodity trade, large changes in the China volumes are hugely significant because this component comprises such a substantial part of the world total. Just under one-third of all world seaborne movements of these commodities consists of imports into China and, for some individual commodities, the proportion is much higher (iron ore is two-thirds of the world total, for example).

Despite the positive changes this year, slowing economic activity is having a restraining impact on consumption of commodities, affecting import demand. Chinese government policy aims to restrict economic output growth while rebalancing the economy. Consumer spending and services have been given a higher priority, shifting the emphasis away from investment spending and manufacturing.

Most forecasters expect a further gradual deceleration during 2016. The latest (mid-August) predictions by the International Monetary Fund point to 6.6% growth in China's GDP in 2016, compared with 6.9% last year, followed by 6.2% in 2017. The expectation for this year is slightly higher than previous estimates, reflecting recent stimulus measures introduced by the government.

Iron ore imports pick up

After the abrupt slowdown in China's iron ore imports last year to only a 2% increase, optimism about the upwards trend faded. Estimates for 2016 suggested marginal growth or perhaps even a small reduction, amid steel production weakness and the apparent receding attractiveness of foreign ore supplies.

Yet events so far have proved much more positive. Provisional figures show that imports of iron ore, in this year's first seven months, were 43mt (million tonnes) or 8% higher than the volume recorded in the same period a year ago, at 582mt. Although it seems unlikely that the annual total will see such a large percentage increase, a substantial rise from last year's 953mt looks probable.

China's steel output has been running at marginally lower levels (down by 1% in this year's first half), adversely affecting raw materials consumption. Slacker domestic demand for steel reflects restrained activity in consuming industries.

But other factors have boosted iron ore import demand. Stockbuilding has contributed, while falling domestic iron ore production has enhanced the competitiveness of foreign supplies. In the second half of this year, beneficial influences may not be so prominent.

Coal imports revive

A dramatic 30% fall in coal imports into China during 2015, to 204mt (including low-quality lignite) was widely expected to be followed by another large reduction. That expectation has been modified by statistics showing a January–July total of 129mt, just over 8mt or 7% higher than the amount seen in last year's same period. However, it remains unclear whether there will be a sizeable increase in the annual volume.

One negative influence on coking coal usage has been the small decrease in steel production in recent months. Also, there is still great uncertainty about the strength of the steam coal requirements trend, the background for which remains predominantly unfavourable. But, at least temporarily, other influences have proved supportive for China's purchases of foreign coal. Increasing emphasis on alternative, cleaner, sources of energy — hydro electricity, gas, nuclear power and renewables, especially wind turbine power — reflects government policy designed to drastically cut air pollution. Controlling coal-burning in electricity generation and other industries has become a priority. Production of coal from domestic mines in China is being reduced (first half 2016 output was 10% lower) as well, contributing to higher prices and the revival of imports recently.

Grain imports falter

Contrasting changes among imports of agricultural bulk commodities into China are unfolding. Last year, the upwards trend continued with large increases. A 14% rise in soyabeans imports to 82mt in 2015 was accompanied by a huge 73% increase in the grain volume, to 29mt, and a 15% advance in other agribulks to just under 29mt.

Soyabeans imports in 2016 may increase again. Consumption of soyameal in livestock feed, and soyaoil used in food manufacturing and home cooking is still growing while domestic soybeans output supplies only a small part of the market.

Much more uncertainty surrounds the outlook for China's imports of wheat and coarse grains, which are expected to decline sharply. Good domestic harvests in China over the past few years have resulted in stocks, particularly of corn, becoming excessive and the government is attempting to reduce these, implying an adverse impact on grain imports.

Other commodity imports

Imports of other dry bulks into China, comprising almost one-fifth of the total, include forest products, steel products, fertilisers, ores and minerals. In such a varied category, changes are often very mixed.

Bauxite is among the larger elements, totalling 56mt last year, a sharp recovery from the preceding year's downturn. During the current year's first half a strengthening trend was evident and further growth may be seen in 2016 as a whole, amid signs of rising aluminium capacity and output.

Richard Scott

CHINA'S IMPORTS OF MAIN DRY BULK IMPORTS (MILLION TONNES)

	2011	2012	2013	2014	2015	% change**
Coal*	222.3	288.9	327.2	291.6	204.2	–30.0
Iron Ore	687.0	745.5	820.3	933.1	953.4	+2.2
Soyabeans	52.6	58.4	63.4	71.4	81.7	+14.5
Grain	4.8	11.6	12.3	16.9	29.3	+73.3
Bauxite/alumina	47.1	45.1	75.4	41.8	60.8	+45.3
Nickel ore	48.3	65.0	71.2	47.7	35.2	-26.3

source: China Customs, USDA, BSA **coal includes lignite* *** 2015 compared with previous year*

Record-high supplies and low prices

expected to bolster feed demand

Maria Cappuccio

The outcome of the UK vote, following the EU referendum held on June 23, to leave the EU, like the devaluation of China's currency, twelve months earlier, not only took global financial markets by surprise but also many of the UK's citizens, reflected in a considerable increase in uncertainty, within and outside the country, and expected to take a toll on confidence and investment. The pound has weakened despite some rebound and equity prices are lower in some sectors, especially for European banks. The International Monetary Fund (IMF) made a modest revision to the global growth forecast for 2016 and 2017, with related revisions mainly concentrated in advanced European economies, with impact muted elsewhere, including in the US and China. While the 'Brexit' decision is in the process of unfolding, the UK remains a member of the EU and pending further clarity on the exit process, the IMF forecast reflects a benign outcome, with less uncertainty going forward, expects arrangements between the EU and the UK will avoid a large increase in economic barriers, no major financial market disruption and limited political fallout from the referendum.

Global grain and oilseed markets are supported in 2016 by record-high harvests projected to rise to over 2.6bn/t with more than ample supplies of wheat, corn and soybeans. Low

MAJOR FEEDSTUFFS — PRODUCTION, USE, FEED & STOCKS 2015–2016/17 (MT)

	Prod 15/16	Prod 16/17	Use 15/16	Use 16/17	Feed 15/16	Feed 16/17	Stocks 15/16	Stocks 16/17
Wheat	735	743	709	733	136	147	242	253
Coarse grains	1248	1323	1249	1312	762	791	245	256
Total grains	1983	2066	1958	2045	898	938	487	509
Oilseeds	519	544	450*	465*	301**	311**	84	81

*Source: IGC/USDA-Prod-mainly harvested Jul-Dec/Local Marketing years *Crush/Oilseed/Meals-Ex. Fishmeal*

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international prices and freights expected to strengthen demand for feed, food and industrial use. The UN's Food and Agricultural Organization (FAO) Food Index fell in July, with cereal prices experiencing the largest monthly fall more than offsetting firmer dairy, meat and sugar prices. Bumper crops and weak demand have depressed food prices for the past few years, with the index hitting a seven-year low, before rebounding in the first half of this year on rallying grains and sugar markets, supported by adverse weather in South America and a weakening dollar, although agricultural commodity markets remain at low levels.

Record grain and oilseed crops boost global output to 2.6bn/t

Global wheat production is forecast at a new record 743mt (million tonnes) in 2016/17, 8mt more than last year, reflecting a record crop in Russia as well as larger crops in Australia, Canada, Kazakhstan, Ukraine and the US, that more than offset the significant decline in the EU and smaller crop in Argentina. Coarse grain production is also expected to notch up a record 1,323mt (Corn 1028mt, barley 145mt sorghum 65mt) some 75mt more than last year, boosted by a record-high corn crop. The global oilseed crop is forecast higher at 544mt, mostly due to larger crops of soybeans 330mt, with larger crops of sunflower seed cottonseed, palm kernel, copra and groundnut, the exception being a smaller rapeseed crop.

Feed demand for grains and oilseeds to rise

Global supply of grains and oilseeds more than adequate to meet increased demand, projected to rise for grains by over 83mt to 2,066mt, with feed demand forecast by USDA to increase by 40mt to 938mt; oilseed crushing projected higher at 465mt with strong demand for feed use of oil-meals to rise by 10mt to 311mt. More than ample grain stocks are expected to increase by 22mt to 509mt by the end of 2016/17, this total includes China's 218mt stock-pile of wheat and corn, representing nearly 44% of the global total.

Record Russian crop and larger crops in most exporting countries

Global wheat production is projected at a record high of 743mt, outpacing consumption for the fourth consecutive year. A record crop in Russia revised up to 70mt, with larger crops in the US 62mt, Canada 30mt and Australia 27mt, Kazakhstan 15mt, Ukraine 27mt, partially offset by a significant decline in the EU, where extensive rain during the summer months caused serious damage to crops especially in France; rain also affected output in Turkey.

GLOBAL WHEAT PRODUCTION 2012–2016/17 (MT)

	2012/13	2013/14	2014/15	2015/16	2016/17
EU	134	145	157	160	148
E. Europe	4	4	4	4	5
CIS Baltics	78	104	113	118	130
N & C America	92	99	88	87	97
S America	18	20	24	21	24
N East Asia	37	42	35	42	39
F East Asia	249	249	258	251	253
Africa	24	27	24	26	21
Oceanic	23	26	24	25	27
Total	**658**	**715**	**728**	**735**	**743**

Source: FAO, USDA, IGC trade-totals may not add due to rounding

Rain reduces Argentine plantings while record Australian crop expected

Excessive and damaging rains hampered Argentine wheat sowings — USDA forecasts a smaller output of 14mt with 8mt available for export. While the National Australia Bank (NAB) forecast the Australian wheat crop at almost 28mt, based on above average winter and early spring rainfall-the wetter than average conditions in NSW, more than offsetting a small downgrade in the West Australian crop; both the Australian Bureau of Agricultural and Resource Economics and Sciences (Abares), and USDA, peg the Australian crop below 26mt.

Feed wheat use expected to rise by 11mt

Overall increase in global wheat consumption expected to increase by 24mt to 733mt, with feed use forecast 11mt higher. The bulk of the increase in feed wheat use is expected to occur in the US and China with a smaller increase in Russia. In the EU, livestock producers are expected to have ample feed wheat to utilize this year as the EU crop continues to receive excessive rains, with French feed wheat prices sharply below French corn for much of 2016, suggest a projected increase over 3% in the EU's feed wheat usage for the coming crop year.

Russia to export a record 30mt of wheat

Global trade for wheat at 170mt remains slightly below the previous year's record. Larger imports are forecast for India, Turkey, South Korea, and Saudi-Arabia to support growing demand. With Russia poised to export a record 30mt of wheat for the first time this year, will bring the overall total for exports for Black Sea countries to 53mt (Russia 30mt, Ukraine15mt, Kazakhstan 8mt), larger exports are also expected for the US 26mt and Australia 19mt; with smaller exports from Argentina and the EU down by over 7mt to 27mt. Russia expected to grow market share to capture some of the trade usually undertaken by France with other EU exporters like Germany and the UK in contention.

EU prices strengthen on poor French crop

Rising global wheat stocks overhanging the market saw prices plummet to seven-year lows in June, while subsequent downgrades to the quantity and quality of the French wheat crop increased volatility, and provided support to EU wheat and Black Sea values; contrasting with a drop in values in Chicago, the benchmark futures exchange, where the spot September contract pressured by large global supplies and news that Japan and Korea had both taken steps to restrict US wheat imports, due to the presence of unapproved GMO wheat, almost dropped to below $4/bu for the first time in a decade before closing at $4.01/bu (2 August).

The upward movement in Black Sea prices against a backdrop

WORLD WHEAT SUPPLY & DEMAND 2012–2016/17 (MT)

	2012/13	2013/14	2014/15	2015/16	2016/17
Production	658	715	728	735	743
Consumption	679	698	706	709	733
Trade	147	163	162	171	170
Stocks	177	194	217	245	254
of which China	54	65	76	97	113
Key exporters *	50	52	61	65	71

Sources: IGC, USDA-Production-mainly harvested Jul-Dec/Local marketing years
**Argentina, Australia, Canada, US, EU, Kazakhstan, Russia, Ukraine.*

WORLD COARSE GRAIN SUPPLY & DEMAND 2012–2016/17 (MT)

	2012/13	2013/14	2014/15	2015/16	2016/17
Production	1,136	1,280	1,305	1,248	1,323
Consumption	1,135	1,233	1,272	1,249	1,312
Trade	132	165	174	179	173
Stocks	164	212	245	245	256
of which China:	68	83	102	112	105
Key exporters*	36	52	59	58	78

*Source: IGC/USDA * Argentina, Brazil, Ukraine, US*

of ample supplies was enough to limit purchases by Egypt's General Authority for Supply Commodities (GASC) to only one cargo — 60,000/t of Russian wheat from Midgulf at $168.90/t plus $8.19/t freight. Wheat loading at Black Sea ports strengthened due to continued unfavourable outlook for crops in France and, to a lesser degree, Germany, according to Moscow-based consultant SovEcon, with Russian wheat quotes higher by $2.5/t to $167/t and Ukraine to $168/t, for wheat with a protein content of 12.5% on an FOB (free on board) basis. Lower US prices stimulated interest in wheat to North Africa and Brazil, providing import tariff restrictions are eased, saw CBOT September wheat contract close up at $4.224/bu ($155.21/t — 12 August). US Soft Red Winter Wheat FOB Gulf $182/t (11 August).

Corn boosts record coarse grain output in 2016/17

A bumper crop in the US, and better crops in India, EU, Ukraine, South Africa, Brazil and Argentina, are expected to drive global coarse grain output, projected to increase in 2016/17 to 1,323mt (Corn 1,028mt, barley 145mt sorghum 65mt) the largest coarse grain crop on record.

Strong demand forecast for feed, food and industry consumption

USDA forecasts coarse grain consumption to rise by 63mt to 1,312mt in 2016/17; feed demand is expected to rise by 29mt to 791mt with food and industry use up by 34mt to 528mt, with increases noted in several countries including the US, China, EU and Brazil driven by livestock demand. Global coarse grain trade is expected to fall by 6mt to 173mt, reduced imports into China down from 18mt to13mt for the major grains-corn, barley and sorghum and reduced imports into the EU down1mt to12mt. Despite lower trade this year the US is expected to take a greater share of the export market; global coarse grain stocks of 256mt are above last year, while key exporter crops are expected to rise to 78mt.

Record-high yields boost corn crop to over 1bn/t

Global corn production is forecast at a new record 1,028mt in 2016/17, 68mt higher than last year. Larger US plantings on 94.1m/acres with harvest acreage at 86.6m/acres and record-high yields boosted the US corn crop forecast by USDA at a hefty 385mt; larger crops are also expected for Argentina 37mt, Brazil 80mt, the EU 62mt, Ukraine 26mt and Russia 14mt, while the South African corn crop has recovered following last year's damaging drought; Brazil and Argentina are also expected to ramp-up corn plantings due to crop shortfall, tighter supplies and

WORLD CORN SUPPLY & DEMAND 2012–2016/17 (MT)

	2012/13	2013/14	2014/15	2015/16	2016/17
Production	870	991	1014	960	1028
Consumption	865	949	981	959	1017
Trade	101	130	128	137	134
Stocks	133	176	208	209	221
of which China:	68	81	101	111	104
Key exporters*	33	49	56	52	72

*Source: IGC/USDA * Argentina, Brazil, Ukraine, US*

higher domestic prices this year.

State aid for Chinese corn scrapped but stock disposal remains tricky

Announcements by the Chinese government in March, to scrap China's long-term support policy for corn, pressured domestic prices and led to lower plantings, which fell for the first time in six years, with a smaller crop forecast this year at 218mt. The policy originally intended to protect farmers' income, by which the state purchased corn, at above-market prices, resulted in the accumulation of burdensome stocks, estimated by private analysts to be c.230–250mt, well above International Grains Council (IGC) and USDA estimates; even with a change in policy the problem of finding a home for them remains tricky, as age, quality and storage conditions, will determine use. Suggestions for disposal, apart from sales onto the domestic market, include turning the stocks into ethanol. While changes in the policy to reform the corn market, will take some time it will also impact on international markets. Rabobank forecast a significant slow-down for feed grain exports to China as domestic prices of corn decline and local corn consumption rises.

Chinese government expects to sell 40mt of corn stocks in 2016

Take-up of corn, at this year's state auctions in May were reported to be lack-lustre and disposal of ageing stocks to processors, implied poor quality. Recent reports (9 August) indicate that 13mt of corn has been sold since auctions began on May 27 according to data from the National Grain Trade Center compiled by Bloomberg. The government is expected to sell about 40mt of corn in 2016, including 20mt sold directly to the market earlier this year, according to Feng Lichen, chief analyst at Chicorn, a private consulting firm. On the Dalian Commodity Exchange, Corn contract January 2017, fell to Rmb 1,438/t ($216.32/t Aug 2) the lowest for the most-active contract since October 2006.

Corn used for US ethanol production to rise to 134mt

The US Department of Energy (DOE) projects 2016 ethanol production will average 980,000 barrels per day or 15.1bn/gallons. The agency also is projecting record ethanol consumption of 14.3 bn/gallons. USDA projects corn use for ethanol in 2016/17 at 5,275m/bu (134mt), producing over 15bn/gallons of ethanol and 40mt of livestock feed (36mt Distillers Dried Grains and Solubles (DDGS) 4mt Corn Glutenfeed/meal), with almost 7mt of DDGS exported to several countries.

The Renewable Fuels Association continues to urge US Environmental Protection Agency's to rethink the proposed reduction to the 2017 Renewable Fuel Standard (RFS) from 15bn/gallons to 14.8bn/gallons, at a time when US corn stocks are forecast to rise to 61mt by the end of 2016/17 and corn prices to average $3.15/bu the lowest level in ten years. Large supplies and low prices highlight the economic challenges facing farmers and rural America, according to the President of the US National Grain Growers Association, as prices for a number of crops and livestock commodities are already below the cost of production.

Strong livestock demand supports corn feed use

Based on USDA's current projections this year's corn crop forecast at over 1,028mt, will only just cover current demand which is projected to rise by 58mt to 1,017mt, driven by feed, food and industrial use up by over 27mt and 31mt respectively. The bulk of the increase for feed expected to occur in the US 8mt, China 7mt and Brazil 2mt to support rising livestock demand, with US and global corn stocks expected to rise.

Large supplies of feed wheat expected to reduce corn imports

Global corn trade is 3mt lower at 134mt, driven by reduced imports into China, EU, Vietnam and South Korea, as they are expected to draw on larger supplies of competitively priced wheat for use in livestock rations at the expense of imported corn; feed use in Indonesia is forecast lower, with corn imports forecast to drop by 800,000/t to 2.2mt reflecting delays in issuance of licences and permits creating uncertainty for importers, the drop in corn imports expected to be partially offset by larger imports of feed-quality wheat. Larger corn imports are forecast for Mexico raised 500,000/t to 13.5mt on expected feed demand, Turkey 1.5mt, Zimbabwe 1.4mt and Venezuela up to 2.1mt. US corn exports, are projected higher this year at 55mt on reduced supplies and less competition from Brazil 20mt, with larger exports forecast for Argentina 24mt and Ukraine 17mt.

Tighter corn supplies in Brazil exacerbated by crop shortfall

A smaller Brazilian safrinha crop highlighted the tight supply corn situation, where following a sustained period of weaker currency values, encouraged farmers to forward sell more of their corn than normal to overseas markets, leaving livestock (pig and poultry) producers struggling to source corn supplies. Brazil is forecast to import 1.1mt of corn including some imports from Argentina and Paraguay in a bid to cover the shortfall, while rising corn prices prompted government intervention. Agricultural Minister Blairo Maggi confirmed he was working for a solution, to lift import restrictions on genetically modified (GM) varieties of corn from September to November 2016; this would permit shipments from the US to take place, pending approval by the National Biosafety Technical Commission, an independent agency responsible for GMO approvals. A decision is expected by September 1.

Drought in Brazil improves US corn prospects

Favourable crop ratings, enhanced the prospect of record corn supplies in the US, contributing to downward pressure on prices, quotes for US corn 3YC FOB Gulf fell $26/t to $167/t (Aug 12). By contrast, in South America, weather-induced damage to the Brazilian crop and harvest delays in Argentina saw higher prices- Argentine feed corn (up River) quoted at $181/t and Brazilian feed corn (Paranagua) $190/t (Aug 12); while Black Sea quotes are slightly lower at $198/t on tight nearby supplies.

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Rising demand for meat supports firm prices

All meat products covered by the FAO Meat Price Index in July, saw prices firm, in particular pig meat, underpinned by limited availabilities — including a shortage of pigs for slaughter and lighter slaughter weights in the EU and reduced output of sheep and bovine meat in Oceania, caused by herd rebuilding. At the same time, international demand for meat remains firm, supported by a recovery in purchases by China, and sustained imports by several countries elsewhere in Asia.

Beef and poultry to expand but pig meat output to fall

FAO forecast that while production of beef 68.4mt and poultry meat 116.2mt are expected to expand, pig meat output is expected to fall to 116.4mt, smaller output in China due to a slowing economy and environmental regulations and in the EU low prices spur herd contraction, more than offsetting higher gains by the US, Brazil, and Russia. Increased exports and improved market access to increase Brazil's production while moderate expansion in Russia due to lower prices. Overall global meat production is anticipated to rise by 0.3% to almost 321mt. Beef herd expansion in the US, India, and Brazil where production is expected to rebound, to offset lower production in Australia as producers rebuild herds. Increases in output are expected in the US, Brazil, the EU, India and Russia, while reduced production is foreseen for China, Australia and South Africa.

Growing demand for meat supports recovery in global trade

Global meat trade is expected to recover growing by 2.8% to 31mt in 2016. Trade in poultry meat is expected to reach almost 13mt — low international prices and rising domestic consumption stimulating import demand in a number of markets, including Saudi Arabia, South Africa, Japan, Vietnam, Cuba and the United Arab Emirates. Pig meat trade is expected to rise by over 4% to 7.5mt, supported by larger sales to Mexico, China, Russia, US, Japan, the Republic of Korea and Australia. While trade in beef meat is expected to rise by 1.3% to 9.3mt driven by growing demand in Asia, especially in China, Malaysia, Iran, the Republic of Korea and a limited recovery in Russia. The increase in demand expected to be met by Brazil, the US, Mexico, Uruguay and Argentina. Restocking in Australia and New Zealand is expected to see trade in sheep meat fall by over 0.9mt, smaller supplies reducing imports into China, the main market.

MAJOR OILSEED SUPPLY & DEMAND 2012–2016/17 (MT)

	2012/13	2013/14	2014/15	2015/16	2016/17
Production	475	504	537	519	544
of which					
Soybeans	269	283	320	313	330
Crush	397	419	439	450	465
Consumption*	260	274	290	301	311
Trade meals*	76	80	83	87	91
Trade seeds	119	134	147	154	159
Stocks	68	78	93	84	81
of which (soybeans)					
*key exporters***	39	44	57	53	53

*Source: USDA/*Meals cons/trade-excl. fishmeal*

***Argentina, Brazil, US*

Smaller barley harvest but feed demand strong

Smaller crops in Turkey, Argentina and US mostly responsible for the cut in global barley production projected at 145mt, 3mt below last year. Rain has delayed the harvest in the key growing regions of France and UK, with EU spring crops faring better. Larger barley imports into Saudi Arabia, Turkey, Jordan, Syria, Tunisia and Morocco offset by smaller imports into China. Feed use at 100mt is almost the same as last year. Like other feed grains, barley values are lower than last year-Quotes for French feed barley FOB Rouen ($160/t – Aug 11); UK Feed Barley Merchant Nov 2016 £102-110/t ($134/t-$144/t – Aug 11).

Demand rises despite reduced sorghum exports to China

Better crops in the Sudan, Ethiopia, Mexico and a number of other countries boosted sorghum output to over 65mt, 5mt up on last year, offsetting a large reduction in the US crop down by over 3mt to 12mt. The decline related to changes in China's support policy for feed grains. In 2014/15 global exports to China peaked at over 10mt, this year sorghum imports are almost halved at 5.5mt. Even with the drop in China's imports, global feed, food and industry use of sorghum is expected to increase by over 4mt to 65mt. Quotes for US sorghum-FOB Nola (Oct) have crept up over the week from $169.88/t to $175.88/t (Aug 11).

Record-high global soybean production forecast in 2016/17

Despite the prospect of a record soybean harvest in 2016/17, with even larger crops expected for key producers, the US, Brazil and Argentina, adding to burgeoning supplies of food and feed grains, Chicago's soybean (November)

contract closed up at $9.966/bu ($366.19/t) Aug 15, strong growing demand for soybeans and South American crop shortfalls, providing support.

Record output for most major oilseeds except rapeseed

Oilseed production is forecast by USDA to rise to a record of 544mt in 2016/17, 25mt above last year's harvest. Record crop for soybeans forecast at 330mt and better crops for sunflower 43mt, cottonseed 39mt, palm kernel 17mt, groundnut 41mt and copra 6mt; partially offset by lower rape crop 67mt, due to smaller crops in China and in the EU, where a lower planted area and persistent rain reduced output. Global crush is forecast at a record level of 465mt driven by soybean demand with greater uptake of oil meals projected to rise by 10mt to 311mt, reflecting rising protein demand mostly in China and in some other countries.

North American and Black Sea oilseed processing margins solid

Drew Burke, Bunge's chief financial officer, forecast a diverging soybean crush environment. With forward oilseed processing and grain handling margins in North America and the Black Sea being solid, reflecting big harvests and strong demand, while noting that smaller than expected crops in Brazil and Argentina are slowing farmer selling, which will damage processing margins. While margins for Canadian canola and European sunflower seed are attractive, European rapeseed crush margins remain depressed due to excess industry capacity and weak biodiesel demand.

Global trade in oilseeds is forecast to increase by 2mt to 159mt with ample oilseed stocks expected to end the year slightly lower at 81mt; this includes lower soybean stocks of 71mt with tighter stocks for rapeseed 3.9mt sunflower seed 1.5mt.

Lower rape output stimulates demand for sunflower seed

Record sunflower seed production is expected to rise to over 43mt, an increase of almost 4mt from the current year. The bulk of the growth is projected in Ukraine and Russia, which accounts for 54% of global production.

Record supplies, especially in both Ukraine and Russia, are expected to sharply raise global crush, boosting meal production, a record at 17.8mt primarily used to substitute for reduced rape meal in EU animal feed, with global consumption forecast to rise by 8%; and record oil production 16.6mt with strong demand in the EU, India, the Middle East and North Africa expected to lift global consumption by 4%;

US prospects brighten on record sales and less competition

Larger soybean crops forecast for the US111mt, Brazil 103mt and Argentina 57mt are expected to lift output to 330mt in 2016/17. Planting progress for the US soy crop in May was faster than the prior five-year average, allowing the plants to take advantage of favourable conditions in June and July, raising crop ratings, while rain in August is essential for the plants to reach full yield potential.

With a large crop in the making, prospects for US soybean exports have brightened considerably since the start of the year. Weather hindered crops in South America, hot, dry weather in Brazil and flooding in Argentina, prompting a significant rise in prices there; buyers switched to US soybean supplies leading to record export sales from May through August revised up to 51mt, leading to a smaller US carryout. Because of the supply problems in South America, the US is expected to be the main source for soybeans from August through to February 2017, with exports forecast to increase to 53mt beans and 11mt meal in 2016/17, with soybean stocks just below 9mt by the end of the season. South American exports are expected to rise with exports from Brazil 60mt beans and 16mt meal; Argentina under 11mt beans and 33mt meal.

Livestock production drives Chinese soy imports

China's demand for meat continues to grow, as a growing middle class consumes more meat. Higher demand for industry feed and protein meal as a result of a recovery in swine production and steady growth in the poultry sector is forecast with imports of soybeans expected to rise to 87mt this year.

India's oilseeds prospects improve with normal monsoon after two years of drought

India remains the world's second-largest consumer of edible oils at close to 21mt (million tonnes) next only to China where the market is around 35mt, *writes Kunal Bose*. This is despite the *per capita* disappearance of oils and fats in India which, at 16.7kg, trails the world average of 27.6kg and China's 26kg. The cumulative use of oils in India, which is the fastest growing among the world's major economies is hugely big because of its over 1.25bn population. Dr BV Mehta, director general of Solvent Extractors Association of India (SEAI), says the country will need an extra 1mt of oils every year to meet its growing requirements. From a health point of view, the oils demand growth is a welcome development. But what niggles the government is that while domestic production of nine major oilseeds during the summer and winter harvests has remained within a narrow band yielding oils of 6mt to 7.25mt, the country has become increasingly dependent on imports.

India's edible oils imports rose to 15.103mt in 2015 from 12.188mt in the previous year. Such a sharp rise in imports resulted from the toll that two consecutive years of drought took on Indian oilseeds crops. The trade estimates that India's oilseeds production was down 18.63% from 33.679mt in 2014/15 to 31.816mt in 2015/16. The one that suffered the most was soybean seeds where production was down 12.90% from 8.5mt to 7.21mt. But SEAI puts 2015/16 soybean production higher at 7.75mt. However, the rape/mustard/toria crop could make gains of 8.40% to 5.92mt from 5.08mt. After two years of the earth being scorched by serious rains deficit in many parts of the country, the country is having more than a normal south-west monsoon this year improving the prospects of all crops, including oilseeds.

According to one trade estimate, soybean this time is planted on larger area of 11.27m hectares up from 11.4m hectares in 2015/16 and the crop is found to be in either normal, good or very condition in almost all growing centres. Similarly, farmers are growing groundnut and sunflower on bigger areas this season. Prospects of a good soybean crop in the current season on the back of 2015/16 drought-related setback in production are a good development for India. This is because soy oil finding increasing favour with the Indians now has a share of 20.28% in the country's oils consumption basket. Any price fall in soybean is always a fillip to higher consumption of this oil.

According to the US Department of Agriculture (USDA) report of August, the global oilseeds production for 2016/17 is projected at 543.5mt, up 7mt from the month earlier in which the share of soybean is placed at a record 330.4mt. The report says: "The US production increase is partly offset by reductions for both India and Ukraine with the latest planting data for both countries indicating lower forecasts for harvested area." The Indian part of the report will call for revision as both soya acreage and production outlook look encouraging. Confirmation of this comes from government agencies and SEAI. The US oilseeds production for 2016/17 is projected by the agency at 120.2mt, up 4.8mt from July due to a higher soybean production forecast. Soybean output for the current season is forecast at 4,060 million bushels (one bushel equals 27.2155kg), up 180m due to yield improvement. The US harvested area remains unchanged at July forecast level of 83m acres.

The US soybean crop benefits from yield forecast of 48.9 bushels per acre which is 0.9 bushels above last year's record. Whatever the size of the US and Indian crops, two developments will have a bearing on soybean prices. First, in a presentation a few months ago, the world-renowned oilseeds expert Dorab E. Mistry said the lack of carryover bean stocks in Argentina was now in the open. "Thus far we had been led to

believe that Argentine farmers were holding back large tonnages of old crop beans. Today we find those stocks are much lower — possibly non-existent," he said. The USDA agreed and "slashed the 2016/17 carryover to just 300m bushels." Secondly, earlier this year rains pounded hard enough the soybean growing centres in Argentina such as Cordoba, Entre Rios, Santa Fe and Buenos Aires, leading experts to lower crop estimate by 6mt to 55mt. Rains have muddied the roads and fields so much that farmers could bring combine harvesters to the field causing damage to growing areas. Along with Brazil and the US, Argentina is one of the world's leading exporters of soybeans, soy oil and soy meal.

In the meantime, a report says that Brazil's till recent insatiable appetite for growing soybeans in increasingly big quantities appears to be fading. Chicago-based commodities consultancy AGR Brasil says the estimated 2% rise in land under soybeans to 83.5 acres during 2016/17. This is seen by many as the smallest in soybean acreage rise in Brazil in the past decade. What is not to be lost sight of is farmers' juggling of land space between corn and soybean depending on price expectation. The world has seen major disappearances of oilseeds, principally soybeans since 2012/13. China being a strong importer of soybeans year after year remains a factor in oilseeds disappearances. Mistry raises an important point: "We are fortunate that world production has also been rising at a dramatic pace. However, as I have repeatedly pointed out, we have enjoyed five back-to-back bumper bean harvests... But what happens when this sweet music stops?"

The Hamburg based magazine *Oil World* says the major bullish factor for oils and fats is to be found in substantial reduction in world stocks by 4.2mt in the first eight months of 2016. Continuing, it says while the recent price rise was led by palm oil, most vegetable oils have reversed the declining trend. Palm oil is the price leader which appreciated by US$ 130–140 a tonne or by 21% to 23% in the three weeks to 18 August. Also lauric oils rebounded with palm kernel oil up 12% and coconut oil 10% during this period. Soya oil was also pulled higher with Argentine prices up US$ 90-100 a tonne and US export prices were up US$110–120 a tonne. The demand for oils would have been higher but for the generally weaker world economy and shortages of petrodollar in big palm oil and vegetable oil markets such as West Asia, north and west Africa.

What also acted as some check on oil prices moving forward was China's active auctioning of oil from the state reserve of old rape oil vintage 2011 mainly and also 2012. This is a common Chinese practice with almost all commodities: build inventories when prices are low and then unload when the market favours to book profits. Indonesia and Malaysia also have to reckon with rising subsidy bill to support production of biodiesel caused by low petrol prices. Mistry's revised estimate for Malaysian palm oil production in 2016 is between 18.4m and 18.8mt. The reason for giving a "fairly broad range," as he explains, is because of the proportion of young new hybrid palms in the south-east Asian country is increasing and "we don't have enough reliable data on how well they perform." At the same time, it is claimed that hybrid palms are highly drought resistant and recover from dryness quickly. The upper end of Mistry forecast will come good if during September to November, Malysia makes 2mt each month.

Mistry thinks the combination of mature area and impact of new young palms will limit the shortfall to 1mt. But he is also aware that a leading Indonesian producer is sticking to a 2mt shortfall. If that happens that will be a positive for palm oil prices. What about palm oil outlook for 2017? According to *Oil World*, production in Malaysia and Indonesia will still be partly curbed by the lagged effect of the previous *El Niño*, keeping yields below potential in 2017. According to the magazine, the number of fruit bunches available for harvest will still be less than normally. However, with improved rainfall, oil palms will be regaining strength and the bunch weights should be considerably higher than in 2016. A recovery in yields (though still staying below 2015 and 2014) and further growth in the mature area are likely to boost Malaysian and Indonesian palm oil production to new record highs.

In the hope that duty difference between crude oils and refined oils will be big enough to allow profitable working of refineries, Indian groups went on building refining capacity close to ports. But since New Delhi in its wisdom has kept the difference in import duties between crude and refined oils at only 7.5% instead of 15% pleaded by the local industry, the refineries in India are using 40% to 50% of their capacity. The difference in landed cost of crude palm oil and refined, bleached and deodorized palmolein should ideally be around $50 a tonne. That alone will lead to better use of the local refining capacity. India, the world's largest user of palm oil, imported 9.496mt in 2015 compared with 7.931mt in the previous year. If major part of this oil comes in crude form then that will prove to be a blessing for the Indian refining industry. The highly rewarding Chinese experience has encouraged Dr Mehta to intercede with New Delhi for reduction of import duty on oilseeds from 30% to10%, if not 5% in order to encourage imports of high oil content oilseeds such as rape and sunflower seeds. India is in such big deficit in local oilseeds supply that imports will not in any way compromise the interest of local farmers. DCi

Failure to correctly fit bulldog grips causes significant damage to cargo

Tony Watson, Risk Assessor at UK P&I Club, advises on the correct application of bulldog grips in order to minimize damage to cargo

"Bulldog grips are commonly used for the securing of project cargo, both under and below deck. They are also used on ships on mast stays and crane wires, although swaged connections are now more common.

"The single most predominant factor associated with the failure of cargo lashings is the incorrect application of bulldog grips. Failed lashings can result in significant damage to cargoes, and can also pose significant risk to crew members and the safety of the ship.

"The Club's Risk Assessors note that stevedores and shipyards should consider the following:

- the saddle part of the bulldog grip should be applied to the 'live' load bearing wire, whereas the U bolt goes around the 'dead' tail. A useful way to remember this is by using the mnemonic 'never saddle a dead horse'. Another good 'aide memoire' is Saddle/Stressed, U/Unstressed;
- the distance between the grips is important and should be about six times the rope diameter; not significantly more or less;
- the length of the tail is also important and should be greater than five times the rope diameter;
- the tail should be whipped or bound to prevent it unravelling;
- the number of grips used depends on the diameter of the wire but at least three should be used for wires up to 19mm; and
- it is important that the tightness of the nuts is checked periodically as the grips have a flattening effect on the wire, resulting in a reduced grip.

"Various tests were carried out several years ago* which showed that a perfectly made up hard eye around a thimble will hold at 90% to 100% of the nominal breaking load (NBL) of the wire before slipping and/or fracturing. If the grips are reversed (contrary to the often expressed opinion that "it makes no difference"), the wire will fail at around 50% NBL.

"By using only two grips (instead of the recommended three), even correctly applied, the wire would slip at around 60% NBL reducing to 50% when reversed or staggered. With one grip, these figures were 25% (correct way around) and 18% (reversed). The correct method of fitting bulldog grips is hardly 'rocket science' but the majority of those seen on board are, in some way, incorrectly fitted. Proper supervision in the builder's yard should ensure that these are initially fitted correctly. Equally, stevedores/lashing gangs should be supervised and instructed to correct improper lashings."

GROUP ETE invests € 5m to strengthen inland waterways operations

- a €2 million investment in a new pusher tug will allow operations in previously inaccessible inland areas of the Tagus and Douro rivers
- a €3 million phased investment in a new river quay at Castanheira do Ribatejo in the Tagus river

The Portuguese GROUP ETE made an investment of €2 million in its new state-of-the-art pusher tug *Baía do Seixal*, named in early July by the Portuguese Minister of the Sea, Ana Paula Vitorino in a ceremony also attended by the State Secretary of Fisheries, José Apolinário and the Mayor of Seixal, Joaquim Santos.

This vessel is a 100% portuguese design and naval engineering project built by the Portuguese shipbuilder Navaltagus, one of the companies of the ETE GROUP. According to Miguel Trovão, Navaltagus managing director, "This is an innovative pusher tug and the first of its kind built in Portugal. It offers high manoeuvrability, provides very good towing capacity, is quite well equipped, has a lift bridge and it is already prepared to change its propulsion to natural gas (LNG — liquefied natural gas), thus meeting environmental challenges. This vessel's combined overall length of 16.50m, breadth of 8.80m, depth of 3.65m, draught of 2.38m and bollard pull of 16 tonnes, allow it to overcome the constraints to the navigation of waterways with narrow, winding areas and low draughts either in the Tagus or Douro rivers."

According to Luis Figueiredo, shareholder and Board Member of ETE GROUP, "this pusher tug to be at the service of Empresa de Tráfego e Estiva (ETE), will allow the group to strengthen its position as the largest inland waterways operator in Portugal, handling over two million tonnes per year. But because navigation in previously inaccessible areas of the Tagus and Douro rivers is now possible, conditions are created for the national government to define policies that strategically promote the inland waterway transportation of goods on these two main Portuguese rivers. There will be benefits for the environment, the country and the local economies where new river quays and logistic platforms will be settled.

"Inland water transport contributes to the creation of a sustainable low carbon economy and an efficient trading environment, since it reduces the environmental footprint of freight transport — emissions of CO_2 and NO_x per tonne moved by waterways may represent less 10% and 9% when compared with road transport, with fuel consumption being almost eight times lower — and improves road traffic, since each barge carries the amount of goods transported by 70 trucks," explains a Group shareholder.

Naming ceremony (from left to right) Ana Paula Vitorino, Portuguese Minister of the Sea; Miguel Trovão, Navaltagus Managing Director; Luís Nagy, Group ETE CEO; Joaquim Santos, Mayor of Seixal.

(l to r) Luís Nagy,; Luís Figueiredo e Filipa Pacheco de Carvalho, shareholders & administrators of Group ETE; Ana Paula Vitorino; Joaquim Santos; José Apolinário, State Secretary of Fisheries.

Luís Nagy, Group ETE CEO, speaking at the pusher tug naming ceremony.

For Luís Nagy, ETE GROUP CEO, "it is fundamental that the Portuguese government begins to offer Portuguese companies operating in the areas of port operations, inland water transport and maritime shipping, the same conditions and support existing in other EU countries. This policies are critical to allow ETE GROUP to maintain the activities it develops as well as its investment plans."

ETE GROUP has an ongoing project for the construction and operation of a new river quay in Castanheira do Ribatejo requiring a phased investment of €3 million. Of this, €1 million will be spent on construction and €2 million on equipment. The environmental impact study has been under assessment by the Portuguese Environment Agency since March.

Companhia do Porto da Castanheira was the company created by the ETE GROUP to ensure the movement of containers and other goods from the North Lisbon Logistics Platform. This pier will serve inland waterways, contributing to the intermodal development of the Port of Lisbon once it will connect the different terminals of this port and the logistics platform, and will also reduce significantly the road traffic congestion in the urban area of Lisbon, with a decrease that can reach up to 750 trucks / day.

About ETE GROUP

ETE GROUP was born in 1936, with Empresa de Tráfego e Estiva, at the time specialized in inland water transport, having pioneered in 1950 the introduction of midstream operations concept using floating cranes, barges and tugs. Currently ETE GROUP is the operator with the largest number of port concessions in Portugal, the largest shipping company and the market leader in shipping agency in Portuguese Ports. Its vast experience in the maritime, port and river sectors makes the Group a reference in the maritime economy at national and international level, being present in five countries (Cape Verde, Colombia, Mozambique, Portugal and Uruguay) and three continents. Its six main areas of activity are Port Operations, Inland Waterways Transport, Maritime Transportation, Shipping Agents, Logistics Operations and Engineering and Ship Repairs, integrating more than 40 companies.

World's first ballast water port solution successfully completes tests

Damen Green Solutions' InvaSave technology has completed shipboard testing onboard the *Henrike Schepers*. During the shipboard tests, ballast water was taken in untreated and the efficacy of the technology was validated upon discharge. These tests have shown that the InvaSave is capable of providing an IMO type approved backup in a port in the event of a failure in a vessel's on board treatment systems to uptake or discharge ballast water. It can even serve as a port-based alternative for those ship owners that may not want to retrofit an on board treatment system or be deployed in a port with a sudden outbreak of marine pests.

"More and more countries are ratifying the IMO's Ballast Water Management Convention (BWMC) and it could enter into force in 2017; in any case, it is only a matter of time. Damen is co-operating with the service providers in the ports to provide this ballast water treatment service. This is also relevant for all port authorities, who could face congestion problems if they don't have a contingency/emergency service in place," said Damen Green Solutions Product Manager Matthijs Schuiten.

Groningen Seaports is the first port to provide this ballast water treatment service. "Our location on the Wadden Sea means that we have a responsibility to push forward the progress of sustainable shipping," comments Groningen Seaports Sustainability Coordinator Bart van der Kolk. "We are fully prepared for the ratification of the IMO Ballast Water Management Convention. This project wouldn't have been possible without the effort of some frontrunners like Royal Wagenborg, Van Gansewinkel, Imares, MEA-nl and Damen." The innovative solution could is likely to appeal to other ports as well as ship owners, operating close to sensitive locations such as World Heritage Sites and Particularly Sensitive Sea Areas.

The results of the InvaSave test meet the D2-Standard of the IMO Ballast Water Management Convention on all aspects. This includes the test series conducted with the high sediment waters of the River Hull and the River Thames, UK. An overall and important principle is that the system is robust, and works under all relevant circumstances, regardless of the composition of the ballast water. Test protocols are in line with IMO BWMC test guidelines and additional requirements of the Dutch flag state. All testing was conducted by MEA-nl.

Damen can deliver the InvaSave technology in a self-sufficient mobile container, which can be put onboard a service barge or moved around the port on a trailer or a pontoon. The system uses innovative filtering and UV technology and does not contain chemicals or hazardous substances.

IMO type approval is expected to be obtained 2016 and a patent is pending.

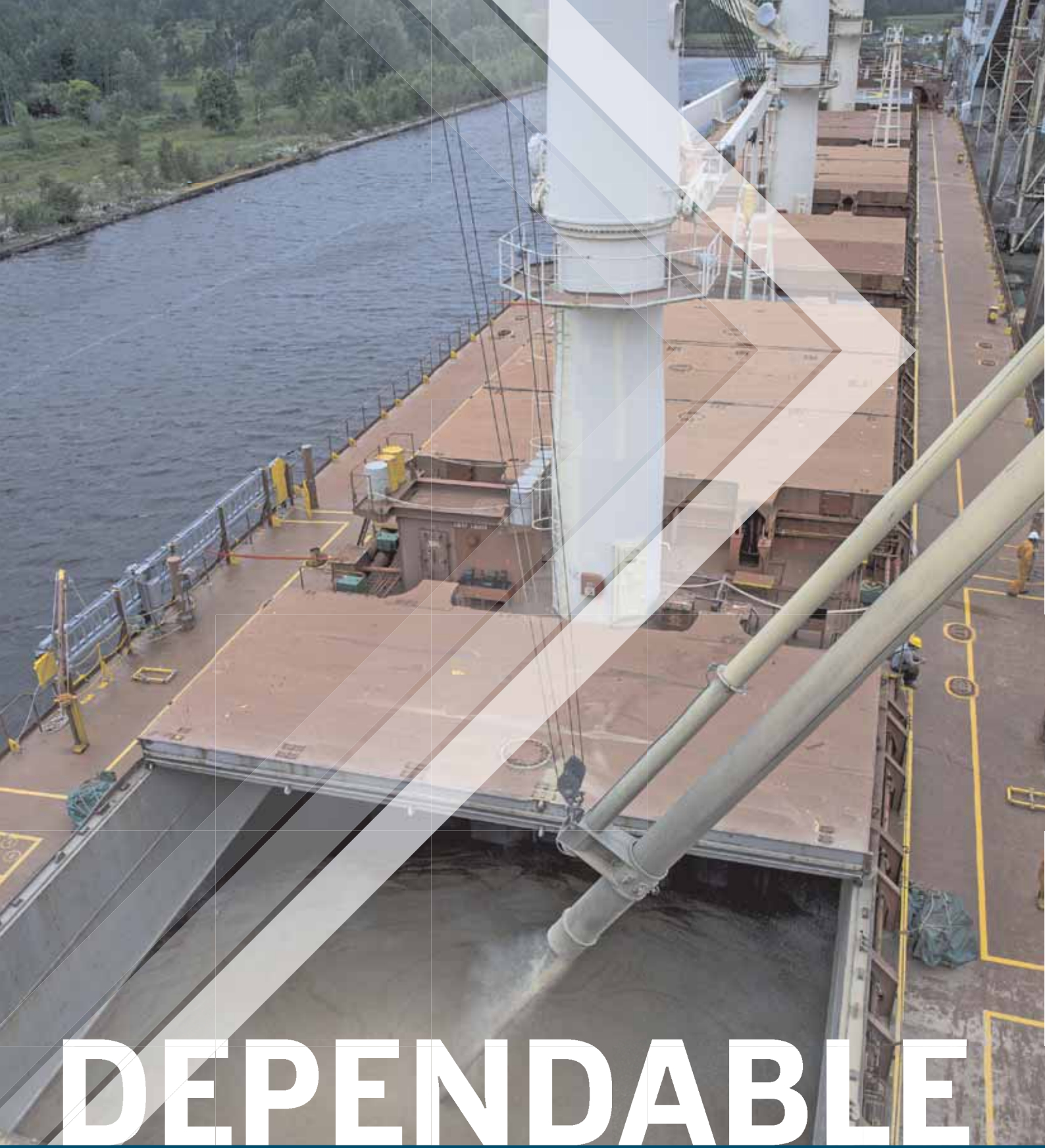
Damen Shipyards Group

Damen Shipyards Group operates 32 shipbuilding and repair yards, employing 9,000 people worldwide. Damen has delivered more than 6,000 vessels in more than 100 countries and delivers some 180 vessels annually to customers worldwide. Based on its unique, standardized ship-design concept Damen is able to guarantee consistent quality.

Damen's focus on standardisation, modular construction and keeping vessels in stock leads to short delivery times, low 'total cost of ownership', high resale values and reliable performance. Furthermore, Damen vessels are based on thorough R&D and proven technology. Damen offers a wide range of products, including tugs, workboats, naval and patrol vessels, high speed craft, cargo vessels, dredgers, vessels for the offshore industry, ferries, pontoons and superyachts.

For nearly all vessel types Damen offers a broad range of services, including maintenance, spare parts delivery, training and the transfer of (shipbuilding) know-how. Damen also offers a variety of marine components, such as nozzles, rudders, anchors, anchor chains and steel works.

In addition to ship design and shipbuilding, Damen Shiprepair & Conversion has a worldwide network of 15 repair and conversion yards with dry docks ranging up to 420 x 80 metres. Conversion projects range from adapting vessels to today's requirements and regulations to the complete conversion of large offshore structures. DSC completes around 1,500 repair and maintenance jobs annually.



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A safer bulk trade – DNV GL releases new guideline on cargo liquefaction

DNV GL has published a guideline for the design and operation of vessels with bulk cargo that may liquefy, *writes Simon David Adams*. The guideline aims to raise the awareness of the risks of liquefaction and describes mitigating actions to reduce these risks. Many common bulk cargoes, such as iron ore fines, nickel ore and various mineral concentrates, have the potential to transform into an almost fluid state, threatening the stability of the vessel.

Morten Løvstad.

Bulk cargo liquefaction

"Cargo liquefaction is probably now the most significant factor in lives lost at sea for bulk carriers," says Morten Løvstad, Business Director of Bulk Carriers at DNV GL. "While the general safety level of modern bulk carriers has been significantly improved over the last decades, recent incidents have shown that cargo liquefaction remains a major safety issue. Since 2009, at least six ships of more than 40,000dwt have been lost to suspected liquefaction of cargo. These incidents have shown that cargo liquefaction is an issue that has not been sufficiently dealt with, and concerned owners and operators have contacted us for support and advice", says Løvstad. "With this guideline we wanted to help our customers by not only increasing awareness and building competence around the phenomenon, but also to offer some strategies, both in design and operation, to reduce these risks."

The guideline focuses on both the operational and design aspects of cargo liquefaction. In daily operation a number of recommendations to reduce the risk of liquefaction are made, including: making sure that cargo is correctly identified and properly documented, ensuring the time interval between testing for moisture content and loading is no more than seven days, that retesting is done in the event of rain, appointing an independent surveyor and performing a can test or similar to verify the moisture content, loading in a non-homogeneous pattern, raising the centre of gravity by ballasting the top wing tanks (provided loading condition and structural strength allows for it), and trimming as necessary to ensure cargoes are reasonably level.

The design guidelines look at the potential of carrying cargoes with high moisture content onboard specially constructed or fitted ships, in compliance with the IMSBC Code. Such vessels can remain safe both from a stability and strength point of view even if the cargo liquefies or shifts.

"Under the IMSBC code such vessels must have permanent structural boundaries or specially designed portable divisions to confine any shift or liquefaction of cargo, but detailed

requirements are lacking," says Løvstad. "It is clear, however, that stability and structural strength have to be specially considered, and our guideline sets out criteria for them, based on DNV GL procedures and rules."

The guideline also examines how and why liquefaction can occur, which bulk cargoes are subject to liquefaction risks, explains the Transportable Moisture Limit (TML) and presents the effect of liquefaction on a vessel. The aim of the guideline is to provide ship designers, yards, shipowners and other stakeholders in the shipping industry a basis to assess the risks and begin the process of making their vessels and their operational processes safer when it comes to the risks of liquefaction.

Driven by its purpose of safeguarding life, property and the environment, DNV GL enables organizations to advance the safety and sustainability of their business. Operating in more than 100 countries, the company's 16,000 professionals are dedicated to helping their customers in the maritime, oil & gas, energy and other industries to make the world safer, smarter and greener.

Importance of fire safety in the engine room

DNV GL emphasizes important aspects of fire safety in the engine room, regarding both newbuildings and ships in service.

Many aspects which determine the fire risk in an engine room, such as insulation, screening and the routing of pipes, cannot be easily addressed in the design approval phase. Therefore, these aspects require adequate attention during the newbuilding construction phase.

Insulation and screening deteriorate during the vessel's operational phase and require extra attention during the vessel's in-service phase. Often, deficiencies within these two aspects are easy to detect during a survey. However, missing insulation or screening is not always easy to identify, especially on relatively new ships. Therefore, it is important that all requirements are met when the vessel is delivered — making follow-up during the ship's lifetime simpler. The applicable rules and requirements regarding fire safety can be found in SOLAS Chapter II-2 and in the DNV GL rules, Part 4, Chapters 1, 3 and 6. In addition, requirements related to the class notation 'Additional Fire Safety' can be found in Part 6, Chapter 5. The IMO's Maritime Safety Circular MSc.1/Circ.1321 provides practical guidelines and gives a comprehensive overview of the SOLAS regulations.

Routing of pipes (for newbuildings)

In general, flammable liquid piping systems shall not be located immediately above or near units with a high temperature and shall be located as far as practicable away from potential ignition sources. Furthermore, piping joints should be screened or protected to avoid leakage onto a potential ignition source. 'Flammable liquid' refers to fuel, lubrication and hydraulic or thermal oil. In addition, fuel oil piping shall be laid in well-lit places, enabling proper inspection and observation of leaks.

The above also applies to small-diameter piping used to connect, for example, manometers. This small-diameter piping is often prone to vibrations and should therefore be properly fastened to prevent fatigue or scuffing damage resulting in leakages.

MSc.1/Circ.1321 states that spray shields should be applied both for piping systems and for pressurized equipment and/ or fittings on oil fuel systems, such as heat exchangers, tube plates and filter or strainer body joints. By extending this stipulation to include other flammable liquids, a higher fire safety level can be obtained. For example, lubrication oil filters located in the vicinity of the turbo charger should be shielded to prevent leakage from the filter reaching the turbo charger. Please note that fuel oil filters fitted on the engine may not be located near rotating parts or hot components.

Flexible hoses (for newbuildings and vessels in operation)

Flexible hoses are only allowed in locations where this is necessary to facilitate relative movement between two connections. The hoses shall be type-approved and as short as possible, and should not be more than 1.5 metres long. Flexible hoses have a limited lifetime under normal conditions, but this lifetime is greatly reduced if the installation is arranged outside acceptable tolerances, for instance when the radius of a bend is less than the minimum required or when the tightening of the connection introduces a twist in the hose. Since flexible hoses are typically installed in locations with relative movement, care should be taken to prevent scuffing of the hoses. The hoses should preferably not have any contact with other pipes, hoses or machinery parts in order to minimize the risk of scuffing damage.

Because of the limited lifetime of flexible hoses, it is recommended to screen the entire hose and not just the connections.

Filters (for newbuildings and vessels in operation)

Class rules specify that filters or filter chambers fitted on the engine shall be provided with suitable means for venting when put into operation and for depressurizing before being opened. Valves or cocks with drain pipes leading to a safe location shall be used for this purpose.

MSC.1/Circ.1321 specifies in general that plug-type air vents on filters are not allowed and that air vent cocks or valves with discharge led to a safe location should be used.

Thermoscans (for newbuildings and vessels in operation)

Infrared thermal scanning equipment can be very useful when looking for hotspots in the engine room. However, it has to be kept in mind that the proper use of the equipment requires knowledge of the emissivity of various materials and calibration of the equipment. Therefore, it is recommended that the infrared thermal scanning results are used as an indicator of relative thermal differences and that the actual temperature of any hotspots indicated is determined by a contact thermometer. Thermal scanning reports prepared by the crew should be used with caution if they do not include contact thermometer references.

Insulation material (for vessels in operation)

More and more engines are delivered with an exhaust gas casing that insulates and shields the exhaust gas piping. This solution is preferred over the solution in which the exhaust gas manifold is wrapped with lagging, with or without mechanical protection, as it is easier to dismantle and reassemble and has fewer gaps through which oil can reach the heated surface. However, the insulation material inside the casing is exposed to high temperatures and vibrations and will deteriorate. Therefore, it is

necessary to regularly open the casing and verify the condition of the insulation material during the vessel's in-service life. This applies to any casing containing insulation material.

The repeated heating and cooling down of sheet metal plates, for example spray shielding or mechanical protection of insulation, is likely to cause deformation of the plates. Often, this leads to openings occurring between adjacent plates or closing mechanisms not sealing properly. When this is encountered, it should be evaluated if the orientation of the opening enables a flammable liquid spray to hit a hot surface. If this is the case, it needs to be rectified.

Safety culture and general maintenance (for newbuildings and vessels in operation)

The safety culture on board is crucial to the safety of the crew, passengers and vessel. A high awareness of the risks associated with the operation and maintenance of the equipment on board greatly reduces the risk of fires.

Engine room cleanliness, the presence of 'make-do solutions', such as drip buckets and 'leak deflectors', or the use of emergency escapes as storage space are often indicative of a poor safety culture on board. Other less visible aspects of the safety culture are, for example, the reuse of sealing materials such as soft copper rings, the calibration of torque wrenches and the availability of the applicable tightening torque for the various engine components such as the fuel pump foundation bolts, fuel injector bolts, high pressure connections and more.

Recommendations

Fire safety is the result of design and maintenance and can never be taken for granted. Continuous attention to all aspects is a requirement across the ship's entire lifetime.

Brookes Bell: minimizing risks in the transport of bulk cargoes

Brookes Bell is a multi-disciplinary consultancy that offers a wide range of marine and energy services that are rooted in investigations and surveying, adding value to clients through its scope and scale. Steeped in over 100 years of history, Brookes Bell's consultants marry practical knowledge and experience gained at sea and onshore with innovative technology solutions — essential to ensuring the highest standards of safety in the modern marine and offshore environment. The group's expertise is regularly tested to the highest level by providing litigation support through expert evidence in courts and arbitrations around the world.

Brookes Bell has recently expanded considerably. It has recruited more highly qualified and experienced consultants, and now offers wide-ranging expertise, from its master mariners, engineers and scientists, right the way through to its naval architects, loss adjusters, metallurgists, fuel chemists, software engineers and fire investigators.

One issue on which Brookes Bell is especially focused is the safe carriage of bulk cargoes, in particular advising on the risk of cargo liquefaction. The current tough market conditions in the shipping industry could, the company believes, have a negative impact on safety as the industry seeks to cuts costs and find better value.

As new or emerging bulk markets are being sought by the industry in order to maximize opportunity, there is the potential for the regulation of those cargoes to be out of date, or indeed partially or totally lacking.

Another factor is fluctuating freight rates — bulk rates have fallen so low so that the bulk shipment of some cargoes has now become viable when previously this was not the case. However, the carriage of cargoes in bulk, versus say in containers, is subject to specific and sometimes different regulations, so this must also be considered and addressed.

Therefore, professional, honest and dependable advice from companies such as Brookes Bell becomes vital if safety margins are to be maintained, or even improved.

It is clear that carrying cargo safely is the ideal aim, but it would be naive to be confident that this is always achieved. Cargo liquefaction has the potential to put the lives of mariners at risk and so remains high on the priority of shipowners, but all too often those involved in the export of the cargoes adopt the position that "there has never been a problem before" or "we have always done it this way". Of course, just because something has been done a particular way for a long time does not automatically make it correct and likewise just because there has not been a casualty before does not automatically make it safe.

Dr Nick Chapman, Associate Consulting Scientist, Brookes Bell, has noted that, despite extensive regulation in the shipping world, the human element of the supply chain means that there are always risks, and this is one reason why incidents continue to occur, some of them catastrophic. It is difficult to remove that risk, but the best approach to evaluating the risk is to obtain reliable technical data on which to base the risk advice. Best practice protocols are essential to minimize the risk of human error during loading. The appointment of an independent cargo superintendent, for example, can be a major force for good — he/she can supervise the loading process and is often more familiar with the particular cargo than the crew. So risks can be reduced, if not completely eliminated.

Brookes Bell's services include

- **casualty investigation:** specialist support to the global marine and offshore industries in the field of casualty investigation;
- **salvage & wreck removal:** appointing the Brookes Bell team to manage any salvage wreck removal is a fast way to solve a problem efficiently, professionally and economically;
- **design support:** Brookes Bell brings a wealth of practical experience alongside innovative technology and advanced computational techniques to bring about design advances that promote maritime safety.
- **energy & marine loss adjusting:** an experienced and dedicated team of loss adjusters focused on resolving marine and energy claims in Asia Pacific and beyond;
- **litigation support:** specialists from all disciplines of Brookes Bell regularly act as expert witnesses in courts and arbitrations or to aid claim resolution through mediation;
- **marine surveying:** Brookes Bell provides the full range of marine hull, cargo and P&I survey services from all its offices in the UK and across Asia;
- **scientific cargo expertise:** scientists within the Brookes Bell can provide in-depth technical knowledge relating to the transportation of all types of commodity carried at sea; and
- **software products:** Brookes Bell has developed a unique team of experienced software engineers to work with boxed and bespoke software products for both marine and offshore sector clients.

UK P&I call for members to use 'can test' to avoid cargo liquefaction

Over the past decade, at least 100 seafarers have lost their lives due to incidents which have been attributed to bulk cargoes liquefying at sea. Senior Claims Director Alan Speed looks at the dangers of cargo liquefaction and the steps members can take to mitigate the risk.

"The issue of liquefaction remains high on the UK Club's Loss Prevention agenda. Solid bulk cargoes such as unprocessed mineral ores and refined mineral concentrates have certain characteristics that, although they may appear to be in a dry, granular state upon loading, contain enough moisture to become fluid under the compaction and vibration that occurs during a voyage. The resulting cargo shift can be sufficient to capsize a vessel and sadly cost lives.

"More tragic is these deaths could have been prevented if a simple test had been carried out and acted upon before the ships left port. The so-called 'can test' is exactly what it says: put some cargo in a can, bang it on the ground for a minute and see if the contents start to flow. If they do, stop the loading and get some proper laboratory tests done — regardless of what it says on the cargo documentation.

"UK P&I Club has produced seven videos in partnership with global cargo experts Minton Treharne & Davis (MTD), to explain what a 'can-test' is and what it looks like in practice. However, members should be aware that a negative 'can-test' result does not necessarily mean the cargo is safe for shipment. If samples remain dry following a can-test, the moisture content of the material may still exceed the Transportable Moisture Limit'. As such, it is recommended that if the can-test fails or there is a suspected failure members should:

- stop loading;
- issue a Letter of Protest; and
- seek further advice from P&I Club. They may require surveyor/reputable cargo expert involvement and further lab testing.

UK P&I Club provides advice on particular points that should be paid attention to:

- nickel, bauxite and iron ore are most susceptible to liquefaction. The IMSBC code specifies standards for transporting each of these ores to prevent risk of liquefaction;
- prevention of liquefaction is achieved through sampling and testing of the ore for their TML (transportable moisture level) and MC (moisture content) no more than six months before transportation.
- the TML test of any cargo to be loaded should be conducted within six months of the date of loading for homogenous material where no change in physical characteristics would be expected
- MC testing and sampling should not be carried out more than seven days prior to the date of loading. These timings are the mandatory intervals between sampling and loading and must be strictly adhered to. If it has rained during these periods, further re-sampling/testing is required;
- testing and constant vigilance of any doubtful cargo is the only way to ensure a minimized risk of liquefaction.

UK P&I Club

The UK P&I Club is a leading provider of P&I (protection and indemnity) insurance and other services to the international shipping community. Established in 1865 the UK P&I Club insures over 225 million tonnes of owned and chartered shipping through its international offices and claims network. 'A (Stable)' rated by Standard & Poor's with free reserves and hybrid capital of $559m the UK P&I Club is renowned for its specialist skills and expertise which ensure 'best in class' underwriting, claims handling and loss prevention services.

The UK P&I Club is managed by Thomas Miller, an independent and international insurance, professional and investment services provider.

Thomas Miller

Thomas Miller is an independent and international provider of insurance, professional and investment services.

Founded in 1885, Thomas Miller's origins are in the provision of management services to mutual organizations, particularly in the international transport and professional indemnity sectors; where today they manage a large percentage of the foremost insurance mutuals. Thomas Miller also manages insurance facilities for all the self-employed barristers in England & Wales, as well as trustees of pension schemes, patent agents and housing associations.

Principal activities include:

- management services for transport and professional indemnity insurance mutuals;
- investment and wealth management for institutions and private clients;
- professional services; and
- building defects insurance.

Polish Register of Shipping – safety for the benefit of the shipping community

Polish Register of Shipping (PRS) is an independent expert institution acting on the international market, and its business is conducted for the benefit of the community. By establishing what is required, carrying out surveys and issuing documents, PRS helps governmental bodies, underwriters and clients to ensure the safety of people, vessels, land-based systems, carried cargo and the natural environment.

PRS is active in many areas, which can be divided into the following basic groups:

- Carrying out surveys for compliance with the requirements of the society's own rules for classification and construction and/or the requirements of the relevant international conventions as well as national regulations regarding the following:
  - sea-going ships;
  - inland waterways vessels, yachts and boats;
  - naval craft and other special-purpose objects intended for state security and defence;
  - steel structures, pipelines and industrial installations, as well as land objects;
  - construction and repair of containers;
  - manufacture of materials and products; and
  - manufacturers and service suppliers.
- Certification of products for compliance with European Union directives.
- Certification of management systems for compliance with international and national standards.
- Provision of technical expertise and advisory services.

PRS is a member of the International Association of Classification Societies (IACS), approved by the European Union to perform surveys and inspections of sea-going ships and inland waterways vessels. PRS is an organization authorized by maritime administrations of Poland and tens of other countries to act on their behalf, a body notified by the European Union to assess compliance and certify products for compliance with EU directives and accredited for the certification management system.

From 1 July 2016, Polish Register of Shipping has launched a new service of quick advice to ship-owners in emergency situations — a so-called Emergency Response Center (ERC).

The Emergency Response Center consists of a four-person team — including specialists on stability, hull strength, fire safety and environmental protection. To ensure reliable operation of the team, it has been given access to appropriate hardware, modern means of communication and independent power supplies in case of power outages. PRS's specialists therefore have the most up-to-date information, and can properly assess threats to a ship in an emergency situation for a period of four to 12 hours. Previously created ERC ship computer models also ensure that the team is able to formulate the most appropriate way to proceed.

It is worth mentioning that the work of the members of the Emergency Response Center is purely advisory and consultative. Thanks to the regular contact with the ship's crew and the owner's representative during an emergency situation, this service helps to assess the current situation better and assist the master to make the right decisions.

PRS — as other IACS members — has undergone a goal-based standards (GBS) verification audit on the Common Structural Rules for Bulk Carriers and Oil Tankers.

MSC 96 confirmed (MSC.1/Circ.1518), at its ninety-sixth session, that the information provided by the Polish Register of Shipping demonstrates that its rules confirm to the Tier I goals and Tier II functional requirements of the GBS Standards (resolution MSC.287 [87]).

Common Structural Rules for Bulk Carriers and Oil Tankers of Polish Register of Shipping are, according to the Tier I goals and Tier II, functional requirements of the Goal Based Standards 9 Resolution MSC.287 (87)).

Positive verification of the Common Structural Rules for Bulk Carriers and Oil Tankers confirms PRS's special role in ensuring the safety of people, ships and environment.

Also, they reaffirm the position of IACS in IMO as a credible expert and technical adviser for the international maritime community.

PRS offers designers of ships and shipyards training on the regulatory requirements of CSR. Software developed by PRS allows users to efficiently perform analyses required by the rules of CSR, and offers meaningful assistance in the process of designing ship constructions.

INTERCARGO: collectively changing the bulk industry for the better

The International Association of Dry Cargo Shipowners (INTERCARGO) is a voluntary, non-profit association representing the interests of dry bulk cargo vessels' owners.

INTERCARGO was the brain child of the late Antony J. Chandris who realized that there was a need for an international forum for individual dry cargo shipowners where they could meet to discuss matters of mutual interest and promote their interests and vision for the dry bulk shipping.

From the first General Meeting of the Association, which took place on 23 April 1980, in London, INTERCARGO has given a voice to shipowners, managers and operators of dry bulk cargo vessels. The power of INTERCARGO is that, collectively, it is possible to change the bulk carrier industry for the better, in a world where one bulk carrier shipowner acting on its own finds it most difficult to make itself heard and facilitate progress.

With Non-Government Organization status at the International Maritime Organization and participation in shipping events, INTERCARGO's mission is the creation of a safe, efficient, high quality and environmentally friendly dry cargo shipping industry. The prime principle of a free and fair competition in the dry cargo industry, serves the objective to create strategies which enhance the interests of the members for the benefit not only of the dry cargo shipping but also of the whole shipping industry.

INTERCARGO works closely with the other international maritime associations – BIMCO, INTERTANKO and the International Chamber of Shipping who, together with INTERCARGO, comprise the Round Table of International Shipping Associations. The aim of the Round Table is to maximize the benefit to members and to avoid costly and inefficient duplication of activity. INTERCARGO believes that this strategy of working together is in the best interests of its collective memberships.

Benefit to INTERCARGO members:

- Participate in the drafting strategy for the dry bulk and the wider shipping industry.
- Be part of an association dedicated to quality and safety, with a proven better than average performance in Port State Control inspections.
- Vessels entered with INTERCARGO are awarded quality bonus points in RightShip's online Ship Vetting Information System.
- Be part of the Round Table's effort in creating a united voice for shipping.
- Associate Members may advertise their services in the hard copy *Bulletin* which is sent to most of the world's 1,200 bulk carrier companies.
- Receive gratis copies of INTERCARGO publications, including the *Benchmarking Report* and *Bulk Carrier Casualty Report*, guidance on Port State Control matters and other reports covering terminals and operational matters. Take advantage of Members' area information services on INTERCARGO's website.
- Use the output of INTERCARGO's Technical Committee and Executive Committee meetings and deliberations. Gain access to wider cross industry sources of knowledge and influence via INTERCARGO's participation in various of IMO and industry working groups.
- Meet fellow Members twice a year at meetings in Europe and Asia.

Harnessing Big Data technology to support long-term profitability of bulkers

In an industry operating within razor thin margins, dry bulk ship owners and operators need to be convinced of the fuel and emissions savings potential of eco-efficiency technologies prior to investment. Michael Hindmarsh, Business Development Manager for AkzoNobel's Marine Coatings Business, International®, outlines the role Big Data technologies can play in delivering accurate and transparent performance predictions.

While there have been some green shoots of recovery in the dry bulk sector since the beginning of 2016, overcoming tough market conditions remains a significant challenge for many ship owners and operators. Weak pricing and low freight rates, increasingly high operating costs and significant over capacity driven by a continued decline in coal and iron ore trade, are some of the business critical issues that are being discussed at board level.

While ship owners and operators have limited control over these pressing issues, they can, through careful decision-making, implement strategies that drive greater operational efficiencies. One key area of focus for those looking to drive efficiencies is the ship's hull. By making the right substrate preparation choices and hull coating selection, dry bulk owners and operators can achieve significant fuel and CO_2 savings through the use of sustainable hull coatings such as Intersleek1100SR.

The efficiency exact savings delivered by hull coatings are dependent many factors that are unique to each vessel including ship type and operating profile. However, what is consistent throughout the dry bulk sector is the increasing value ship owners and charterers place on eco-efficient vessels. From a ship owner's perspective, efficient vessels are becoming more marketable on the back of reduced bunker bills and emissions output, increasing their competitiveness in the eyes of charterers; charterers typically pay for the fuel, and prefer more efficient vessels that are less costly to operate, and increase the sustainability of their supply chains.

Transparency in hull coatings selection

While the benefits of fuel and CO_2 savings to dry bulk vessels are clear, those responsible for selecting and implementing energy efficiency strategies are faced with a myriad of choices when it comes to eco-efficiency technologies, including hull coatings. Before installation or application, the decision-making

process taken by ship owners and operators is largely influenced by the technology provider's ability to demonstrate an accurate return on investment. Hull coatings are no exception to this. While coatings manufacturers have long since offered insight into the performance of their solutions, there are still instances where ship owners are sceptical about the statistics provided.

To overcome this challenge, and to bring a new level of transparency and choice to hull coating selection, AkzoNobel's Marine Coatings Business, International®, has developed Intertrac Vision, the shipping industry's first Big Data consultancy tool that provides accurate and transparent predictions on the fuel and CO_2 savings potential of fouling control coatings, prior to application.

Intertrac Vision combines an understanding of total hull roughness (micro and macro) and roughness associated with biofouling. It also uses studies carried out by computational fluid dynamics (CFD) on different hull forms in order to make accurate predictions on the impact of fouling control coatings on the comparative powering requirements of a vessel.

Intertrac Vision is free to use for ship owners and operators and is accessible via specially trained AkzoNobel consultants. The technology processes individual vessel parameters, input during a consultation and then uses multiple proprietary algorithms and models to provide an accurate and detailed assessment of the impact of each potential fouling control coating choice over the ships specified in-service period. Key outputs from Intertrac Vision include: ships powering requirement, fuel oil consumption, fuel oil cost, CO_2 emission predictions and a full cost benefit analysis when comparing different coatings and surface preparation options.

ISO19030

In addition to the provision of accurate and transparent datasets, performance prediction technologies such as Intertrac Vision must be able to keep apace with the latest shipping industry dynamics if they are to remain current and relevant to users.

In support of this ambition, in July 2016, AkzoNobel

announced that the requirements for ISO 19030 have been incorporated into Intertrac Vision, so performance predictions can be verified and validated against actual performance using a monitoring process that is ISO 19030 compliant.

Hull coating performance predictions produced by Intertrac Vision can be analysed during vessel operation to confirm compliance with the requirements for all parts of ISO 19030. This includes ISO 19030 Part 2, which is used by an estimated 10% of the commercial fleet and is based on taking data from sophisticated on-board sensors at high frequency intervals, as well as ISO 19030 Part 3, an area of the standard proposed, and its development led by AkzoNobel. Part 3 is founded on a tiered system of potential methods for monitoring, including noon report data collection, which makes the standard applicable to the majority of the shipping industry. AkzoNobel will also continue to support ship owners and operators who wish to verify the performance of their coatings using other methods.

Providing choice for customers

There is still work to be done by technology providers to build the proof and trust that the dry bulk sector rightly demands before investing in eco-efficiency technologies. In an industry operating within tight profit margins where every dollar must be spent wisely, performance prediction technologies such as Intertrac Vision offer an important tool through which greater confidence can be fostered, driving further update and supporting the long term sustainability and financial stability of the dry bulk sector.

Martek Marine: the latest products revolutionizing bulk cargo vessel operations

Martek Marine recently introduced to market two groundbreaking new systems to revolutionize on-board communications, safety, and welfare.

The first, iCon™, is a plug-and-play on-board WiFi system. It needs no retrofitting and can be installed on any vessel using existing power cables. iCon™ brings connectivity to the entire vessel, delivering a wide range of new opportunities and improved efficiencies in one package.

Greater operational awareness is possible thanks to connected systems such as water ingress detection sensors, engine monitoring, RFID tracking, and wireless cargo monitoring. All of these feed back to one central unit on the bridge, allowing a full and comprehensive operational overview at any point. The fast speeds allow for quick upload and download of files to on-shore head office, speeding up operational reports and urgent communications.

The on-board WiFi hotspots created by the plug-and-play marine-approved system improves crew welfare in many ways. Most significantly, it enables ships to implement affordable telemedicine systems to offer better healthcare while at sea. Specifically, it will help ships make the most of Martek Marine's other new offering: iVital™.

One in five ships diverts every year at an average cost of $180,000 due to medical emergencies. Yet over 20% of these diversions could be avoided with telehealth systems on-board. Now, iVital offers a system that is completely affordable for all vessels in a pay-as-you-go package with no capital outlay.

iVital™ consists of wireless medical equipment such as ECG and blood pressure monitors, thermometers, and oxygen meters. When a crew member falls ill, a simple Skype call on the included tablet connects to a senior NHS-registered clinician — at any time, anywhere.

The wireless equipment in the iVital™ kit provides the clinician with real-time patient feedback for an accurate initial diagnosis, and ongoing monitoring is also possible using this equipment. Using this system provides operators and ship captains with more detailed information to enable faster decision-making about treatment, evacuation, quarantine, or diversion.

Avoiding unnecessary diversions for medical problems that can be resolved on-board is essential for any vessel wanting to maintain high profit margins and retain a competitive edge. Providing on-board medical care of a high standard will be of benefit to crew and operators, improve efficiency, and save thousands of dollars every year.

Port of Vancouver USA: 86 acres available for a new mineral bulk facility

Since 1912, the Port of Vancouver USA has been an economic engine and job creator in Washington state. Located at the hub of the Pacific Northwest on the Columbia Snake River System, this deep water port has five marine terminals and 13 berths that handle more than 400 ocean-going vessels and river barges annually, with a total cargo volume exceeding six million metric tonnes.

The Port of Vancouver USA now has space available at its newest terminal — Terminal 5 — for a new high-volume mineral bulk facility. Permits are already in place and construction can begin immediately on this 86-acre parcel, which is specially designed to handle a multi-million-tonne facility. This site provides a unique opportunity to develop shovel-ready property on the US West Coast.

The Port of Vancouver USA is located on 2,127 acres including 800 acres of developed property and 500 acres available for future development. The port currently has 86 acres available and permitted for a new high-volume bulk facility at Terminal 5.

Terminal 5 features a loop track that allows unit trains to be handled within the port's internal rail complex. Four 8,500ft. loop tracks were specially designed to accommodate multiple unit trains carrying a variety of dry and liquid bulk cargoes. There is also room to add a fifth track to meet future capacity needs.

Rail capacity and infrastructure

Two Class 1 railroads — BNSF Railway and Union Pacific Railroad — transit the Port of Vancouver, offering cost-effective rates. The port has nearly completed its West Vancouver Freight Access rail expansion, a $275 million project that will more than triple the port's rail capacity and reduce regional rail congestion by as much as 40% on BNSF's main north-south and east-west rail lines. This allows the port's capacity to grow from 55,000 to 400,000 railcars per year.

The port's location near key freight corridors, including I-5 and I-84, provides quick access to major north-south and east-west routes. Transloading cargo to barges on the Columbia River ensures efficient movement of freight and access to inland ports serving the Midcontinent.

Efficient trade routes

The port offers the most efficient, direct, uninterrupted route between the Pacific Rim and the US Midcontinent and Canada. Customers save almost half the time — and thousands of dollars — compared with shipping through Gulf ports.

Efficient trade routes to and from the US Midcontinent and Pacific Rim have never been more critical as shippers seek to cut costs and save time when importing and exporting goods. That's why many of them are partnering with the Port of Vancouver USA. Located only 106 river miles inland from the Pacific Ocean, the port is situated on a 43ft (13.1m) deep draught shipping channel with berths capable of handling Panamax-sized vessels. It specializes in handling break bulk, RoRo, bulk and project cargoes, with dedicated facilities for handling wind energy components, automobiles, grains, pulp, mineral ores, and agricultural commodities, among others. Long term agreements with shippers, OEMs and stevedores ensure shipments can be scheduled at an agreed-upon rate so cargo efficiently and reliably reaches its destination.

The Port of Vancouver USA is located on the Columbia River, 106 miles from the Pacific Ocean, and is situated on a 43ft (13.1m) deep draught shipping channel.

Not your ordinary landlord — or port

The port has a dedicated staff that works closely with customers to ensure efficiency in all areas, whether in leasing buildings or property or consulting on shipping and supply chain logistics. This team of talented and experienced people offers outstanding customer service and a strategic and consultative approach that capitalizes on the port's unique capabilities.

"We've made numerous strategic moves in the last several years to invest in the equipment, people, facilities and infrastructure to ensure our customers can get their products to market stress-free," said Alastair Smith, chief marketing and sales officer at the Port of Vancouver USA. "It all pays off when we hear from our satisfied customers, who repeatedly tell us that they appreciate our high level of service and logistics expertise."

Port of Vancouver USA

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43'
DEEP DRAFT CHANNEL (13.1 METERS)

400K
RAIL CARS PER YEAR FUTURE CAPACITY

8,500'
LOOP TRACKS & UNIT TRAIN CAPABLE

Bring your high volume–and your high expectations–to the Port of Vancouver, which is 5,800 miles closer to Asia than the Gulf ports. Contact Steve Mickelson at smickelson@portvanusa.com or 360-693-3611, or visit portvanusa.com.

You've got the volume. We've got the capacity. And the know-how.

The Port of Vancouver's Terminal 5 has space available for a new high-volume mineral bulk facility. Our 86 acres of opportunity offer a berth and loop track with unit train capacity, and are already permitted for high-volume mineral bulk. With our skilled workforce, first-class service and exceptional efficiency, we're not your average landlord.

Rendering of potential bulk facility.

THE PORT OF / *Possibility*

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The port is our life. Hands-on mentality, hard work and accessible people, that's our character. Anyone who gets to know Zeeland Seaports becomes acquainted with professionals who are proud of their ports. We understand that your interests are also our interests. Clients come first. Always. We know what's important to your company. That's all in our character, and one of our many strengths:

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Aveiro acquires largest MHC in Portugal

In the Portuguese port of Aveiro, PTM Ibérica recently took delivery of the largest ever crane to be deployed there. The Liebherr LH500 has a capacity of 150 tonnes, which will allow it to handle not only dry bulk, but also twin lift containers. This makes in not only the largest crane of its type in Aveiro, but also in any Portuguese port.

PTM Ibérica already operates a Liebherr LH400 in the port of Aveiro. *Barry Cross*

Haldia to receive two new MHCs

At Haldia port in India, IRC Natural Resources, has placed an order for two Model 4 Gottwald mobile harbour cranes with Terex Port Solutions. The G HMK 4404Bs are four-rope units and these will be deployed at Berth 13 of the Haldia Dock Complex, which is situated to the south of Kolkata on the Ganges estuary.

The two cranes, which are due to arrive in August 2016, will handle coal, coke, manganese ore and limestone as of October. Each have a lifting capacity of 100 tonnes and offers an outreach of 46 metres. Their maximum lifting speeds are 85m/m and each offers a propping system allowing them to adapt to the conditions on the berth at any given time.

IRC is the eighth customer to have ordered cranes from TPS since mid-2014, with the two bound for Haldia being the eleventh and twelfth units acquired by India in that period, with 40 mobile harbour cranes active in the country. These are deployed across six ports on both India's coasts. *BC*

Beira coal terminal to triple capacity

Mozambique's Ministry of Transport and Communications has given permission for the New Coal Terminal Beira (NCTB), which is controlled by the Indian concessionaire Essar Ports, to expand its facilities at the port of Beira. The aim of the investment is to allow the terminal to triple its existing capacity, which currently stands at 6mt (million tonnes) per year.

The decision to up capacity has been prompted by similar developments on the Sena Railway, which links Moatize, in Tete province, with the port of Beira, in Sofala province. This will shortly be able to handle 20mt of coal annually as opposed to the previous figure of just 6.5mt.

According to Minister Ambrósio Sitoe, "The modernization of the Sena line is at a fairly advanced stage and should be completed by December, but the coal terminal at Beira port continues with a stockpile capacity for coal of around 6mt per year. This therefore requires the harmonization of the two infrastructures."

The Ministry is also looking into a number of priority projects at the port, including the proposed Machipanda railway link, whose feasibility study has already been completed, as well as renovation of Berth 11, which will specialize in container traffic.

The government has every interest in promoting development of NCTB, since 30% of the equity stake is held by state-controlled Portos e Caminhos-de-Ferro de Moçambique, leaving Essar Ports Ltd with 70%. *BC*

SIOT to be converted from iron ore to coal terminal

Kamarajar Port Ltd (KPL) has given permission to Sical Iron Ore Terminal (SIOT) to undertake modifications of its existing iron ore terminal to allow it to handle coal.

The original terminal development contract was signed in September 2006 between KPL and SIOT, in what was a 30-year BOT concession, as part of a $71.767 million project. The plan called for a two phase development, each of which would involve providing capacity of 6 million tonnes per annum.

Although phase 1 was built at a cost of $53.82 million – involving a revenue share of 51.6% - the terminal was never commissioned due to a ban on iron ore exports being introduced by the Supreme Court and the Karnataka state government.

Given its inability to handle iron ore, KPL has sought to turn its facilities into a common user coal handling terminal. This involved an open tender in which three parties bid, with the eventual contract being awarded to SIOT, whose proposal involved a revenue share of 52.524%. The concession agreement was signed on 11 July.

Conversion work on the terminal is due now to commence in October and is slated for completion within 12 months. *BC*

Efficient stevedoring services from Maja Stuwadoors

Maja, a 40-year-old family-owned stevedoring company in the Netherlands, handles a wide range of bulk products in the ports of Amsterdam and Rotterdam for different customers. Maja is known for its flexibility, and effective, efficient stevedoring services. With the experience of its skilled personnel, Maja is able to achieve remarkable results in time savings and effective handling of bulk and breakbulk cargoes.

Maja also handles breakbulk and containers with floating cranes, if its customers need such operations. Several clients use this option to ensure the shortest handling process, saving time and money. For the last five years, Maja has also been active in offshore stevedoring.

Maja started offshore activities about five years ago with a lemniscate crane, which was chartered to a third party, mainly handling coal in Colombia at sea. The crane was mainly loading Capesize vessels for the continent. In Colombia the stevedoring at sea ended, and a new contract was taken for handling bauxite at the coast of the Dominican Republic, to load Capesize vessels at sea with a quantity of around two million tonnes per annum.

At the moment Maja has expanded its activities and increased crane capacity with one 25 metric tonne lemniscate crane, which can handle 20,000 tonnes per day.

As many developing countries do not have the necessary port infrastructure for handling larger vessels, offshore stevedoring remains a fast and flexible solution for mine owners to transport large volumes of bulk by sea. As the floating crane only has a draught of two metres the capabilities of the crane can also be used to load inland or sea barges from shore with limited draught at the quayside. Even if there is no quay, the crane is able to use spud poles to maintain its position while (un) loading to or from the shore.

Maja is also able to handle breakbulk or containers to a maximum of 32 tonnes as well from onshore to offshore. The flexibility of personnel and equipment makes it possible to handle containers, bulk and breakbulk on the same vessel in one place. Since the vessel does not have to shift to different terminals for different cargoes, time and transport can be saved and vessels can be loaded with multiple cargoes.

Louis Dreyfus opens Bahía Blanca extension

In Argentina, Louis Dreyfus Company (LDC) has inaugurated an extension to its Bahía Blanca Port Complex. Among the work undertaken was the creation of a deepwater harbour and construction of a grain conditioning plant. Taken together, this is one of the most important infrastructure projects developed in the country in recent years.

Speaking at the time of the inauguration, company president Margarita Louis-Dreyfus noted, "Argentina is a very important country for our group, given its enormous potential as a producer of quality food products and for the commitment and specialization of its people."

In total, LDC invested $16 million in the expansion, which brings to $76 million investment over the last five years.

At its Bahía Blanca terminal, inbound grain can be handled from both rail or road, while vessels drawing up to 45 feet of water can be accommodated. In 2015, traffic at the terminal amounted to 1.2mt (million tonnes). Going forward, with the expanded work area in place, LDC suggests it will be able to accommodate up to 2mt annually.

Port of Bahía Blanca.

"This investment will improve logistics in south-western Buenos Aires, allowing producers from that area to obtain better prices and infrastructure," noted LDC's regional CEO, Javier Racciatti. "This port represents a key investments to achieve the logistics efficiency that agro-industrial exporters need in this country." *BC*

Transnet Port Terminals celebrates one billion tonnes of iron ore exports

The 18th of August 2016 marked a historic milestone for Transnet Port Terminals' Saldanha operations. One billion tonnes of iron ore passed through the Saldanha Bulk Terminal, which is South Africa's main iron ore export terminal and a highly mechanized bulk-handling facility that remains the largest facility in the Port of Saldanha.

In addition to that, due to Saldanha having South Africa's largest natural anchorage port with the deepest water — the terminal is also where the first deliveries of iron ore were exported on the vessel *Fern Sea* during September 1976.

Key TPT stakeholders, local and regional management gathered at the Saldanha Terminal to celebrate this momentous milestone and acknowledge the amount of hard work and dedication taken to achieve this record.

"Transnet Port Terminals (TPT) is constantly looking to expand and strengthen our operations so reaching such a large milestone is very significant for the company as a whole. We are delighted with the success of the terminal and commitment that has been shown by the Saldanha TPT staff and management team that has seen us go from the terminal's total handling capacity increasing gradually from 18mtpa (million tonnes per annum) in 1976 to where we are today at 60mtpa — an increase of 233%," stated Robert Van Rooyen, TPT Saldanha Terminal Manager.

Mineral cargo represents the biggest market for Transnet

Port Terminals which is a key player in the success of the sector. To support the South African economy and the world trends as well as the growth of emerging miners Transnet Port Terminals has committed to investments that have included the purchase of sophisticated bulk handling equipment as part of Transnet's seven-year Market Demand Strategy (MDS) implemented in 2012. As part of the MDS roll-out, R5,5 billion was earmarked for the expansion of the Saldanha Iron Ore Terminal.

"We don't intend on slowing down and are focused on continuing to increase volumes and improve efficiencies so that we maintain our efforts to contribute to the Western Cape region and the country's economy as a whole," concluded van Rooyen.

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All at sea?

shipboard and floating cranes

Repeat order proves worth of barge-mounted E-Crane at Mulzer Crushed Stone

After three years of successful operation of its 1500 Series barge mounted E-Crane, Mulzer Crushed Stone ordered its second barge-mounted E-Crane in 2014 for its Shamblin Stone operation in Dunbar, WV, USA. This machine is used for unloading barges of aggregate. The E-Crane unloads the material directly into a hopper, located on an adjacent barge to the E-Crane barge. Because the E-Crane is barge-mounted, Mulzer has the flexibility to transport the entire barge unloading system to wherever it needs to perform barge-unloading operations.

The E-Crane balanced design is based on a parallelogram style boom which provides a direct mechanical connection between the counterweight and the load. This ensures that the E-Crane remains in a nearly perfectly balanced state throughout its entire working range. This balance principle makes the E-Crane ideal for barge mounting. Because the E-Crane is always in a balanced state, there is very minimal listing and movement of the barge while the E-Crane operates.

The machine has been performing well since installation in 2015, and Mulzer is happy with the success of the project. Don Gengelbach, Equipment Manager at Mulzer Crushed Stone says, "The machine is performing well and meeting our expectations.

Normally when we commission a new machine there are always some issues to work out. With E-Crane, those issues were addressed quickly and the machine is operating very

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DAMEN

Barge-mounted E-Cranes handle grain

Following an order placed in 2014, these barge-mounted cranes from equilibrium crane specialist E-Crane were commissioned in 2015, and are being used successfully to handle grain. They are installed at the UABL facility in Pueblo Esther, Argentina.

For more details on these UABL E-Crane 700 Series/Models 4264 PD-E, 4290 PD-E, please see p87 of this issue.

> "Unloading as much as 4,500 tonnes in a ten-hour shift is not a problem for this model 8248 E-Handler"
>
> **Robert Caruthers, Shamblin Stone**

smoothly. We have since purchased our third E-Crane and are expecting it to be delivered this week."

"Unloading as much as 4,500 tonnes in a ten-hour shift is not a problem for this model 8248 E-Handler," according to Robert Caruthers of Shamblin Stone. "We are very satisfied with this material handler after unloading 142 barges with it."

E-Crane is very proud to have Mulzer as a repeat customer, and is looking forward to continuing to work with this great company.

PROJECT SPECIFICATIONS

Customer:	Mulzer Crushed Stone
Type:	EH900/Model 8248 PD-E
Location:	Dunbar, West Virginia, USA
Application:	Barge unloading
Mount:	Barge
Lifting capacity:	13.6 metric tonnes/15 US tons
Reach:	24.8m/81.5ft
Attachment:	3.0m³/3.9yd³ hydraulic clamshell grab
Power source:	132kW/177 hp Electric Motor

Verstegen grabs for floating cranes

Verstegen clamshell grab on a Figee crane transshipping bauxite.

Floating cranes are used in ports and in open waters for loading, discharging, transshipment and lightening (for ports with insufficient depth). Verstegen grabs operate on floating cranes from 16 to 63 tonnes.

Independent flexible operation

Floating grab cranes have been in operation for many years. Mounted on a (self-propelled) pontoon the cranes provide fast, independent operations. In ports or at open sea, the cranes are used for loading, discharging, transshipment and lightening (for ports with insufficient depth). Often multiple floating cranes operate simultaneously on one vessel so very high unloading rates can be achieved.

Lemniscate crane

The design of the lemniscate crane is based on the double-boom principle, which delivers an optimal balance between weight and centre of gravity. The cranes have short cycle times and offer a perfect view for the crane driver, directly on top of his work. Floating lemniscate cranes are available in capacities from 16 to 50 tonnes and operate mainly in the Port of Rotterdam and Amsterdam.

Verstegen clamshell grab and Liebherr crane loading iron ore.

Harbour pontoon crane

Manufacturers of mobile harbour cranes also offer floating cranes. These cranes use the same standardized concept as the standard rail or rubber tyre-mounted mobile harbour cranes. The cranes have higher capacities up to 63 tonnes. Large stevedoring companies on the Mississippi river use these cranes for their operation.

Crane barge

Crane barges are mainly used for offshore transshipment operations. Most crane barges work with one or two 30–35-tonne deck cranes on an outreach of 32 to 36 metres. These floating transfer stations (FTS) are especially popular in Indonesia for loading of coal.

About Verstegen

Verstegen is a manufacturer of rope operated mechanical grabs for the dry bulk industry. Stevedoring companies, port authorities as well as steel works and power plants use the company's grabs for handling all kinds of bulk materials. More than 10,000 Verstegen grabs operate in more than 100 countries worldwide.

Dedicated to grabs

Verstegen is specialized in the designing and building of efficient and cost-effective grabs. Besides the standardized product range, Verstegen also develops unique solutions for specific situations and customer needs.

Verstegen philosophy

For fast and efficient unloading, a grab is one of the most important tools. In order to get high unloading rates, the grab must be extremely reliable with a high productive capacity. Furthermore each grab should be custom built for the material it has to handle and the unloading situation in which it has to operate.

High capacities and low dead weights

In order to obtain the highest productive capacity, a grab should have the highest possible volume without unnecessary dead

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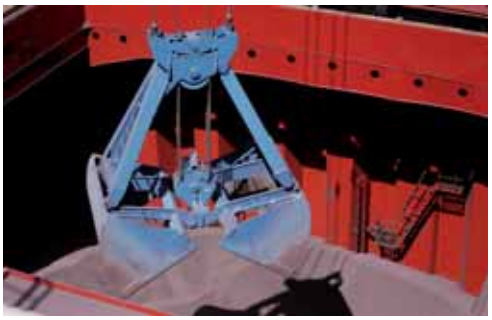

Are you looking for a new grab?

Please contact us. At Verstegen we are fully specialised in rope-operated mechanical grabs. Our goal is to provide the optimal grab for your specific operation. A new Verstegen grab leads to higher production rates and lower maintenance costs through extreme reliability and long lifetimes. Tell us how you want to improve your operation and together we will find the best solution.

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weight. This is only possible with a good and well proven design and the use of the best possible materials. To increase strength and minimize wear, each Verstegen grab is provided with shells completely made of high tensile wear resistant steel. The friction in the articulation points is absolute minimal because of an excellent bearing system.

A different grab for each bulk material

Each material has its own specific properties and a grab must be adjusted to these properties. A grab that will work perfectly with coal can have great difficulties whilst handling iron ore. Through extensive experience and expertise, Verstegen has developed a number of grab models, especially designed for common bulk materials (coal, iron ore, agribulk, fertilizer, phosphates). Besides grabs for the above mentioned materials,

Artco Stevedoring on the Mississippi with different sizes of Verstegen grabs.

Verstegen has special solutions available for other bulk materials with specific properties.

ARK Transshipment solutions in Indonesia and South-East Asia

ARK provides innovative and reliable fully integrated offshore transshipment solutions for its clients in the coal and other dry bulk industries in Indonesia and South-East Asia.

With its fleet of floating cranes/loading facilities and tugs and barges, ARK is able to handle the entire transshipment process for both loading and discharging operations.

Armada Rock Karunia Transshipment Pte Ltd was established in Singapore in September 2010. Together with its subsidiaries and associates (collectively 'ARK' or 'ARK Transshipment'), ARK owns, operates and manages floating cranes/loading facilities and tugs and barges to provide innovative and reliable fully integrated offshore transshipment solutions for the coal and dry bulk industries of Indonesia and South-East Asia.

With its strong association with the top coal producers in Indonesia and the major power plant operators in Indonesia and overseas, ARK is poised to play an important role in the sea-borne coal industry in Indonesia and South-East Asia. The continuous expansion and reorganization of its fleet with a flexible operations strategy allows it to optimize usage of its vessels and diversify into other businesses as and when the opportunity arises.

ARK maintains long-term and strong relationships with its stake-holders and partners such as clients, shippers, agencies and also financial institutions, as part of its team effort to build a leading offshore transshipment company operating in Indonesia and South-East Asia.

Services

Floating cranes/loading facilities

ARK's floating cranes/loading facilities are designed to meet the toughest conditions in terms of loading capacity and working environment. The floating cranes/loading facilities transship dry bulk cargo from barges to ocean-going bulk carriers (up to Capesize) and ARK provides stevedoring crew, mooring gangs and has dozers and loaders on the barges to ensure optimum shifting of the bulk cargo for efficient operations. The company is also able to unload dry bulk cargo from bulk carriers to barges (offshore) and from barges and/or bulk carriers directly to shore.

Tugs and barges

ARK's fleet of owned and managed tugs and barges are used for the transport of dry bulk cargo from the inland jetties to the anchorages to be loaded onto either gearless (using floating cranes/loading facilities) or geared ocean-going bulk carriers. The company also provides domestic inter-island barging services and even international barging services to South-East Asian countries (using ocean-going tugs and barges and/or self-propelled barges).

Fully integrated offshore transshipment solutions

ARK is always prepared to support the specific requirements of its clients and its goal is to provide innovative and reliable fully-integrated offshore transshipment solutions.

ARK is able to handle the entire transshipment operation for its clients — from the loading of the dry bulk cargo to its barges at the inland jetties, the barging of the cargo to the anchorages and then the transshipment of the cargo onto either gearless (using floating cranes/loading facilities) or geared ocean-going bulk carriers. The monitoring and supervising of all loading activities will be handled by ARK and its professionals will continuously assess the operational processes to optimize efficiency and thus reducing costs for its clients. Inversely, ARK are also able to provide a fully-integrated discharging solution to its clients, unloading dry bulk cargo from bulk carriers to barges (offshore) and from barges and/or bulk carriers directly to shore.

ARK's Transshipment fleet:

Floating crane ARK Shalom/ FC ARK Shalom *(self-propelled).*

Floating loading facility Hana/ FLF Hana.

Floating crane ARK Shiloh/ FC ARK Shiloh *(self-propelled).*

Build operate transfer (bot) floating crane Hua/ FC Hua.

Stevedoring barge delivered to ProvPort

Conrad Shipyard, Amelia, LA, earlier this year delivered a 300-foot long x 72-foot wide rake/box barge with a deck rating of over 6,000 pounds per square foot to ProvPort, Providence, RI, USA according to naval architect JMS Naval Architects, Mystic, CT. The crane barge design allows for the easy loading and unloading of cargo from ships to the dock or from ship to ship.

JMS Naval Architects, Mystic, CT, engineered and designed the crane barge for the State of Rhode Island that will be used for stevedoring operations at ProvPort Inc.

ProvPort is a nonprofit public-private partnership, formed in 1994, which owns and operates the municipal port of the City of Providence, RI. ProvPort is New England's premier deep-water multimodal facility for international trade and domestic distribution and one of the busiest ports in America's northeast.

JMS designed the barge to carry and operate the facility's 440-tonne Liebherr LHM 550 mobile harbour cranes. The barge is ABS classed A1 with notation 'Deck Barge', uninspected and unmanned. JMS also created the technical specification documents to utilize for the solicitation of shipyard bids and provided owner's representative services during the construction of the barge at Conrad Industries.

The contract was funded by the State of Rhode Island's Transportation Investments Generating Economic Recovery (TIGER) II grant programme award managed by the Rhode Island Commerce Corporation. The grant was created by Congress in the 2010 Transportation Appropriations Act and allowed the purchase and installation of the barge and two high performance harbour cranes. The new stevedoring equipment will modernize and enhance the port's ability to continue its existing bulk material operations while expanding its capabilities to accommodate container operations; thus alleviating demand on the Port of Boston — the only existing container port in New England. The new crane barge will be critical for the port which has relied on 30-year-old rented crane barges that have been prone to breakdowns and have been out service for prolonged periods. The crane barges are estimated to remove on average 1,000 trucks per week off the northeast corridor highway system – one of the most congested in the country.

Bedeschi equipment for Tan Thang

ITALIAN BULK HANDLING EQUIPMENT MANUFACTURER BEDESCHI IS CONTRACTED TO SUPPLY ALL THE CRUSHING, TRANSPORTING AND STORING RAW MATERIAL MACHINES IN THE NEW TAN THANG CEMENT PLANT IN VIETNAM

Bedeschi has signed a contract for the supply of all the equipment for crushing, transporting and storing raw material in the new Tan Thang cement plant that is being built in Vietnam. The new plant will be in the Nhe An province, where there are large reserve of good quality raw material. The plant capacity production will arrive up to two million tonnes per year. The order includes:

- one crushing group for limestone with a capacity of up to 850tph (tonnes per hour);
- a limestone circular storage facility (stacking capacity 850tph – reclaiming capacity 350tph);
- one clay crushing group with an apron feeder and a Bedeschi double roller crusher, suitable for crushing sticky and moist material (capacity 300tph);
- a stacking and reclaiming system for raw material additives (clay, iron ore, silica) made up of a luffing stacker with a capacity of 300tph and a bucket reclaimer with a capacity of 200tph; and
- a stacking and reclaiming system for coal with a luffing and travelling stacker (capacity 200tph) and a side type scraper reclaimer (capacity 100tph).

The contract includes all connecting belt conveyors, including the long one that connects the quarry to the cement plant, and all the filters for the conveyors de-dusting.

In brief

Jeff Court has been appointed as Senior Vice President for Regional Operations within the Minerals division of FLSmidth. In this new role for the division, Court will hold oversight of sales, project execution, operational excellence and P&L for all regions.

He joins FLSmidth's Global Minerals Management team, ensuring greater collaboration and streamlined communication between the division's business units and the regional heads, which will deliver more effective and harmonized responses to any regional needs. His focus will be on improving operational excellence in the regions, including improved order execution, sales and deliveries. Court's career history includes over 20 years in senior roles where he focused on industrial products and services while working within and supplying to the mining, minerals and construction sector. His vast business expertise will be of great value in improving the company's profitability and operational excellence.

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BENEFITS

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Your rollers for belt conveyors

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Louise Dodds-Ely

Bedeschi expands capabilities to become major player in conveyor market

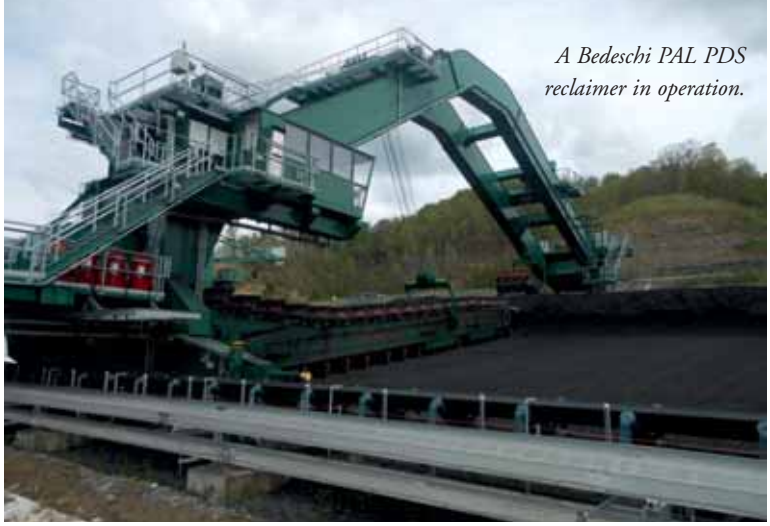
Acquisitions of ONT and Dearborn provide extensive conveyor expertise

In September last year, Bedeschi S.P.A. announced that it had purchased the assets of the bulk group of Dearborn Mid-West Conveyor Co, a major provider of turnkey bulk material handling systems for utility, mining, cement, fertilizer, refinery and marine terminal markets. The group, now renamed Bedeschi Mid-West Conveyor LLC (BMWC), was founded in 1947. It has operations located in Lenexa, Kansas. From there it designs, fabricates and installs complex bulk materials handling systems including pipe conveyors and rotary ploughs.

Bedeschi also had another important success last year, with the incorporation into the group of ONT Spa, a leading Italian company in the production of bulk material handling systems. ONT has delivered over 1,000 solutions to all types of customers. Its headquarters is located in the Milan-Bergamo area, where it has a 15,000m^2 covered workshop.

Thanks to these expansions, Bedeschi can now offer solutions to all types of bulk material handling needs. It has supplied solutions to industries including: cement, lime, chemical products, coal, mining products, oil & gas, grains, cereals and other alimentary products. The range of products includes conveying systems — comprising enclosed belt conveyors; descending overland conveyors with energy-generating solutions; belt and chain bucket elevators; screw conveyors; in-water scraper conveyors for slag evacuation systems of incineration furnace, gravity; and driven roller conveyors, for straight and curved runs.

The following case study is a great example of Bedeschi's expanded capabilities, and showcases its ability to manage a complex project in a reliable and expert manner.



A Bedeschi PAL PDS reclaimer in operation.

Punta Catalina project – Santo Domingo

In December 2014, the Bedeschi Group was awarded a contract to supply a new greenfield coal power plant with a capacity of 2x360MW to the contractor, Consortium Technimont – Odebrecht – Estrella. The final client is Corporacion Dominicana de Empresas Electrical Estatales (Dominican Republic's state energy holding).

The Bedeschi Group scope of supply consists of: complete material handling equipment set from coal-receiving rail mobile hopper on jetty up to coal storage and delivery up to loading point at boiler area.

Due to the constraints of the local environmental conditions, the design phase for the equipment and structures was extremely challenging. Problems included very heavy winds (the area is known for its hurricanes and tsunamis); soil issues (instability and potential liquefaction); and earthquake conditions.

With five of its companies, the Bedeschi Group participated in all project phases (engineering, procurement, construction, expediting and delivery).

- **ONT SpA:** project management, design, procurement and fabrication of ten conventional belt conveyors, two feeders, diverter valves, structural design, procurement and fabrication of all steel structures included in the scope of the contract;
- **Bedeschi SpA:** design procurement and fabrication of two reclaimers, two crushers, five trippers, one moveable hopper, logistics and expediting;
- **CTP Team:** design, procurement and fabrication of seven bag dedusting filters;
- **Bedeschi Handling:** design of pipe conveyor D.700. This is one of only a few of its size, and is one of the biggest in the world, with a capacity of 3,000tph (tonnes per hour);
- **Midwest Conveyors (USA):** various procurements on the US market. Below is a list of the main supplies and equipment:
  - one mobile hopper on the pier, with a 3,000tph receiving capacity;
  - one 2,000mm-wide, 150m-long dock conveyor with a capacity of 3,000tph;
  - one D.700mm, 2,150m-long pipe conveyor with a capacity of 3,000tph. This conveyor has;
    - a speed of 5m/s;
    - a diameter of 700mm;
    - length of 2,150m;
    - lifting height of 33m;
    - a horizontal radius of 450m; and
    - a vertical radius of 450m;
  - one 3,000tph-capacity tripper unit (storage loading);
  - one 200,000-tonne-capacity coal storage facility;
  - two Bedeschi PAL PDS 260/35+5 +220/15 double-boom reclaimers, each with a capacity of 1,500tph. These reclaimers:
    - have a rail span of 58m;
    - have 16 wheels;
    - are of portal type, with two booms;
    - have a main boom length of 35m;
    - have blades of 2,600mm x 520mm; and
    - have a chain speed of 60m/min.
  - two 1,500tph-capacity coal conveyor lines which are each 1,000m long. These:
    - have a total of eight conveyors;
    - have a width of 1,400mm; and
    - are independent, mutually interchangeable lines.
  - two 1,500tph-capacity belt-type volumetric extractors;
  - two 1,500tph Bedeschi RL 450/3000 on line coal crushers. These
    - have Bedeschi double roll crusher technology;
    - have a roller diameter of 450mm;
    - have a roller length of 3,000mm; and
    - are of a planetary gearbox shaft mounted drive type.
  - four 1,500tph-capacity (each) tripper units, translating above the boiler line;
  - five steel transfer towers;
  - four conveyor galleries for supporting double parallel conveyor lines. These:
    - have a total length of 550m; and
    - have two 1,400mm-wide conveyors.
  - seven dedusting bag filters on conveyor transfer points and on board the travelling machines;
  - one on-line coal sampler installed before the boiler lines;
  - belt scales, magnetic separators, metal detectors, pneumatic diverters;
  - fire fighting system for all towers and galleries;
  - electrical automation, lighting and instrumentation for the complete supply.

PROJECT DATA

Material handled	natural coal
Bulk density	0,72 t/m3 size 50mm
Handling receiving capacity from self-unloader ships on new incoming port (1,200m jetty + 300m jetty) to coal covered stockyard	3,000tph
Handling dispatch capacity from stockyard to coal firing	2 lines 1,500tph capacity each

The project is currently still under way, and erection by ONT will take place this year. Most procurement and main supplies have already been completed.

Conclusion

Bedeschi's co-operation with ONT, and the recent acquisition of Bedeschi Mid West Conveyor, will significantly enhance Bedeschi's capabilities in the handling sector, and will improve its offering to customers. Thanks to the expertise of CTP — a leading provider of filtration, gas treatment, equipment and services in the cement, steel and metals, power plant and glass sectors — Bedeschi is able to meets its clients' needs and offer projects that are environmentally friendly and with a low energy impact.

Rexnord – expertise in bulk conveying components

Rexnord is a $2 billion multi-platform, industrial company. Within its two platforms, the organization serves the global market. In its Process & Motion Control platform, Rexnord designs, manufactures, markets and services engineered mechanical components. Rexnord Power Transmission offers a portfolio of products, including gear drives, bearings, couplings, industrial chain, and a range of conveyor components. Rexnord products and services are designed to enhance equipment reliability for industries, such as mining, food, beverage and liquid, and transportation. The company's additional platform serves the water industry.

Historical snapshot

Founded in 1891, Rexnord is headquartered in Milwaukee, Wisconsin (USA). This year the company celebrates its 125th anniversary. Rexnord is a publicly traded company that employs approximately 8,000 associates worldwide. Rexnord has provided engineered solutions for bulk material handling since 1905 when it introduced its first conveyor system.

Staying competitive in the market

Rexnord continues to build its pipeline of innovative products. The company recently released a new, breakthrough torque limiter option for applications susceptible to torque overload. The Autogard® 820 Remote-Reset Torque Limiter is a first-of-its-kind option, allowing users to reset the device from a distance, eliminating traditional, hands-on labor requirements. This innovation can reduce downtime by anywhere from minutes to hours for manufacturers in heavy-duty industries, such as mining, metal processing, aggregates, cement, food processing, and pulp and paper. Applications for the Autogard 820 Remote-Reset include conveyors, crushers, extruders, mill drives, mixers, and roll drives.

Rexnord has just unveiled Falk® CT-Series Gearboxes, as well, specifically for cooling tower and vertical drive applications. The product is designed to serve industries such as refineries, pulp and paper, petrochemical and power generation.

Products are in development for mining, aggregate, material handling, cement, grain handling, packaging, and pulp and paper purposes.

Rexnord is growing in multiple markets, such as the food industry, through recent acquisitions. In June, Rexnord purchased Cambridge International, one of the world's largest suppliers of metal conveying and engineered woven metal solutions, primarily used in food processing end markets, as well as in architectural, packaging and filtration applications.

Key products for bulk conveyors

Couplings, bearings, gear drives, heavy-duty elevator chain, idlers, pan assembly rollers and bucket elevator components are among the organization's product lines that support conveying efforts. Among the company's trusted brands are Rexnord®, Planetgear™, Falk®, Ultramite®, Quadrive®, and Falk V-class® gears. Well-known bearing brands, including Rex® and Link-Belt®, encompass ball bearings, cylindrical roller bearings, sleeve bearings, and spherical roller bearings.

They are used worldwide in conveyors, industrial machinery, chain and belt drive, fan and blower, and power transmission applications. With a history of providing coupling solutions for close to a century, customers can choose from a selection of disc, grid, gear, elastomeric, fluid and composite couplings — manufactured for quality, reliability and easy maintenance.

Telling the Rexnord story

The Rexnord website was recently updated to include interactive process maps, allowing customers an experience illustrating where and how Rexnord products fit in their industry or application. Visitors can find product maps for worksites, including cement, coal, copper, iron ore, and fertilizer mining – and more.

An array of Rexnord top performers

Chain solutions

- **engineered chain** – standard sizes are available for rapid delivery; offering superior heat treatment and hardness depth of all components.
- **welded steel chain:** 22 standard sizes are offered in both narrow- and wide-mill chain.
- **leaf chain:** all standard sizes available in F (machine tool quality), AL (high quality) and BL (super heavy-duty series).

Conveying equipment

- **heavy-duty elevator chain:** standard sizes are available for quick delivery and a wide array of designs to suit specific applications and customer requirements. They are designed and produced from choice raw materials.

- **idlers:** factory sealed or re-greasable bearing area options make up a convenient, patented, one-point greasing system.

- **pan assembly rollers:** designed for bulk material applications. A four-point seal provides maximum lubrication retention.

- **bucket elevator components:** a single source option for all elevator component needs, they include premium traction wheels and sprockets, elevator chain, and heavy-duty reinforced buckets.

Gear drives

- **V-Class gear drives:** built with mining in mind, the Falk V-Class, the Rexnord Gear Drive engineered to deliver power, durability and reliability under the toughest conditions.

Additionally, the Rexnord Innovation Center™ and its independent, accredited laboratory delivers advanced technology, innovative thinking and breakthrough research to improve productivity and efficiency for industrial applications.

Metso wins contract with Codelco

Metso signs landmark deal with the world's largest copper miner Codelco in Chile

Metso has won a significant deal to support the conversion of the largest open-pit copper mine in the world to a large-scale underground mining operation. The Chuquicamata mine, located 1,650 kilometers north of Santiago, Chile, is owned and operated by Chile's National Copper Corporation, Codelco.

Metso's scope in the contract includes the engineering, supply of equipment and materials, and site assistance for 12 underground crusher stations combined with a conveyor package. The delivery contains 20 conveyors, 11 new units of Metso's largest C200 jaw crushers, and 24 push feeders. Overall, the contract constitutes one of the most sizeable crusher orders ever for Metso's mining business. The project is scheduled to continue until 2020 and the order was booked in Metso's second-quarter 2016 orders received.

Total cost of ownership and energy efficiency in focus

Metso offered an integrated solution that carried through from engineering, crusher stations, and material handling to electrification, automation, and site assistance. In addition, the energy savings from the company's Energy Saving Idler (ESI) conveyor technology gave the Metso offering a competitive edge.

Codelco's decision to work with Metso was also backed by Metso's proven installed base of equipment, engineering and project management capability already present in other similar applications in the region, demonstrating Metso's ability to deliver on time and on budget with production guaranteed. The Metso team was able to offer Codelco the best deal in terms of total cost of ownership and energy efficiency of material and handling.

"We are very proud of this order. It clearly demonstrates that we at Metso are more committed than ever to promoting excellence in our operations to help our customers create profitable and sustainable solutions. It is in this spirit that we fought and won this sizable and strategic deal with Codelco," says João Ney Colagrossi, President, Minerals Capital business area, Metso.

About Codelco

Codelco is a Chilean state-owned copper giant operating seven large mining divisions that control 8% of the proven copper reserves in the world. The 2015 annual output of 1.89 millions of tonnes is 10% of the global copper production and makes the company the number one miner for the red metal. Codelco employs over 18,000 persons and has a huge importance for the national economy in Chile. To ensure the production for the coming decades, Codelco is developing a large portfolio of mine investments, spearheaded by the on-going $4 billion investment to the Chuquicamata underground mine.

Metso is a world leading industrial company serving the mining, aggregates, recycling, oil, gas, pulp, paper and process industries. It helps its customers improve their operational efficiency, reduce risks and increase profitability by using its unique knowledge, experienced people and innovative solutions to build new, sustainable ways of growing together.

Metso's products range from mining and aggregates processing equipment and systems to industrial valves and controls. Its customers are supported by a broad scope of services and a global network of over 80 service centres and about 6,400 services professionals. Metso has an uncompromising attitude towards safety.

The Chuquicamata copper mine in Chile.

Standard Industrie International: keeping bulk cargo moving

Standard Industrie International was established in 1978. The group designs, manufactures and uses equipment developed to facilitate the safe handling of powdered bulk material whilst respecting the environment. Standard Industrie International has four fields of expertise:

- **CONVEYOR BELT OPTIMIZATION with its patented solution LIFTUBE®:** this innovative system optimizes the sealing of any conveyor belt. Safety, dust emission, spillage and maintenance costs issues can all be solved thanks to this patented system.
- **BLOCKAGE AND BUILD-UP REMOVAL with its patented AIRCHOC®& MACSYS Wireless:** Standard Industrie International offers customized technologies for different types of blockages. These preventative solutions enable customers to optimize productivity by helping regain full storage capacity.
- **INDUSTRIAL VACUUM CLEANING:** Standard Industrie International's wide range of vacuum machines caters to all cleaning, pumping and recycling needs: from 4kW to 300kW, electric or diesel, fixed, mobile units or trucks.
- **SILO AND HOPPER CLEANING SERVICES:** Standard Industrie International also provides safe silo and hopper cleaning and vacuuming services without human intervention within any storage unit (Gironet & Powernet).

With its 11 branches and global network of salesmen, Standard Industrie International operates worldwide. The group's key strengths are its know-how and experience, proximity and reactivity, professionalism and innovation. It is also an approved training institute. Furthermore, as quality, safety and environment are part of its main targets, it follows the standards of all the countries it works with and holds certifications such as ISO9901, OHSAS18001, VCA* approval pending, ATEX, food grade, high temperature, etc. Standard Industrie International's technical team, which specializes in industrial processes, is available to advise cement plants, food industries, foundries, chemical industries, quarries and mines, petro-chemical industries including harbours in installing and commissioning equipment adapted to the problems and constraints encountered in all types of bulk handling (coal, lime, fly ash, limestone, sand, cement, cereals, wood dust, wood pellets, crushed glass, and so on.)

Standard Industrie International has already supplied its conveyor belt optimization solution, the LIFTUBE®, to different harbours around the world, some of them in co-operation with local administrations. This equipment optimizes the sealing and safety of the conveyors between the loading and unloading points. The solution enables companies to comply with environmental and safety standards while also reducing operating, maintenance and cleaning costs. For one of its harbour customers, the target was to avoid pollution of the docks by reducing spillage and overloading. As the LIFTUBE® can be high temperature, explosion proof, food grade compliant or

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self-extinguishing certified, Standard Industrie International is able to adapt its solution to each case.

Recently, Standard Industrie International worked on a project for the biggest power plant in Morocco. The customer was already equipped with a vacuum truck from a competitor. The investment in a new vacuum truck from Standard Industrie International was defined by the future production increase with the opening of new production units near the unloading docks. The technical solution recommended by the group was a truck with four steering wheels, a vacuum flow rate of 40tph (tonnes per hour) and 16m^3 of storage capacity. Because the product is coal, the truck had to be equipped with ATEX components such as solenoid valves and explosion vents to clean along the coal conveyor that is on the harbour. Moreover the truck also had to be connected to a vacuum fixed pipe network to clean around the boiler and to vacuum ashes during shutdowns.

In the north of France, along the docks of the Mineral Basin, there are bulk terminals where huge boats bring imports of raw materials such as coal, iron ore for companies such as Arcelor Mittal. Here too there are exports of steel, lime, blast furnace slag and so forth. All of these products are transported by trains, trucks, boats, conveyor belts etc. Standard Industrie International is regularly consulted to provide adapted solutions to companies working on these huge platforms, those can also be cleaning

contractors.

One of Standard Industrie International's key customers has four production centres across various communities in Spain and manufactures innovative solutions for companies in the world's main markets. A leading aluminium manufacturer in Spain and sole producer of alumina and primary aluminium, this plant based in La Coruña has two lines of electrolysis and foundry furnaces. It produces primary aluminium via electrolysis in a variety of alloys and formats such as slabs for rolling, billets for extrusion and rod for both the Spanish and European markets. The person in charge of the port facilities consulted Standard Industrie International about an issue in the harbour hopper. Every day, boats came from Africa in order to deliver bauxite which is the raw material to manufacture alumina. A crane discharges from vessels to a large hopper continuously for many hours, and sometimes bridging could start in the hopper depending on the condition of the bauxite. When the moisture was too high, build-ups appeared in a short timeframe and caused many manual operations. Standard Industrie International solved its customer's issue by installing eight AIRCHOC® air cannons adapted to the capacity of the hopper, its dimensions, the type of extraction and build ups: four near the extraction and four at a higher level, all with a 200-litre tank capacity and blow pipes of 200mm diameter.

Thanks to its experience and know-how, Standard Industrie International is involved in harbour bulk management and provides solutions for dust spillages and pollution or blockage and build-up removal, for all industrial sectors.

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Centred: the art of conveyor belt tracking

With rollers at the belt edge, multi-pivot trainers can sense smaller movements and correct even slight misalignments.

The moment a conveyor belt begins to wander, the safety and productivity of the system quickly degrades and the cost of operation rises, *writes Paul Harrison, Global Engineering Manager, Martin Engineering.*

Even a slight belt misalignment can lead to a variety of issues, from small annoyances to full-blown catastrophes involving a conveyor system.

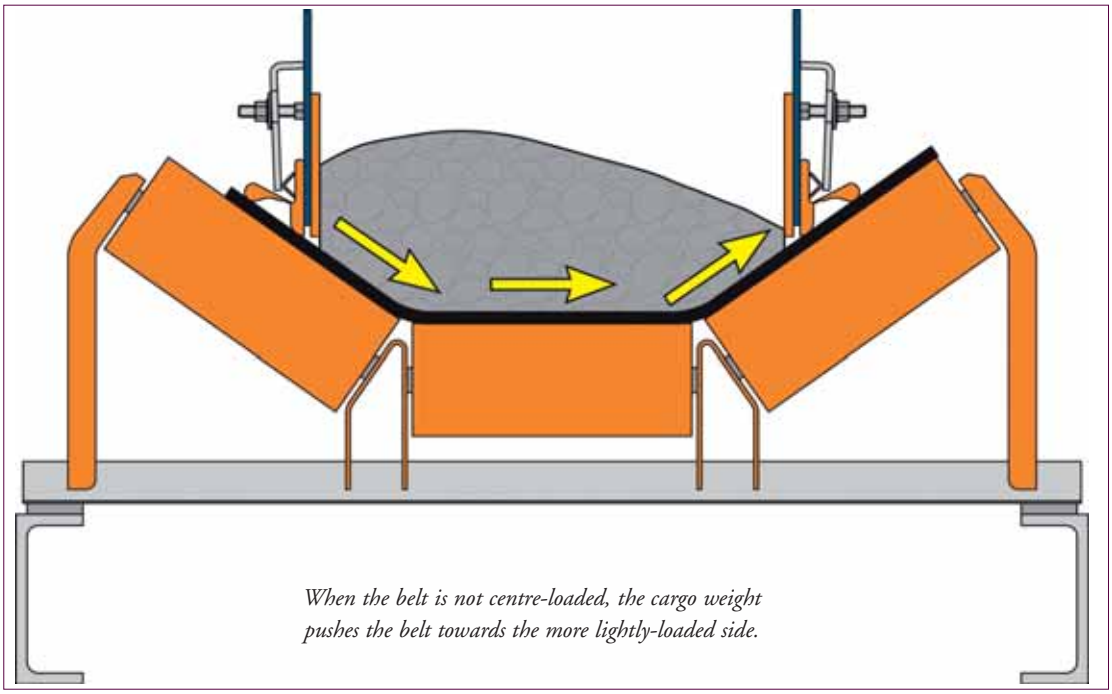
For example, spillage from non-centred cargo can get into idlers and pulleys, causing them to seize, leading to friction damage on the belt and potentially starting a fire. A misaligned belt can also come in contact with the stringer, causing fraying, shredding or splice damage. If this condition isn't noticed right away, great lengths of valuable belting can be destroyed, and the structural steel itself can be damaged. In fact, a high-speed belt edge rubbing on the support structure can cut through steel mounts with surprising speed, leaving a razor-sharp edge that poses a safety risk. Further, a compromised bracket or support can cause a catastrophic idler failure, which could damage other components of the system. All of these consequences of mistracking result in added expenses, higher maintenance and reduced efficiency.

Fugitive material can bury the load zone, resulting in idler failures, belt mistracking and even fires.

According to Senior Product Specialist Dave Mueller, beyond the many causes for mistracking, the belt training system that came with the conveyor may in some cases actually worsen the problem. "We're seeing increased belt speeds and greater cargo loads across most industries," explained Mueller. "But some systems are equipped with belt tracking devices that aren't able to handle those higher thresholds. We often see OEM trainers tied off with rope or chain in an attempt to drive a belt back into line."

In the vast majority of cases, mistracking is a problem that can be corrected. Belt behaviour is based on a set of principles, which serve as the guidelines for 'belt training'. Training a belt is the process of adjusting the conveyor structure, rolling components and load conditions to correctly centre the belt. Wandering is prevented by first understanding the basic patterns of belt behaviour

and then following established procedures to carefully align the structure and components to correct any fluctuations in the belt's path.



When the belt is not centre-loaded, the cargo weight pushes the belt towards the more lightly-loaded side.

Mistracking indicators

Belt drift can begin in any part of the conveyor system, and identifying mistracking is the first step towards correction. All of the traits listed below could be indicators of mistracking.

- **edge fraying:** probably an indication that the belt is rubbing on the conveyor frame at some point, degrading the edge, reducing the usable width and increasing the chance of a fire. Increasingly MSHA is writing citations if belt edges are frayed;
- **excessive spillage:** could mean that one side of the belt has drifted higher on the trough angle, allowing cargo to discharge along the belt path;
- **idler fouling:** an off-centre load and uneven belt plane can foul idlers. Bearing abrasion can then cause the idler to seize, and the ensuing friction against the running belt can erode its coating and increase the risk of fire;
- **off-centre at head or tail pulley:** this type of drift can lead to a fast-moving belt coming in contact with the conveyor stringer structure. There is also a chance of splice failure, which puts the entire system in jeopardy of the fast moving belt detaching and causing a serious injury to workers in close proximity;
- **lack of tail pulley protection:** on many systems, the belt collects lumps of spilled material on the non-carrying side. If these objects are not removed, they can become trapped between the tail pulley and the belt, causing mistracking and often doing significant damage to both;

The in-line sensing roll trainer has a carrying roll on a central pivot bearing with vertical guide rolls mounted on both sides.

- **uneven discharge:** as the belt drifts to either side of the head pulley, the belt cleaners do not properly clean the entire surface, causing excessive carryback. Material collects on the pulleys and structure, fouling the return side of the belt, resulting in slippage, lost product and other negative effects; and
- **uneven loading:** if the belt path leading from the tail pulley into the loading zone is uneven, the cargo can be loaded off-centre and cause excessive spillage. This may also be caused by inadequate transfer point design.

Identification begins at the head pulley

The first step in solving tracking problems should be a complete walk of the belt, inspecting the entire length for issues such as frozen idlers. When an idler bearing seizes, the constant belt movement can wear through the shell with surprising speed, quickly developing a flat spot that produces friction and diverts the belt, sometimes leaving a razor-sharp edge that poses a potential threat to workers and to the belt itself.

Starting at the head pulley, the belt should also be inspected for cupping, bow/camber (a long curvature) or crooked splicing. When observing the empty belt running over the head pulley, a cambered belt will drift to one side in the middle of the camber and then slowly return to centre as the belt travels through the head pulley. If a splice is crooked, the belt's path will jump quickly to one side as the splice travels across the pulley.

If it is discovered that these factors are the cause of mistracking, adjusting the conveyor's rolling components will not correct the issue. The only options are either replacing the belt, or — in the case of crooked splice(s) — re-splicing the belt, assuming there is enough extra belting in the take-up system to allow removal of the faulty splice section.

During the observation procedure, if the belt moves to one side and stays there, the problem may be one of three things: the head pulley lagging is not consistent, the last few carrying idlers prior to the pulley are out of alignment or the head pulley itself is not properly adjusted.

Mistracking just after the head pulley on the conveyor's return has two main causes. The first might be that the lagging is missing on one end of the pulley, so the pulley's diameter is off-

Multi-pivot belt trainers use a torque-multiplying system to improve belt path correction.

centre, placing uneven pressure on the belt and causing it to wander. If this is not the case, then the belt cleaning system may have been mounted slightly askew, putting greater pressure on one side of the belt and pulley. This uneven friction can also lead to mistracking.

Causes

Once operators and maintenance professionals properly identify the type of misalignment, they can then seek out the cause. "We've observed that there are three groups of common causes for mistracking," Mueller pointed out. "One is a fault with the belt or splice, another group is the conveyor's structure, components or environment, and the last is due to improper material loading."

Belt and splice

Problems can begin in the manufacturing of the belt and poorly matching it to the structure or application. If the belt is poorly manufactured or stored improperly, it can bow or camber. Poor installation of a vulcanized or mechanical splice can result in a splice that causes belt tracking problems.

Exposure to the elements or to chemicals can degrade the carcass (plies or cords) and the cover of the belt, leading to bowing, cambering or cupping due to unequal shrinkage between the top and bottom covers. Faults and damage caused by mismatching the belt to the application and/or operating environment can require frequent replacement and cause unnecessary strain on the system.

Conveyor structure, components or the environment

Inaccurate alignment during the construction of the conveyor stringer structure can have subtle but lasting effects on the belt's performance. However, structural alignment can degrade over time, so alignment should be tested periodically at several points along the conveyor structure. If bumped by machinery or affected by seismic activity or settling ground, realignment of the structure will most likely be needed.

For proper tracking, all rolling components (idlers and pulleys) must be aligned in three planes. According to appendix D 'Conveyor Installation Standards' in CEMA's Belt Conveyors for Bulk Materials, "all pulleys should be level and at 90° to the centreline; they should never be shifted to train the belt."

If rolling components are not aligned in all three axes, the belt will deviate from its path. This can also happen at the take-up system, which compensates for slack due to stretching or to adjust belt tension. If for some reason idlers have been removed or seize due to material buildup or abrasion, they should be replaced immediately to both realign the belt and prevent fires.

Outdoor conveyors can experience regular misalignment, since they are often set on uneven ground or between towers where they can experience high winds requiring 'wind loops' to keep the belt in line. Exposure to extreme temperatures on one side of the conveyor can make components expand, causing changes in friction. This lop-sided exposure also happens with large amounts of snow, rain or frost and if it is persistent, it might merit a cover or enclosure.

Improper loading

Loading problems will cause the belt to run in one position when loaded and another position when empty. The load's centre of gravity will seek the lowest point of the troughing idlers, so if the belt is not centre-loaded, the weight of the cargo pushes the belt toward the conveyor's more lightly-loaded side. This can be corrected by installing a central loading transfer chute or by using deflectors, grids or chute bottoms that can be adjusted to correct the placement of the load on the belt.

Belt training

A common procedure to correct the wandering belt is to slightly adjust the return and carrying idlers against the direction of the mistracking. Unfortunately, even slight over-compensation can cause friction or pinching and may reduce the life of both the idlers and the belt. Moreover, the approach does not work on reversing belts. An even more serious consequence is that over

time a number of the idlers may be misaligned, 'fighting' each other to correct the alignment.

When idler training is not successful as a long-term solution, operators may be faced with a situation where the training procedure is repeated on a frequent (sometimes daily) basis. At that point, managers should consider installing some form of engineered training solution to mitigate the problem.

Engineered training solutions are devices that sense the position of a belt and, through a mechanism or geometry change, actively adjust its path. Some of the most common types include:

- **belt misalignment switches** are sensors that are installed at intervals along the length of the conveyor on both sides of the belt near the outer limit of a safe belt path. The wandering belt pushes a lever arm and activates a switch, which either sets off an alarm or, in the case of severe mistracking, interrupts the conveyor's power circuit, stopping the system. Costly downtime and lost production make these devices less of a solution to the problem of misalignment and more of an indicator of a severe problem.
- **vertical edge guides** are meant to be positioned perpendicular to the belt's path to keep the edge away from the conveyor structure and should not be used to compensate for persistent misalignment problems. Performing more of a damage control function than true alignment, they allow the belt to strike a rolling surface instead of the structure. Most practical on short, low-tension systems and not particularly effective on thin belts, operators have experienced severe damage when the belt rides up over the guide into the structure or the guide causes the belt to roll over on itself.
- **vee idlers and rollers**, set on both the cargo side and return side of the belt, use a trough configuration and edge brackets that rely on a centreing force to correct the belt path, which can add stress on the belt and lead to damage. These systems are more expensive and require more maintenance than a conventional return idler.
- **crowned pulleys**, with larger diameters at the centre than at the edges, operate from the basic tracking principle that if the raised portion of the pulley (the crown) touches the belt first, it centres the belt, because the outer sections of the belt on both sides produce a force driving it toward the centre. These forces cancel each other out on a centred belt and if it wanders to one side, the dynamic forces will be greater on that side, acting to push the belt back toward the centre. Crowned pulleys are most effective on conveyors with short, low-tension belts, but do not work with some blade cleaners because the pitched belt plane does not allow the flat surface needed for effective cleaning.
- **dynamic belt-tracking systems** use the force of the mistracking belt on an arm that moves an idler, creating a steering action that directs the belt back into the centre. The design can be vulnerable to the accumulations of fugitive material that can block the range of motion or seize the pivot bearing. This can lock the belt-training idler into a position where it functions as a 'misalignment' idler and pushes the belt out of the proper track, worsening the problem.
- **in-line sensing roll trainers** have vertical guide rolls that are mounted on both sides of the belt, in line with the roller, with the centreline running through the idler's pivot point. Movement of the belt against either guide roll causes the roll to move in the direction of the misalignment, pivoting the entire idler. Since belts always move toward the side they contact first, the pivoted idler then steers the out-of-track belt back to the proper path. On some systems, the corrective action of the central pivot idler can be abrupt, causing the belt to 'kick over', slamming it consistently from one side to the other and resulting in edge damage and overuse of the pivot bearing.
- **leading sensing-roll trainers** are supplied as original equipment on many new conveyors. Employing either a pivoting carrying roll or troughing set, short arms on both sides of the frame are positioned in advance of the pivoting roller and end in guide rolls located 25–75mm (1–3in) from the belt edge. Designed for use on the carrying side or the return side, movement of the belt against the guide roll directs the steering idler and corrects the belt path back toward the centre. These designs can be prone to material clogging in pivot bearings, causing them to freeze in an extreme position and resulting in constant mistraining. To remedy this, operators have commonly 'tied off' these devices with rope or wire, reducing or eliminating the functionality of the device.
- **torsion-spring trainers** improve upon the leading sensing-roll trainer design by removing one sensing roll and incorporating a spring into the pivot, which keeps the one remaining sensing roll in constant contact with the belt edge. As the belt mistracks in either direction, the idler will compensate by pivoting and steering the belt. Since the sensing roll is in constant contact with the belt, there is no delay in reaction, no pinching due to continuous 're-tuning' of the idler, and less material accumulation at the pivot point. Among the drawbacks are that it cannot use a troughed idler set, and the

sensing roller requires frequent replacement due to constant use.

- **multi-pivot belt trainers** use longer arms than other designs, positioning the guide rolls further from the pivot roller, as well as closer to the belt edge. The closer proximity allows guide rolls to sense very slight misalignments and make immediate corrections. Rather than waiting for a powerful mistracking force, the longer arms require considerably less force to move the pivot roller. The result is better correction with no pinch points and less wear on conveyor and tracking equipment, for a longer and more efficient service life.

Reverse belt trainers

"Once any belt training mechanism or procedure has been initiated, you can't just throw the system in reverse," Mueller warned. "That could cause immediate, expensive and hazardous consequences."

If operators have manually trained the idlers in one direction opposite to the misalignment, suddenly they're faced with an idler that, when the belt reverses, exacerbates the mistracking and causes it to drastically drift to one side almost immediately. This means that every time the belt is to be reversed, the system must be shut down and all idlers must be straightened or set in the opposite position. Most engineered training solutions react the same way and will pivot in the wrong direction.

"Only mechanisms that are designed to detect both forward and reverse mistracking can centre these belts," Mueller said. "Examples are torsion spring trainers with an opposite-end sensing roll and reversing multi-pivot trainers with four long-arm guide rolls. The forward guide rolls recognize the opposite direction of the belt and automatically switch to the back guide rolls, adjusting the pivot roller in the proper direction."

Installation

Installation of a belt tracking device can be at any point where the belt path needs adjustment, but opting to install too few trainers or misplacing trainers can cause a strain on the equipment and may not address the entirety of the issue. "Training devices should be mounted approximately three to four times the width of the belt in advance of the point of the mistracking," advised Mueller. "Also, make sure that the conveyor is locked out/tagged out/blocked out/tested out before installing any belt trainer."

Devices can be installed over the entire length of conveyor, but should especially be installed to correct the path at any place the belt enters an enclosure or enters a critical conveyor system like the take-up. To avoid units competing and contradicting each other's steering action, they should be positioned approximately 20–50m (70–160ft) apart, depending on the severity of the mistracking problem.

Typically elevated 10–20mm (0.5–0.75in) higher than the rolls of the adjacent conventional idlers, a centre roll or pivot roll increases the belt's pressure on the tracking device, improving the corrective friction between the belt and the aligning roll. This is applicable to both troughed (carrying side) and at (return side) self-aligning idlers. It helps to have rubber-covered rollers rather than 'steel can' idlers, because they create higher steering friction with the belt. Though they may need replacing more often, rubber surfaces grip better and are more effective with wet and/or slippery materials.

Another technique to improve performance is to install a return belt-training system with a conventional return idler above the belt, upstream of the tracking device, to push the belt down, increasing the force on the training idler and allowing it to work more effectively.

Total conveyor analysis

Conveyor mistracking is a major problem, but it's as much a symptom as it is a cause of spillage and equipment failure. Performing only a head pulley inspection won't reveal all of the problems that could cause persistent misalignment. Mueller recommends conducting an entire system assessment to discover the true causes of misalignment.

"Installing trackers is the economical solution, but operators should do a full analysis and consider also addressing other causal issues," he added. "By focusing solely on belt alignment, plant personnel may miss other opportunities to increase production and relieve some of the burden on their system."

Off-centred loading is a major cause of mistracking, but other causes can include improper cradles, an inadequately designed settling zone and ineffective belt cleaning, among the other causes. To remedy these issues, some conveyor accessory manufacturers offer well-engineered modern equipment such as load-centreing transfer chutes, high-impact cradles, adjustable slider cradles, an assortment of cleaner blades created for specific applications and redesigned chute box technology.

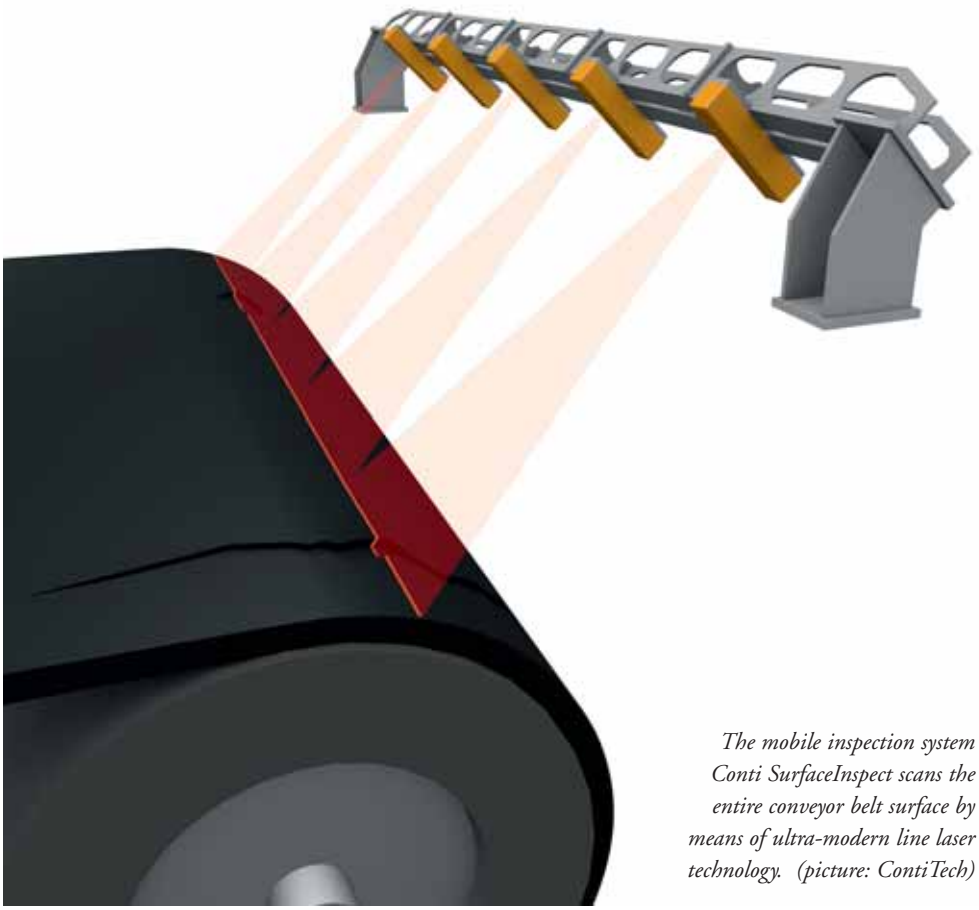
Keeping the belt centred and moving quickly is the key to high production, a low cost of operation and a safer workplace. "Misalignment causes downtime and costs money," Mueller concluded said. "But nothing causes more downtime and expense than a destructive belt fire or other catastrophe as a result of inattention to mistracking problems."

This roller tracker uses a unique ribbed lagging made of durable polyurethane to increase performance.

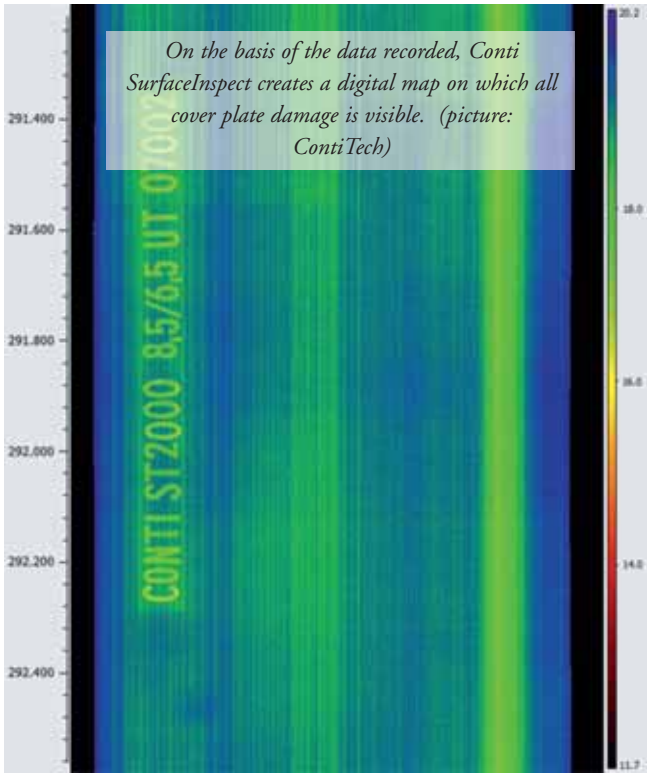
Surface scanner from ContiTech makes conveyor belt damage visible

Conveyor belts are the heart of many transport systems. This is the reason why ContiTech manufactures and develops high-end conveyor belt technology for the mining sector, machinery and equipment construction industries and other industries. ContiTech offers complete solutions from fabric and steel-cord conveyor belts to special-purpose products and service material. Around 3,900 employees develop and manufacture at 27 locations in Australia, Brazil, Chile, China, Finland, Germany, Greece, Hungary, Mexico, Morocco, Serbia, Slovakia, South Africa and the USA. The many locations, with close proximity to the customers ensure that the company can provide comprehensive service for conveyor belt and conveyor needs — worldwide.

The importance of conveyor belts becomes particularly clear when damage occurs. If this results in an extended system downtime, the entire production chain frequently collapses. This in turn results in high sales losses for the mine operators. To allow conveyor belt systems to run free of faults and cost-effectively in the long term, even when subjected to high loads, operators are focusing more and more on prevention. Innovative electronic conveyor belt monitoring systems make it possible to identify the exact state of the transport systems at any time. They meet high quality standards and therefore guarantee a high level of safety.



The mobile inspection system Conti SurfaceInspect scans the entire conveyor belt surface by means of ultra-modern line laser technology. (picture: ContiTech)



On the basis of the data recorded, Conti SurfaceInspect creates a digital map on which all cover plate damage is visible. (picture: ContiTech)

To help customers with servicing, ContiTech has developed the mobile inspection system Conti SurfaceInspect. Using ultra-modern line laser technology, this system scans the entire conveyor belt surface. On the basis of the height profile that is identified, it creates a digital belt map on which all cover plate damage is recorded and can therefore be examined more closely. In an automatically generated report, ContiTech provides all relevant information about the damage.

Conti Inspect: reliable forecasts increase service life

The mobile inspection systems, to which the surface scanner belongs, allow conveyor belts to be serviced while still in operation, and help to detect at an early stage damage caused by the material conveyed or by wear. The portfolio is rounded off by two further Conti Inspect systems. By means of triangulation sensors, Conti WearInspect measures the cover plate thickness over the entire belt length. It records the position of the belt surface on the pulley and carrying side, and calculates the conveyor belt's actual thickness with a large number of measuring point. If damage occurs inside the carcass of the steel cord conveyor belt, it can be detected with Conti CordInspect. Via magnetic induction procedures, it detects the smallest of damage to the steel cable tension members.

Conti Protect: providing protection from total failures

Larger pieces of damage such as longitudinal slitting and splice faults on the conveyor belt can have serious consequences for system operation, and lead to total failures in a worst-case scenario. Conti Protect monitoring systems help to detect such damage at an early stage during operation, and automatically stop the system if necessary.

Conti SpliceProtect monitors the length and stretch of the conveyor belt splices in systems that are exposed to heavy tensile forces due to long center distances or large height differences. The system uses magnetic strips vulcanized into the conveyor belt to make precise measurements during operation. As soon as a splice has reached a critical length, the danger of a splice failure becomes too great and the system stops the conveyor before the splice tears.

Conti RipProtect provides protection against longitudinal slitting that causes long downtime and high costs. Thanks to conductor loops vulcanized into the conveyor belt, it detects the dangerous longitudinal slitting at an early stage. The metal loops carry a high-frequency signal between a transmitter and receiver. If a loop is damaged, the signal will break down on the receiver end. The system control then automatically stops the conveyor belt.

Conti CordProtect allows customers to look inside the carcass of steel cord conveyor belts. The system magnetizes the tensile members and detects magnetic fields that arise at the ends of the cords or if defects occur. This means that even very minor cord damage in the intact belt area can be detected and monitored, as can the state of the splices.

Conti MultiProtect expands the functions of Conti CordProtect. Rip inserts implanted into the conveyor belt are checked for longitudinal slitting by means of their characteristic magnetic fields. With a special sensor application, the rip insert function can also monitor the rotation of tube conveyors.

Conti TotalProtect makes a detailed examination of steel cord conveyor belts possible by means of x-ray technology. The system detects and monitors all types of defects, from the tiniest pieces of surface damage and all manner of effects caused by foreign bodies, right up to cord and splice damage.

Continental develops intelligent technologies for transporting people and their goods. As a reliable partner, the international automotive supplier, tyre manufacturer, and industrial partner provides sustainable, safe, comfortable, individual, and affordable solutions.

In 2015, the corporation generated sales of €39.2 billion with its five divisions, Chassis & Safety, Interior, Powertrain, Tires, and ContiTech. Continental currently employs approximately 215,000 people in 55 countries.

As a division in the Continental group, ContiTech is one of the world's leading industrial specialists. Its customers can be found in key industries such as machine and plant engineering, mining, the agricultural industry, and the automotive industry. With around 43,000 employees in 44 countries, the company uses its development and material expertise for products and systems made of rubber, plastic, metal, textile, and electronic components to combine these with individual services. ContiTech always thinks in terms of customer-friendly and environmentally-friendly solutions — going well and truly beyond its roots as a producer of rubber products.

With sales of €5.4 billion (2015), this international technology partner is active with core branches in Europe, Asia, NAFTA, and South America.

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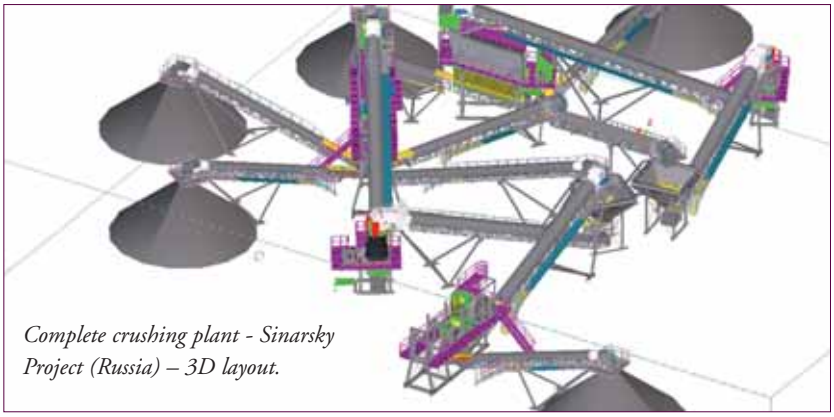
STM: Italian expertise to handle bulk materials

STM specializes in the engineering and supply of belt conveyors systems for bulk materials handling facilities. Since 1975, when it started as a family business, STM has provided worldwide innovative integrated solutions that increase efficiency, reliability and cost savings for its customers' production processes.

STM has wide experience in different markets, thanks to the extensive knowledge acquired operating in many fields. Through this, it has developed even more innovative solutions for bulk materials handling to meet the needs of all its customers. Hence, over the last few years, applications in the STM portfolio have become more challenging and specialized with specific and innovative solutions for each application: mining conveyors, RCC conveyors, tunnelling conveyors, crushing plants conveyors, batching plant conveyors and waste-to-energy plant conveyors.



Complete crushing plant - Sinarsky Project (Russia) – 3D layout.

Complete crushing plant – Sinarsky Project (Russia).

The entire supply process, from feasibility study to final delivery and commissioning, is completely carried out in the STM factory, located with its headquarters in Tito Scalo (Potenza) in Italy. This allows STM to optimize the design, industrialization time and information exchange with the customer. In-house engineers and designers are able to develop complete projects from general lay-out proposals up to shop-drawings.

STM: LONG EXPERIENCE IN THE MINING SECTOR

In the mines where expansion and relocation are necessary as the mine develops, STM's systems can expedite, optimize and economize the process of overburden removal, redistribution and stacking. The conveyor systems for this application are designed for long lifetimes and for minimizing maintenance and downtime risk. STM is committed to delivering high-value performance and to meet customers' needs for excellent reliability, investment cost, delivery times, lower operating costs, high standards of safety and sustainability.

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Conveyors belt in inert crushing and washing station.

system in inert crushing and washing stations for international customers.

Shiploading and unloading systems

STM designs and manufactures conveyor systems and equipment for bulk material transport from stock location/silos to the vessel, typically up to 75,000dwt and vice versa for shiploading and unloading handling systems. STM supplies a complete stockyard systems included stackers, reclaimers. Reliability, safety and low environmental impact of STM's conveyor belt systems makes it possible to convey the bulk material in a fast and clean way.

The complete belt conveyor system comprises a sequence of belts designed to transfer the material from the main hopper to the vessel. A basic configuration is composed of one fixed hopper and different conveyors, to cover the distance from the ship. The first conveyor is fixed and placed below the hopper and the other one is mobile and equipped with wheel-mounted bogies, and the last one that will discharge the material into the vessel and is equipped with wheels mounted bogies too, in order to change the final discharge position.

STM designs the system to allow future extensions of the distance, adding further conveyors to the line in order to reach more distant points, for the different options of shiploading and unloading.

STM is very aware of the need for the dust pollution control, degradations and segregation (during load and unloading of bulk materials (coal, clinker, cement) from conveyor standard chute. STM therefore supplies extensible chutes for a dust-controlled loading and unloading solution. DCi

STM's flexibility makes it possible to manage a wide range of different plant configurations, both for size and typology, including mobile plants. This configuration is one of the latest trends in a sector in which the plant owner wants to have freedom to move the plant after limited time usage in determined area.

A valuable example of the long experience of STM is the conveyor belt system for a crushing plant for the customer Sandvik Mining and Construction – Sinarsky Project (Russia). STM has designed a complete belt conveyor system to serve a semi-mobile plant. In this crushing plant, in the first phase, the raw material (basalt) is transported in a main hopper of vibrating screen feeder to feed a primary stone crushing equipment. The crushed stones are conveyed by a belt conveyor system to a secondary crushing equipment and then sent to a vibrating separator to have stockpile of different sizes. The capacity of the belt conveyor system is of 360tph (tonnes per hour) and the total length of the supply is 310m.

STM designs and manufactures complete conveyors belt

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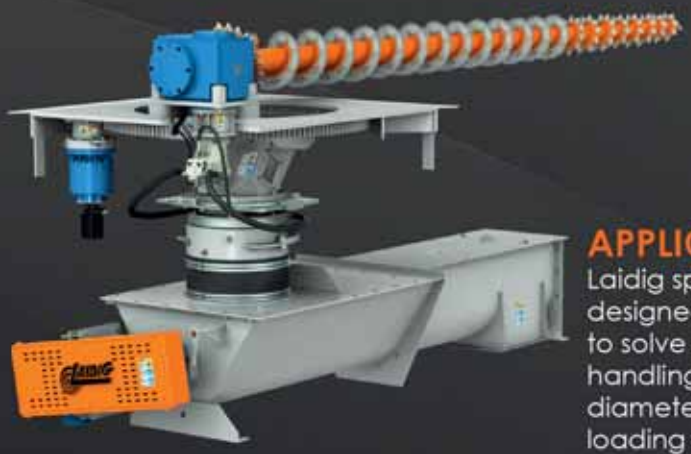
MATERIAL HANDLING SOLUTIONS

FULLY AUTOMATED TURNKEY SYSTEMS

Laidig's turnkey storage and reclaim systems offer superior material handling performance and dependability in the harshest environments.



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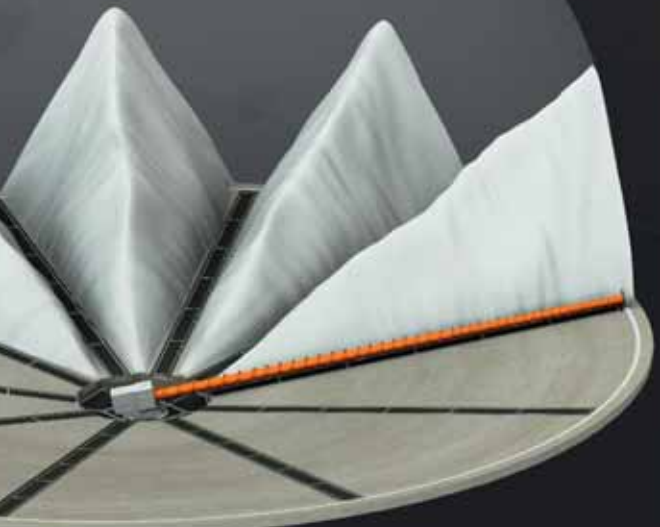

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Go with the grain

grain handling and storage systems under the spotlight

Louise Dodds-Ely

Laidig solves King Milling Company's wheat handling conundrum

Speed, Space and Sanitation. The three key words that motivated a wheat milling operation, located in Western Michigan to improve their efficiency in storing and handling millfeed in its vertical storage silos.

For the King Milling Company located in Lowell, Michigan, Laidig is more than just steel; it is also a solution provider for bulk storage and automated material handling.

The King Milling Company has been milling wheat for 125 years. And the family-owned operation continues to grow each year. Much like any company, with growth will come growing pains. King Milling was no different, especially when it came to handling their millfeed, sometimes called midds. Typically, every 100 pounds of wheat milled yields about 25 pounds of millfeed. The millfeed is another source of revenue for King Milling. It quickly became apparent, however, that the efficient storage and handling of it was going to be a challenge. According to Jim Doyle, Senior Vice-President for King Milling, "Millfeed is very difficult to handle. Getting it loaded into trucks was taking too long, and we were having difficulty storing it. We needed a guaranteed solution."

At that time, the average truck loading time took up to 90 minutes. Due to this lengthy process, King Milling found itself storing its millfeed in temporary storage trailers on their property and using pneumatic methods to transfer it to customer trucks for distribution. There were times when all of the storage trailers were fully loaded and production was delayed because of the lack of adequate storage. In order to get the millfeed loaded and taken off-site, drivers were asked to load out their trucks on Saturdays. A reduction in price was even offered to incentivize the weekend load out. In addition to inadequate storage capacity and lengthy unloading times, the dusting generated from the load-out of the millfeed was a concern. It became clear that a better solution was needed.

Vice-President Steve Doyle, wanted to get Laidig involved. "The old method of moving the millfeed wasn't cutting it. We had a goal of unloading 50,000 pounds of millfeed onto a truck in 15 minutes with limited dusting. This would make us more efficient, increase our storage and save us money."

He knew this wouldn't be easy to accomplish. But, he also knew that with the right partner, it could be done. "If we were going to do this, we were going to go big, and we were going to do it right. We had a good team in place here at King Milling. We knew of Laidig and their reputation. We had visited with them at trade shows over the last 25 years, so we contacted them."

Laidig met with King Milling to review the situation and

discussed potential solutions. After much discussion and careful planning, a long-term solution was agreed upon. Laidig provided King Milling with two truck drive-through Model 5330 Cone Bottom Reclaimers — fully automated, hydraulically powered reclaim systems. This storage and reclaim system solution provided automatic load-out of the millfeed into trucks six times faster than how King Milling had previously been operating. The result of King Milling's partnership with Laidig has successfully resolved its three main goals of speed, space and sanitation.

King Milling understood that it needed to make some improvements to support its growth and efficiency. They knew they wanted a system guaranteed to work and a relationship guaranteed to last. Laidig was the answer.

According to Jim Doyle, it was a matter of trust in Laidig. "We knew we were going to spend money on this project. But, at the end of the day, it needed to work and we had to do it right — and we did."

It has been two years with the Laidig system in operation at King Milling. For Steve Doyle, it has been a good experience. "The overall experience of working with Laidig has been a good one. They are dependable and available when we need them. They worked with us throughout the entire process."

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Digging deep with grabs from CFS Handling

Civettini talo & c sas — under the brand name CFS Handling — is a major designer and manufacturer of grabs for the handling of bulk commodities. The company's product range includes mechanical, hydraulic and electro-hydraulic buckets as well as hydraulic and electro-hydraulic grabs.

CFS Handling grabs are widely used in the grain handling market, and are ideal for such free-flowing cargoes. Its grabs are precise, and prevent spillage from between their blades.

CFS handling has 30 years of experience, so it is able to guarantee high quality, good prices, excellent design quality and customer focus. It operates worldwide, and its equipment can be found in countries from Brazil to Russia, for large production machines with buckets from 18m^3 to 40m^3, with hydraulic Bosch Rexroth special applications for faster closure and optimized landing costs and boarding.

CFS Handling uses wear-resistant building materials which characterize its machines, such as Hardox 500 for the blades or automatic greasing systems on the bucket. This enhances the grab's features and decreases maintenance time, prolonging bucket life.

Civetti Italo & c sas continues to research materials and components of increasing sophistication and high-performance, such as hydraulic grabs fitted with diesel engines of 60kW and the ability to lift 20m^3 with a remote control for cereals and for use with the cranes used by its customers who have not yet adopted the use of port cranes such as those supplied by Terex Gottwald or Liebherr.

Accurate measurement improves grain handling process

Accurate and reliable contents measurement of grain in silos, vessels, hoppers and bins is vital for a variety of reasons:

- stock management and control;
- process control;
- bulk out-loading;
- providing data for suppliers as part of a VMI (vendor managed inventory) system; and
- as part of a safety system to prevent overfilling or over-pressurization.

However, obtaining accurate and meaningful contents information is often not straightforward. Firstly, a high percentage of vessels are either not initially installed with pre-designed, fit for purpose measuring systems or have outdated instrumentation that may already be redundant. Secondly, a complex blend of product characteristics, environmental conditions, operational parameters and budgetary constraints further complicate the situation. This means that when users need to obtain reliable data from their vessels they need to be able to make an informed decision on the best measurement solution for their particular application. Redditch, UK-based Hycontrol has over 35 years' experience in helping customers from a broad spectrum of industries choose the correct level measurement system for their application.

Before instrument-based measurement became widely used, content levels were often determined by rudimentary mechanical means. Level measuring technologies have advanced considerably over the past two decades and are now well-established for measuring the contents of tanks, hoppers, bins and silos up to 100m high, providing a relatively non-intrusive, easy-to-fit system. A wide range of critical factors needs to be considered when choosing a solids level measuring system, including:

- product characteristics (dust, dielectric constant, bulk density, flow behaviour, angle of repose);
- vessel environment (temperature, pressure);
- size, shape and internal structure of vessel;
- operational requirements; and
- filling and emptying points (location and number).

Level measurement techniques fall into two basic categories — point measurement and continuous measurement. In turn, continuous measurement techniques are broadly divided into contact and non-contact technologies. Each type of product has its own unique material properties which play a role in determining the effectiveness and performance of any level measuring system. In parallel, vessels differ in size and design — a typical silo can be ten metres or greater in height — whilst bins and hoppers are usually smaller and may act as intermediate product buffers between inventory and daily production.

Point measurement technologies include paddle switches, capacitance and admittance probes, and vibrating probes . They provide a cost effective solution for simple level measurement where (for example) the user may only need to know when the vessel is empty or full.

Continuous measurement technologies include ultrasonics, TDR (time domain reflectometry) guided microwave, and radar. These have the advantage of providing real-time level data over the complete measuring range. However measuring solids and powder contents can present challenging problems, as outlined below.

It is important to understand the way in which silos are filled and emptied when installing level measurement systems in order to optimize performance. If the silo has centrally located single

fill and draw-off points, the way in which material behaves is usually repeatable. Complications can occur when silos have multiple fill and draw-off points. In most applications filling is carried out over a relatively short period and then left until needed, however in some process applications material is continually filling and being drained from the silo. The shape the top of the material forms is dependent on its flow characteristics, number and position of fill points and the internal surface finish of the vessel. Similarly the draw-down shape depends on the number of outlet points and positions.

Changes in bulk density can have a significant effect on the measured levels of product in a vessel. Bulk density is both time-dependent and level-dependent. For example, the level in a freshly filled silo may change with time as the material settles. In parallel to this issue bulk density will vary from the bottom of the vessel to the top.

The dielectric constant of a material is a measure of the extent to which it concentrates electric flux, and is the electrical equivalent of relative magnetic permeability. For radar- and TDR-based level measurement systems, the intensity of the reflection of the microwave beam is dependent on the dielectric constant of the material. The higher the dielectric constant the stronger the reflection will be.

All these factors and more will need to be considered before choosing an appropriate level measurement system. Hycontrol's wealth of experience and comprehensive product range means that the company is ideally placed to consult and assist with choosing an appropriate, effective level monitoring system for grain storage.

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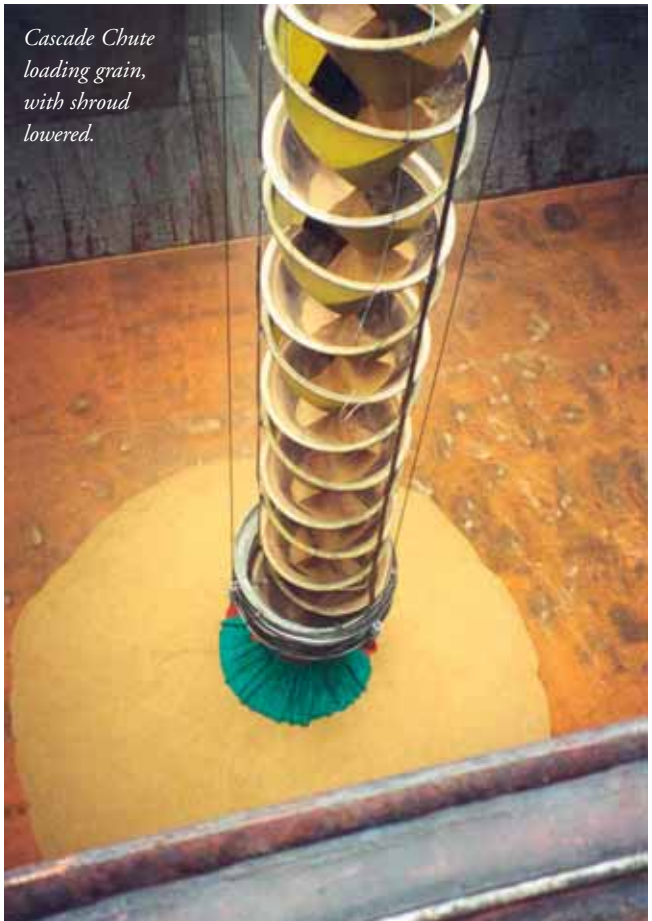
Grain loading chutes from Cleveland Cascades

The production and distribution of grains is a vast global industry and one of the biggest sectors in the dry bulk business. The International Grains Council, estimates that global production of Grain in the last 12 months was 2,005mt (million tonnes). Of that, 314mt of that was traded on domestic and international markets and therefore distributed by road, rail or sea transport. The same period has seen increased price volatility on global markets, leading to a recent bounce in the price index from 173 in March to 199 in August.

Cleveland Cascades has long had a strong presence in this sector and grain has always been a major part of the company's business. The first grain handling chute was delivered to Australia in 1997 and since then the population of grain handling systems has grown consistently. Grain has accounted for approximately 10% of sales and systems have been delivered worldwide to customers in North and South America, Asia, Australia as well as in Europe. The product types delivered in to the grain sector also vary widely, including cascade and free-fall shiploaders, transfer chutes, storage points and vehicle loading chutes.

Being a free flowing, small granular foodstuff, grain requires specific handling capability. When loading grain, operators often focus on minimizing material degradation and avoiding dust pollution, while at the same time maximizing loading rates.

The Cleveland Cascade chute is specifically designed to address all these key performance criteria for grain handlers. The Cascade solution directs the material flow down a series of inclined cones, which limits the flow velocity to a controlled speed. The shape of the cone holds the dry bulk material in such a way that prevents particulate separation and minimizes material degradation. The significantly reduced product velocity creates a 'mass flow — a stream of material moving as a single mass through the chute and onto a stockpile with minimized segregation. The controlled descent of the material prevents air separating the particles and largely eliminates dust generation at source.



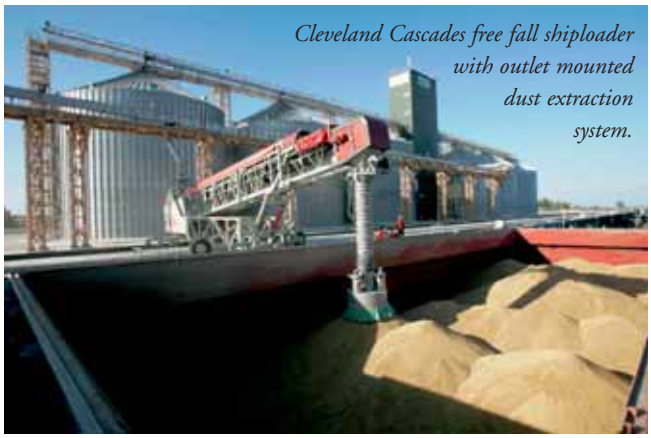
Cascade Chute loading grain, with shroud lowered.

Cascade Chute loading grain.

A recent project in Turkey utilized the benefits of a Cascade shiploading chute. Iskar Muhendislik in Derince Port, installed an 18m chute capable of loading 1,200 tonnes of grain per hour. The running faces of the cones and head chute were lined with UWHMW polyethylene to provide a low friction abrasion resistant surface for the grain flow. The chute also includes an interchangeable outlet. The standard skirted arrangement can be alternated with a rotating trimmer device which directs the grain flow to corners of the ships hold.

In applications where the shiploading conveyor is portable, a lighter-weight free fall chute system is an often an effective choice for grain loading operations. To effectively control dust emissions, a dust extraction system can be fitted to the outlet carrier. One project for Cleveland Cascades in Ukraine, used this arrangement on four 8.5m chutes, fitted to Telestack mobile conveyors.

In recent years, the company has built a large population of grain loading chutes in the Black Sea region. Ports all around the Black Sea basin operate Cleveland Cascades grain loading chutes in Ukraine, Turkey, Moldova and Bulgaria. Only last month the company delivered a chute to Bulgaria, capable of loading 1,500tph (tonnes per hour) of grain. The 12.5m-long chute is light enough to operate with a mobile conveyor and uses GRP free-fall cones fitted with low friction UHMW PE liner.



Cleveland Cascades free fall shiploader with outlet mounted dust extraction system.

Cleveland Cascades Ltd

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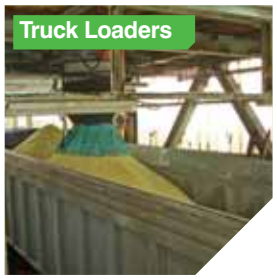

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AAL delivers mobile grain shiploader to Port Metro Vancouver

Leading multipurpose heavy lift operator AAL has completed a series of shipments to Port Metro Vancouver (PMV) of an innovative 'mobile' grain shiploader to be installed at the Port's Pacific terminal run by Canada's largest grain handler Viterra. The largest component was over 66m long and weighed 250mt and, once assembled and operational, will increase the terminal's shipping capacity and allow for the loading of post-Panamax-sized vessels.

The shiploader was transported from China along AAL's Pacific Service between Asia and North America and aboard its 31,000dwt A-Class vessel, the *AAL Singapore*. Responsible for logistics and planning was Ontario-based Convoy Logistics Providers Ltd. (CLP), appointed by bulk material systems expert EMS-Tech, which designed and commissioned the shiploader.

Felix Schoeller, General Manager of AAL's Pacific Liner Service, explained, "The cargo comprised of a newly manufactured

shiploader, dock conveyor and transfer tower — part of a wider infrastructure development that will boost grain throughput by millions of tonnes a year. The delivery of this crucial parcel in such an important project underscores our credentials as a service provider and ability to support major N. American projects with optimum safety, efficiency and timely delivery."

Dona Asciak, CEO and owner of CLP added, "After almost a year of planning, there's a great sense of accomplishment when you execute a well-planned logistics solution for your customer from 'stem to stern' and it proves successful and furthers their interests. We are proud to be involved in this project for EMS-Tech, during such an exciting stage of expansion for Viterra Pacific elevators at the Pacific Terminal."

About AAL

AAL is one of the world's leading breakbulk, project cargo and heavy lift shipping operators, providing a unique dual tramp and liner service for its customers throughout Asia, Europe, Middle East and the Americas. Established in 1995, the company operates the multipurpose sector's youngest fleet — multiple classes of modern multipurpose heavy lift vessels (ranging from 12,000dwt to 31,000dwt) and each specifically designed to accommodate heavy lift and project cargo alongside breakbulk, containers and bulk.

In 2015, it launched an international cooperation with highly respected shipping company, Peter Döhle, to offer enhanced tramp and projects solutions to the global market and new semi-liner services on key global trades. In the same year, AAL won 'Best Shipping Line – Project Cargo' at the prestigious Asian Freight, Logistics and Supply Chain (AFLAS) Awards for the second year running and in 2014 won 'Best Maritime Cargo Provider' at Cargo Logistics Canada.

In 2016, AAL won 'Best Shipping Line – Project Cargo' at AFLAS.

The award-winning operator is headquartered in Singapore and is a member of Schoeller Holdings, a long-standing and highly respected maritime group.

About Convoy Logistics Providers (CLP) Ltd.

Convoy Logistics Providers (CLP) Ltd. is a privately held Canadian Corporation. Since 2002, it has provided global project logistics solutions to customers within the niche project cargo sector. CLP's focus is to build long-lasting customer relationships based upon the provision of innovative solutions — developed with confidence and proven reliability.

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How a 'black' terminal can perfectly handle other products: even agribulk

Despite being known for its expertise in handling coal cargoes, OVET is also able to move and store a range of other cargoes, and is much more than a 'black' terminal.

As national governments in Western Europe are closing more and more coal-fired power stations in order to fulfil the demands of the European Union concerning CO_2 emissions, dry bulk terminals need to fill the gap that has been left by the 'black gold'.

Diversification is the key word, but is that possible? In other words, can a 'coal' terminal be GMP-certified, transship and even store other products such as agribulk and biomass in a clean and safe way? The answer is yes! OVET, known as a dry bulk terminal located in the ARA (Antwerp–Rotterdam–Amsterdam) range with terminals in Vlissingen and Terneuzen, has already proven that it's possible. Originally founded as a coal terminal to supply coal to coke plants and coal-fired power stations, nowadays OVET is specialized in handling all kinds of cargoes. To avoid any kind of contamination and to deliver the best performance in transshipment, OVET treats every cargo in accordance to its specific needs.

As other dry bulk terminals based their strategy and equipment in the past upon the big bulk of coal, OVET has chosen to stay a terminal not just suitable for the big bulk of coal, but also for smaller quantities of special bulk products. In fact, OVET always had the strategy of diversification, but recent years more than ever.

At the open storage space of approximately 48ha, OVET stores different products strictly separated, without causing any contamination. This can only be done by keeping the terminal neat and by handling and storing the various products carefully and with respect to its characteristics.

Besides open storage, OVET offers also covered storage with separate compartments which are fully ventilated. This covered storage is GMP plus-certified and has the exact building specifications to store agribulk and biomass products in a perfect way. To avoid any possible contamination with 'black' products, the covered storage facilities are located at a separate part of the terminal, near a dedicated quay used only for these type of products.

As the demand for storing agribulk is increasing, OVET will extend the possibilities for covered storage by building a new shed. This will double the capacity for covered storage and enable OVET to intensify its strategy of diversification. Moreover, the fact that OVET knows well how to handle agribulk and biomass has already been proven by the many direct transshipments and even lightering operations that OVET has carried out handling these products.

So it is certainly possible to fill the 'black' gap with other products such as agribulk and biomass, but only by handling and storing these goods in a correct way and by adapting the terminal's equipment to the needs of the different products.

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E-Crane expands in Argentina with multiple grain handling contracts

As countries in South America are working to develop their rivers into an industrial waterway system, many companies are continuing to realize the benefits of the E-Crane, a proven solution for bulk handling applications. The development of these rivers would reduce the cost of export and benefit the economy there, which is currently mostly dependent on transport by land. As new ports are being developed, E-Crane continues to expand its fleet of machines across South America.

The E-Crane is ideal for bulk handling, including heavy duty production cycles such as barge unloading, ship unloading, and midstream transfer. Specifically designed for bulk material handling processes, anything from coal to limestone to fertilizer to grain to scrap steel can be handled with the E-Crane. The E-Crane is a truly versatile machine in that it can easily switch between commodities and still offer the high production required at many ports and industrial facilities. Built for 24/7 duty cycle operation, E-Cranes have unprecedented life cycles, high efficiency, and low maintenance costs.

Two 1500 Series/10290 PD-E cranes are in service with Cargill VGG in Rosario, Argentina.

Last year, we discussed two new E-Crane projects that were recently installed in Argentina. These highlighted projects were just two examples of many that are continuing to appear all across South America. Argentina in particular, is the location of many E-Crane projects. Let's take a look at several E-Crane projects in Argentina:

Case study: Cargill VGG

Type:	1500 Series/10290 PD-E (x2)
Location:	Rosario, Argentina
Application:	Barge unloading
Material:	Grain
Mount:	Pedestal
Duty cycle capacity:	14.0 metric tonnes/15.4 US tons
Reach:	29m/95ft
Attachment:	12.2m³/16.3yd³ hydraulic clamshell grab
Power source:	200kW/300hp electric motor

Two 1500 Series E-Cranes have been operating in Argentina since 2008 at Cargill VGG. Cargill decided to upgrade its logistics system by installing an E-Crane system to handle barges, in addition to already being able to receive grain by trucks and rail. This added flexibility to the port, and provided the company the ability to receive grain by three different modes. This upgrade not only improved the logistics on site, but it was also a direct response to the increased use of the rivers as a transport method.

Both E-Cranes unload barges simultaneously, and feed the material into two hoppers located between the E-Cranes on the dock. A conveyor system then moves the grain into a grain tower and scale room. From here it is either conveyed to the plant where it is stored, or it is directly loaded into ships.

The E-Cranes are still in operation and are working successfully with close to 10,000 hours of operation on each crane.

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Case Study: Terminal 6 S.A.

Type:	1500 Series/ 11264 PD-E
Location:	San Lorenzo, Argentina
Application:	Barge unloading
Material:	Grain, soybeans
Mount:	Pedestal
Duty cycle capacity:	16.5 metric tonnes/18.2 US tons
Reach:	26.4m/86.5 ft
Attachment:	12.2m³/16.3yd³ hydraulic clamshell grab
Power source:	200kW/300hp electric motor

The 1500 Series/11264 PD-E at Terminal 6 S.A. in San Lorenzo, Argentina.

In 2013, E-Crane installed and commissioned a 1500 Series/Model 11264 PD-E pedestal mounted E-Crane to unload soy beans and grain from Mississippi- and Paraná-sized barges at Terminal 6 S.A. in Argentina. The E-Crane is dock mounted, and has a 26.4m outreach and a duty cycle capacity of 16.5 metric tonnes. The E-Crane transfers the grain from the barges to a hopper and conveyor system on the dock with a 12.2m³ hydraulic clamshell bucket. Terminal 6 S.A. chose the E-Crane after realizing the many benefits of the equilibrated crane's efficient design. Its goal was to increase the productivity and capacity of the port. The material was originally unloaded using a cable crane and a small material handler, with each machine achieving a production rate of about 400tph (tonnes per hour). The new E-Crane replaced the both machines and achieves a much higher production rate than the previous setup.

One of the big challenges of this project was the access to the dock for installation of the new E-Crane. The main components of the crane were sub-assembled at a laydown area about 50m away and 26m above the dock area. The subassemblies were lowered down to the dock area using a 600-tonne lift crane.

Similar to Cargill VGG, Terminal 6 now has the ability to receive grain and flour by trucks, rail and barges. This E-Crane has achieved an offloading rate of more than 800tph and is an important part of the ongoing expansion of grain shipments from Argentina to the rest of the world.

Case study: CHS

Type:	1500B Series/Model 11264 PD-E
Location:	Zarate, Argentina
Application:	Barge unloading
Material:	Grain, soybeans
Mount:	Pedestal
Duty cycle capacity:	16.5 metric tonnes/18.2 US tons
Reach:	26.4m/86.5ft
Attachment:	14m³/18.3yd³ hydraulic clamshell grab
Power source:	200kW/300hp electric motor

In 2014, a 1500 Series/Model 11264 E-Crane was installed for CHS in Zarate, Argentina. CHS is a leading company in agribusiness with locations all over the world. The E-Crane is dock mounted, and is used to unload soybeans and grain from both Mississippi- and Paraná-sized barges. The E-Crane transfers the material from the barges to a hopper and conveyor system located on the dock using a 14m³ (18.3yd³) hydraulic clamshell bucket.

1500B Series/Model 11264 PD-E at CHS's facility in Zarate, Argentina.

This was a greenfield project, with all new equipment, in order to expand operations at CHS. CHS was looking for a solution to offload grain barges while expanding its grain handling capacity and E-Crane engineers worked closely with CHS to determine the best possible set-up. Along with the E-Crane, a brand new dock, hopper, and transfer tower were constructed to offload barges and either transfer the grain into a warehouse or transfer directly through its existing shiploader into oceangoing vessels.

Case study: UABL

Type:	700 Series/Models 4264 PD-E, 4290 PD-E
Location:	Pueblo Esther, Argentina
Application:	Barge unloading
Material:	Grain, soybeans

Mount: Barge
Duty cycle capacity: 5.5 metric tonnes/6 US tons
Reach: 4264: 26.4m/86.5ft
4290: 29m/95ft
Attachment: 4.5m³/5.9yd³ hydraulic clamshell grab (x2)
Power source: 110kW/150hp electric motor

UABL, a subsidiary of Ultrapetrol, owns and operates river terminals and provides barge and terminal services across South America. In 2014, the order was placed for two E-Cranes mounted together on a single barge. This is a midstream transfer project, and the barge is completely self-contained. The entire midstream transfer system travels along the Paraná River as needed to transfer grain. Both E-Cranes work together to unload grain from Paraná-sized barges into two separate hoppers also located on the barge. The hopper outputs the material onto a conveyor/shiploader system which transfers the material into Handymax-sized vessels on the other side of the crane barge.

The E-Cranes were installed on schedule in 2014, and commissioning and training took place in the summer of 2015. Commissioning took place several months after installation due to delays with other grain handling equipment for the barge. The E-Cranes are now up and running successfully!

Case study: Noble

Type: 1500B Series/Model 10290 PD-E
Location: Timbúes, Argentina
Application: Barge unloading
Material: Grain, soybeans
Mount: Pedestal
Duty cycle capacity: 14 metric tonnes/15.4 US tons
Reach: 29m/95ft
Attachment: 12.2m³/16.3yd³ hydraulic clamshell grab
Power source: 200kW/300hp Electric Motor

In 2015, another E-Crane was ordered for handling grain in Argentina, this time by the Noble company located in Timbúes, Argentina. Noble operates several warehouses and elevators in South America in Brazil, Argentina, Uruguay and Paraguay and offer cutting-edge solutions for the domestic and international trade and export of grains and oilseeds. This E-Crane was installed in 2016 to unload grain barges and load the cargo into a hopper, similar to the operations at Terminal 6 S.A. and CHS.

The E-Crane was delivered on time and installed in 2016, however the crane is not yet in operation because of dock construction delays due to high water levels on the Paraná River. Operations are scheduled to begin at the end of the year when the new soybean harvest arrives on site.

Case study: Cargill Quebracho

Type: 1500B Series/Model 10290 PD-E
Location: Quebracho, Argentina
Application: Barge unloading
Material: Grain, soybeans
Mount: Pedestal
Duty cycle capacity: 14 metric tonnes/15.4 US tons
Reach: 29m/95ft
Attachment: 12.2m³/16.3yd³ hydraulic clamshell grab
Power source: 200kW/300hp electric motor

Also in 2015, Cargill ordered a 1500 Series/Model 10290 E-Crane for barge unloading at their facility in Quebracho, Argentina. This is the third E-Crane for Cargill in Argentina for grain handling. The machine will be installed in Quebracho in late 2016 to unload both Mississippi- and Paraná-sized barges.

The new E-Crane will replace an obsolete cable crane which is currently used at the site, and will exceed the current unloading capacity. This will help Cargill keep up with the increasing volume of grain being handled on the Paraná River.

About E-Crane

E-Crane Worldwide is a modern, state-of-the-art engineering and heavy equipment construction company, based in Adegem, Belgium and with subsidiary companies for sales management, technical support and service in the Netherlands (E-Crane International Europe) and Ohio, USA (E-Crane International USA). E-Crane Worldwide develops turnkey material handling solutions with engineering services, equipment manufacturing, erection, operator/maintenance training and custom-tailored on-going service programmes for its clients.

The standard E-Crane product line consists of five series of balanced hydraulic cranes (equilibrium cranes): 700 Series, 1000 Series, 1500 Series, 2000 Series, and 3000 Series. E-Cranes provide longer outreach and higher duty cycle capacities than typical material handlers. Outreach ranges from 24.8 to 47.8 metres (82 to 157 feet) and duty cycle capacity ranges from 5.5 to 39 metric tonnes (6 to 42.9 US tons).

The 1500B Series/Model 10290 PD-E at Noble in Timbúes, Argentina.

Where do we start?

Four questions to ask before your next grain-handling project

When planning a grain-handling project, the process is all about the questions, *writes Rebecca Long Pyper for Dome Technology*. How can grain breakage be minimized? How can spillage be avoided? How can product be switched without excessive facility cleaning? How can the desired throughput be achieved without costing an arm and a leg?

Asking the right questions is key to securing the ideal handling system. That's why Dome Technology's team utilizes scope questionnaires covering everything from mechanical systems and property issues to reclaim. These questionnaires are part of front-end engineering that helps identify the ideal handling system, one that will get more bang for the buck now and in the long run. Use these questions to get the planning process started:

What are our throughput goals? In discussions with engineers, companies should identify the desired type of throughput, whether the product will be stored long term or processed quickly, what type of transportation will move grain to customers, and more. If a dome is selected, "those are all concerns that will be addressed during the preliminary phase of the project to make sure the project is optimal for the owner," engineer for Dome Technology Adam Aagard said.

Different reclaim systems will be discussed early on, and multiple options are available on the market today. The biggest determiner of the handling system is usually desired throughput rate. "It's probably not so much the type of equipment as it is the size of equipment that's affected by throughput," Aagard said.

The type of equipment selected might largely be determined by cost. According to Dome Technology sales manager James Stoker, grain is most commonly reclaimed via clean-sweep screw or auger that pulls material into a hopper. But some types of reclaim aren't capable of moving 100,000 bushels an hour out of a dome — that's best achieved by a front-end loader or a Vibrafloor. However, the cost difference between those two options is substantial — the former might cost $150,000 to $250,000 versus $1 million for the latter. For that reason, "economics may drive selection, and that will drive the throughput rate," Aagard said. Since grain is a tight-margin industry, the more product a company pushes through, the more money they make, and many are "looking for the cheapest system they can get to move the most volume," he said.

With throughput informing the entire process, engineers can identify the costs of various types of systems, and based on the speed and volume of reclaim, customers can choose the best system to meet their needs.

Upfront planning

It's common for companies to have annual budgets, but by thinking in terms of a single calendar year can result in pinched planning time. Instead of trying to execute both planning and construction between the New Year and grain harvest, Aagard suggests breaking up the process. Allocating engineering money at the end of one calendar year and money for the actual construction at the beginning of the next "prevents design-as-you-go instead of a well-thought-out design," he said.

What foundation system is best? Traditional bulk storage often requires expensive deep-foundation systems based on the amount of weight the structure will hold.

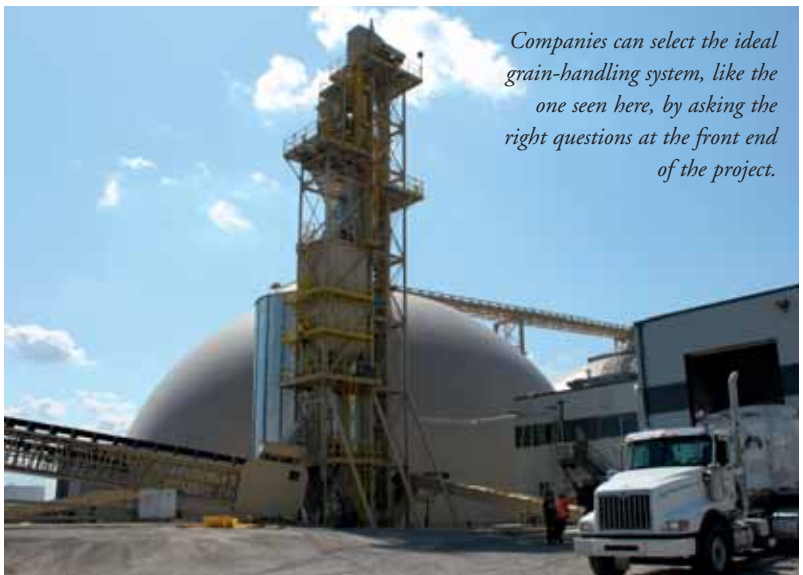
A dome's strength and geometry provide a tolerance for differential settlement. That quality combined with geotechnical engineering and site analysis ensures proper foundation performance. In contrast to a flat storage, the dome is continuously supported by the ring foundation. As a result, some differential settlement doesn't adversely affect the structure, where some differential settlement in a flat storage is generally not acceptable. Customers can save millions as the need for deep foundations may be reduced or eliminated based on the ability to accommodate some global and differential settlement.

How do we combat flow issues? Oily grains are prone to caking or bridging in storage, especially when product is stacked especially deep. When the problem is severe, grains fail to free-flow.

Breaking down a compacted pile within a dome is possible, and companies can choose from multiple methods to tackle the problem. A front-end loader can knock down product, but this approach is sometimes avoided because of safety concerns. Safer alternatives include a whip-chain system to break product, air cannons that blast grains loose, or a screw reclaimer capable of working under pile load.

What are we forgetting? An expert team that understands product qualities and reclaim options will guide customers in analysing all aspects of the handling process. Dome Technology relies on two types of scope questionnaires, one for a fixed budget and another for a quick budget. So whether a project is imminent or simply hypothetical, companies can get a good idea of what's available and how to reach their storage and handling goals.

Another advantage of front-end engineering is potential cost savings at every stage of the project. For instance, companies often ask what kind of civil work Dome Technology can complete. Depending on what's most cost effective, Dome Technology's team can either perform the excavation and backfilling on a project or hire a local contractor that may cost less. "Our goal is to work to bring that price down, whether we self-perform it or find a subcontractor that we will manage," Stoker said, adding that sometime companies will have access to necessary materials, which also reduces costs.



Companies can select the ideal grain-handling system, like the one seen here, by asking the right questions at the front end of the project.

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Mole•Master's Junior™ 360°: dealing with clogged grain silos safely and quickly

Eradicating safety concerns, expediting cleanout

There are significant obstacles to face when a grain silo becomes clogged. First, traditionally, cleaning out a grain silo or bin has required human entry. A worker is lowered into the silo and using various hand tools, the material is slowly knocked off the walls to clear blockages. Tragically, the dangers inherent in this methodology have been demonstrated far too many times. When material becomes unstable inside a silo, it can easily give way, leaving the worker stuck or, worst of all, buried inside the silo.

Another obstacle when faced with cleaning out a grain silo is loss of saleable material. Depending on the cleaning method being used, material may be damaged or, if contaminated, can't be used because of health or other concerns.

The Junior™ 360° from Mole•Master Services Corporation, an expert in the silo cleaning industry, helps to address both of these and many other concerns.

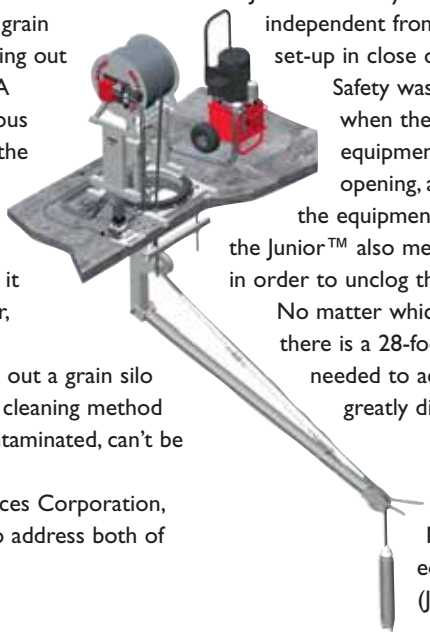
Features and benefits

The Junior™ 360° Series represents a technological breakthrough in equipment for the silo and bin cleaning industry. The Junior™ Series restores lost storage capacity quickly, safely, and economically. The fully adjustable boom and crane bearing mount allow the unit to provide complete 360° coverage of the vessel's interior wall(s) from the initial set-up position. The unique modular design means the equipment can be easily set up and operated in virtually any vessel, regardless of the size or shape.

There are two different models of the Junior™ 360°. One is hydraulically actuated and the other is pneumatic. However, both versions share a few key features.

Perhaps the key to the Junior™ 360° is the unique 360° bearing, which allows for infinite positioning of the cutting head. The cutting head can accommodate interchangeable blades, flails, or chain cutters that are engineered to safely remove a wide variety of materials.

The Junior™ was engineered to be easy to use and quick to set up. The lightweight aluminium construction means the Junior™ is easy to transport and assemble. The hose reel is independent from the boom assembly which allows for easier set-up in close quarters.



Safety was of course also a significant consideration when the Junior™ 360° was being designed. The equipment can be positively mounted to the vessel opening, and custom mount bases are available so that the equipment can be adapted to any roof opening. Using the Junior™ also means that nobody has to enter the silo or bin in order to unclog the material.

No matter which version of the Junior™ is being used, there is a 28-foot (8.5m) reach that provides the flexibility needed to adapt to all kinds of vessels that may vary greatly dimensionally.

Maximum flexibility

The Junior™ 360° is flexible by nature, but Mole•Master expanded the capabilities of the equipment by engineering a hydraulic model (JR360H) and a pneumatic model (JR360P).

The JR360H Model provides greater torque and a higher operating speed for the operator. This model also offers the smallest cutting head available on the market (5in or 12.7cm) which allows it to fit into the tightest flow channels or 'ratholes'.

The JR360P is particularly ideal for the grain industry because there is no danger of contamination. No hydraulic fluid is used with this model, so in addition to the standard benefits of the Junior™, grain silo owners can feel confident that their material can be salvaged while their silo is being cleaned out.

When time is of the essence

Regardless of the industry, a clogged silo or any type of storage vessel is a serious problem that can slow or even stop productivity. The grain industry, however, has another dimension of complexity that not all industries share. The nature of grain storage is that the material can build up very quickly. Once a blockage presents itself, the clock is ticking to solve the problem before it becomes progressively worse. The need for speed may at times even outweigh the known risk factors involved with human entry. The urgency can create an overwhelming amount of pressure on all involved.

The flexibility and ease-of-use that the Junior™ 360° provides eradicates the safety concerns while also expediting the actual clean-out procedure. The silo owner can rest assured that the job will be done quickly, safely, and efficiently, and that material loss will be at a minimum.

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Terex Gottwald mobile harbour cranes fleet handling coal in a Spanish terminal.

Terex Port Solutions: mobile cargo handling in ports

Terex Port Solutions (TPS) focuses to a great extent on container handling, and has a wide range of products that meet the needs of this market. However, for its mobile harbour crane technology, including rubber-tyred and rail-mounted portal harbour cranes and floating cranes in particular, bulk is very important. This is especially true for the four-rope variants (two ropes for lifting and lowering and two ropes for opening and closing the mechanical grab).

TPS offers electric cranes using electric power for the crane's main drives, either generated by an on-board diesel-generator or by taking advantage of the terminals mains. External power makes crane operation more efficient, environmentally friendly (no exhaust, less noise).

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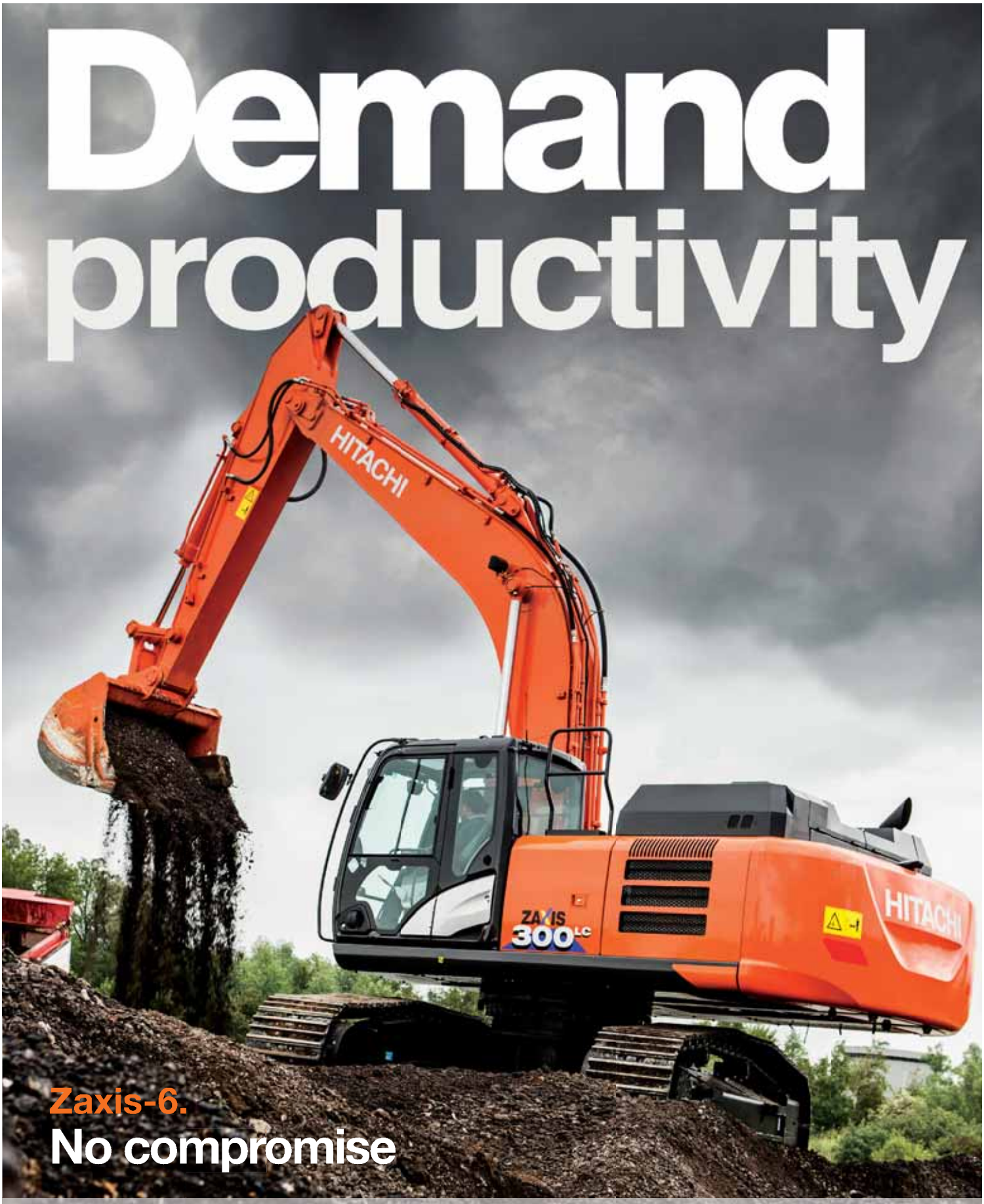

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planning and advisory expertise and a global network, TPS is an expert for efficient, safe and environmentally aware cargo handling in ports and terminals. The clients for its vast product range are the terminal branches of the shipping lines, stevedoring companies, port authorities and industrial companies.

TPS's cranes and material handlers for bulk operations are all renowned for reliability, efficiency and economy.

Mobile harbour cranes

The mobile product range includes eight dedicated models, including Model 2 up to Model 8, as well as the Quaymate M50. These cranes are suitable for handling bulk, breakbulk, general cargo, project cargo (like turbines, generators or transformers) and containers. Many of these models are also available in four-rope variants for professional bulk handling. These cranes are classified as A8, dedicated to the harsh conditions in the bulk sector to provide a long service life.

The Quaymate M50 is different to the Model 2 to 8 cranes. It is designed as an entry model for light to medium-duty handling at economically viable working speeds and with a service life appropriate to the application. The new 50-t crane is manufactured in the TPS plant in Xiamen, China. It is ideal for small maritime and river ports aiming to professionalize their cargo handling.

Bulk in focus

TPS's rubber-tyred mobile harbour cranes (four-rope variants) are ideal for a wide range of bulk commodities, including coal, ore, scrap, gravel, sand, fertilizer, sugar, cereals and alike.

Based on this mobile harbour crane technology, TPS also offers portal harbour cranes and floating cranes in four-rope configuration, or harbour pontoon cranes. These models use the same technology as the mobile harbour cranes from the slew ring up. The largest crane (Model 8) handles up to 1,850tph (tonnes per hour), depending on site and operational conditions. The figure provided is valid for the portal, the floating and the mobile crane type.

Portal harbour cranes and floating cranes are two very good examples of further product development that has taken place in consultation with customers. Once the technology was in place for the mobile equipment, it suggested itself for adaptations which offer further market penetration and opportunities to replace other equipment or to compete with other equipment like CSUs (continuous ship-unloaders) or bulk bridges.

There are many advantages to TPS's solution. Since its cranes come from a construction kit, they therefore offer short delivery lead times. The availability of spare parts is also an advantage. With regards to the floating cranes, TPS started with so-called mid-stream applications on the Mississippi river but quickly

Terex Gottwald Model 8 portal harbour cranes handling coal in Turkey.

Model 8 floating crane operating on the open sea.

managed to find solutions for operating this crane type in open sea applications. The majority of both portal harbour cranes and floating cranes are applied in coal handling operations but are also frequently found in other bulk environments.

Technical features

To support crane operators/drivers in achieving high handling rates and to manage the handling process, TPS offers optional additions to the Visumatic crane management system. These features make the work of the crane operator easier, as they assist him with frequently recurring tasks, or simplify operation of the crane. These include:

- **Auto-adaptive grab fill-level control:** this has been standard on all Terex Gottwald four-rope grab harbour cranes since 2012. Benefits include excellent grab filling; increased bulk handling rates; improved crane performance; reduced overload; cut-outs and reduced time losses; and increased crane lifetimes.
- **Hold totalizing feature:** this is an additional function of the Visumatic which helps give the crane operator a better overview of the quantity of bulk material unloaded from the different holds of the ship. This feature assists in unloading the ship in the specified unloading sequence, as the totalized quantity of material already unloaded is displayed. This makes it easier for the crane operator to see when he has to change to another hold.

  For up to ten holds, the Visumatic monitor shows the number of lifts, the quantity of bulk material already unloaded from the current hold and the total quantity of bulk material unloaded from the ship. The data are based on totalizations of the mass registered by the standard load detection system for each individual work cycle.

  By means of function keys, the crane operator can manually select the holds for which the following lifts are to be registered.
- **Semi-automatic point-to-point motion:** handling operations using harbour cranes often involve moving repeatedly back and forth between the same two positions, e.g. ship's hold and hopper or stockpile, to pick up and set down loads. This repeated move can be semi-automated, with the hoist being operated manually by the crane operator in the usual fashion while the slewing gear and luffing gear are controlled by an auxiliary control module. The integrated antisway system ensures that the sway of the load is minimized when the end point is reached. If the feature 'Semi-automatic point-to-point motion' is implemented in a crane, the functionality of the 'Antisway' feature is also available for manual crane operation.
- **Hoisting height limitation:** the hoisting height limitation function realizes two virtual limit switches for the hoist: an upper limit and a lower limit of the working range. This is useful if the crane operator often has to move a load to the same hoisting height. As he does not have to position it manually every time, the work is made easier. This function can also reduce the risk of collisions if a load has to be moved










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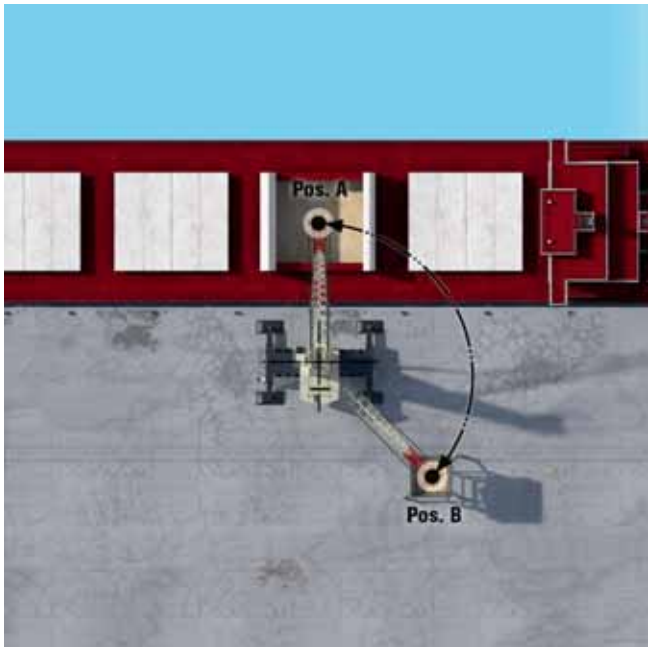
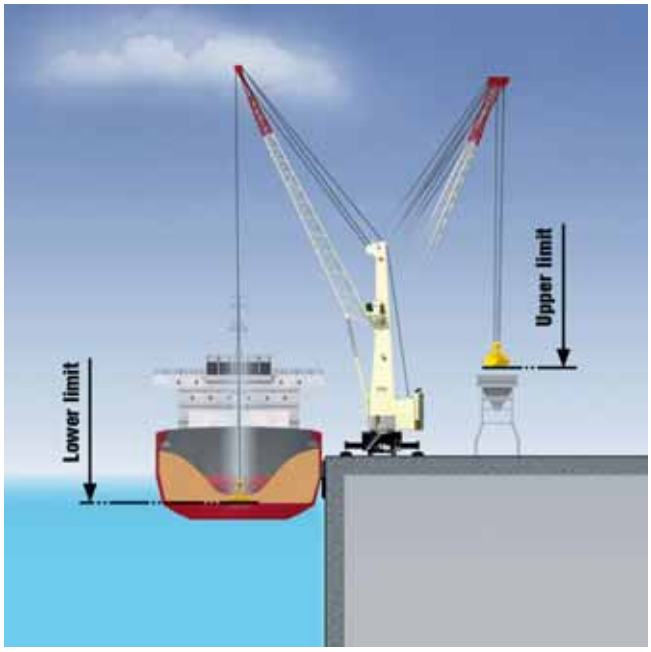


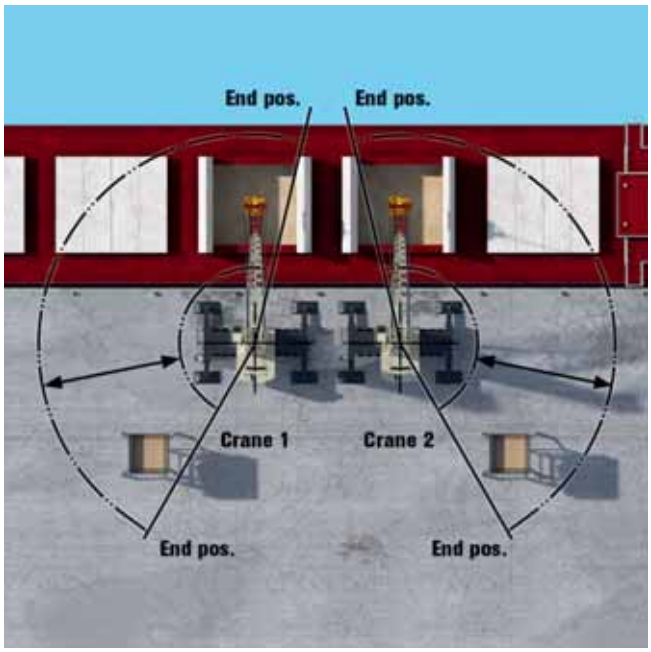
Semi-automatic point-to-point motion helps operators when moving repeatedly back and forth between the same two positions.



Hoisting height limitation is useful if the operator often has to move a load to the same hoisting height.

to a specific minimum height, e.g. over a hopper. Use of the hoisting height limitation feature is particularly recommended for cranes handling bulk materials. Here, the lower limit is typically at the surface height of the bulk material in the ship's hold and the upper limit just above the hopper opening.

- **Slewing angle and radius limitation:** the working range of a harbour crane is normally circular, i.e. a slewing angle of 360° is possible. In certain working situations, however, it may be advantageous to limit the slewing range of the crane by virtual limit positions or to reduce the maximum radius. This can be helpful to avoid an overlap of the working ranges of two cranes working side by side. If the crane operator wishes to set a slewing angle limit, he moves manually to the angle positions one after the other, saving them with the corresponding Visumatic function key. The programming of virtual limit positions for the luffing gear is carried out in a similar manner. The crane operator can now work manually as usual within the working range limited in this way. As he approaches a previously saved limit position, the speed is automatically reduced before the limit position is reached so that the speed is zero when the limit position is reached. This means that leaving the defined working area unintentionally is not possible.



Slewing angle and radius limitation is especially helpful to avoid overlaps of working ranges of two cranes working side by side.

Recent contracts

Two Model 4 G HMK 4406 B mobile harbour cranes for IRC Natural Resources in Haldia

In mid-June this year, TPS revealed that its success in India is continuing, with the award of a contract for its diesel-electric Terex® Gottwald mobile harbour cranes. IRC Natural Resources Pvt. Ltd., which is part of the IRC Group (IRC), has ordered two Model 4 mobile harbour cranes in the G HMK 4406 B 4-rope grab variant for its contract at Berth No. 13, Haldia Dock Complex, located to the south of Kolkata on the Ganges estuary. By the time this issue goes to press, the cranes will be have been transported, completely erected, by heavy-load vessel to India, where they will handle coal, coke, manganese ore and limestone from October onwards. The two identical machines have a 40t grab curve and a maximum lifting capacity of 100t. They offer an outreach of up to 46m and maximum lifting speeds of 85m/min and are equipped with a propping system adapted to the conditions at the berth.

With the two cranes, IRC is placing its trust in globally proven technology for the development of its new port logistics business segment. The group of companies previously specialized mainly in excavation of raw materials and logistics solutions on land. Anil Gupta, Chairman, IRC Group: "Our global growth strategy continues to be aimed at diversification. Here, the port sector at the Haldia site will play a major role. To win the trust of our customers in our capability in this new sector right from the start, we opted for cranes from TPS in our new contract. These machines offer us both excellent productivity and high availability." Particularly with a view to the availability of the cranes, the order also includes an extensive spare parts and service package for three years.

Andreas Moeller, Sales Director Harbour Cranes TPS is delighted to have captured the attention of yet another new

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Indian customer, IRC, with mobile harbour crane technology from TPS: "We have significantly expanded our Indian business within a very short time. IRC is the eighth customer to order mobile harbour cranes from us since mid-2014. The machines for Haldia will be the eleventh and twelfth cranes to go to India in this period. We will then have delivered around 40 machines there overall." Robust cranes for professional bulk handling are particularly in demand in the second most populous country in the world. Moeller: "It is especially operators of bulk terminals who are deliberately opting for the productivity and reliably of Terex Gottwald cranes, since fast-growing local industrial production requires a reliable supply of energy carriers such as coal."

First crane from TPS for IRC and Haldia: the cranes ordered in the past two years, including the latest two machines for Haldia, are spread over six ports on both the east and west coasts of India. Here, TPS has succeeded in gaining the interest of highly diverse terminal operators. Shyam Pathak, Regional Director South Asia TPS: "In addition to existing customers established on the market, we have been able to win over up-and-coming terminal operators, such as IRC, with the versatility and high performance of our cranes." The sites in question are characterized by particularly high economic growth. Pathak: "Since 2014, the Indian economy has again gained momentum in many parts of the country. With these cargo-handling machines, we are once again pleased to be able to make a long-term contribution to this positive development."

Associated British Ports continues to trust Terex® Gottwald portal harbour cranes

In late June, TPS announced that it has received an order from Associated British Ports (ABP) for two electric Terex® Gottwald Model 8 portal harbour cranes in the G HSK 8424 B four-rope grab variant for bulk handling. The leading British port operator has ordered the two machines for its terminal in Immingham, located on the North Sea estuary of the Humber. The cranes have been adapted to the individual conditions of the terminal and are particularly efficient as they are driven with power from the terminal's own electricity supply. From the middle of next year, they will significantly increase handling capacities for professional loading and unloading of bulk products.

The machines will be part of a particularly high-performance terminal, where many Terex Gottwald mobile harbour cranes and portal harbour cranes have been operating since 2002. There they will replace two older Terex Gottwald HSK 360 EG portal harbour cranes from Generation 4 of TPS. The new machines have a 50t grab curve and a maximum lifting capacity of 100t. They offer an outreach of up to 50m and maximum lifting speeds of 140m/min.

TPS has adapted the crane portal to the existing infrastructure of the terminal by providing 14m track gauge and 6m headroom. This also includes the rail-bound travel units that comprise a total of 24 wheels – six in each corner – in order to comply with maximum permissible rail loading.

In Immingham, the G HSK 8424 B portal harbour cranes, like their predecessors, will act as part of a complex, specific bulk material solution, including hoppers controlled from the crane and a conveyor belt. Sean Blissett, Engineering Manager Humber, ABP: "The terminal at Immingham handles a significant amount of bulk products. The solution from TPS has proven its reliability in this demanding environment over the years."

Neil Griffiths, the new Sales & Service Director UK and Ireland, TPS, is delighted that ABP is now taking the next step in its long-term business relationship with TPS: "The terminal in Immingham shows how customers can continuously expand their business with our technology. ABP has opted for Terex Gottwald mobile harbour crane technology for 14 years. The cranes now ordered again stand for another visible leap in growth and performance. Griffiths: "The two G HSK 8424 B machines will be the largest cranes based on mobile harbour crane technology in the whole of Great Britain."

AES Argentina Generacion S.A. orders world's first Terex® Gottwald Model 2 portal harbour crane to unload imported coal

In April this year, TPS announced a further success in South America. The Argentinian power plant operator AES Argentina Generacion S.A. (AES) has ordered a Terex® Gottwald Model 2 portal harbour crane in the G HSK 2224 variant. From the end of 2016, AES will use the cargo handling machine in its 1,540MW power plant in San Nicolás de los Arroyos to unload coal imported from Colombia and South Africa. The G HSK 2224 crane will be the first Model 2 in the world designed as a portal harbour crane. It will replace the ageing cargo handling equipment in the river terminal located approximately 200km to the north west of the Atlantic estuary of the Rio Paraná.

The versatile portal harbour crane features a 32t grab curve and a maximum lifting capacity of 80t. It offers an outreach up to 40m and maximum lifting speeds of 85m/min and will be used at the terminal of the AES power plant for efficient coal handling on vessels of the Panamax class. The machine will be driven particularly cost-effectively by external power from the terminal's own supply. TPS will adapt the crane portal with 10m track gauge and 6m clearance height to individual local conditions. This includes rail-bound travel units that comprise a total of 24 wheels — six in each corner — in order to comply with maximum permissible rail loading. Guillermo Paponi, Operations Director for Argentina: "With the G HSK 2224 we have opted for a state-of-the-art solution that specifically meets our requirements for cargo handling rates and design of the crane portal and is also based on proven Terex Gottwald mobile harbour crane technology."

Terex Gottwald portal harbour cranes can be ideally incorporated into both existing and new terminal infrastructures and particularly allow for operation of conveyor belts, trains and road trucks below the portals. There is currently increased demand in South America for mobile harbour crane technology on rail-mounted portals.

According to Daniel Vanegas Torres, Regional Sales Manager TPS: "In Brazil, two Model 6 and two Model 4 portal harbour cranes are already working in the demanding area of fertilizer handling. The four machines are each tailored to very specific individual terminal requirements. We are delighted that a customer in the neighbouring country of Argentina has now opted for one of these adaptable cranes."

Software

As a provider of solutions, TPS's range extends beyond just equipment, and includes software solutions from its DBIS software brand, CommTrac. CommTrac enables operators to plan, track and manage all bulk/breakbulk cargo, manned/automated assets and people right across a terminal or terminal network — in real-time. It gives the tools, control and management information needed to maximize operations, profitability, compliance and growth potential, all while reducing risk.

SAMSON equips Silsteve multifunctional terminal at the Port of Sillamäe

SAMSON FERTILIZER EXPORT FACILITY — TRUCK TO SHIP — STATE-OF-THE-ART DESIGN

The Port of Sillamäe in Estonia, through the Silsteve multi-function terminal operation, has chosen the SAMSON mobile shiploader with integral SAMSON feeders for the export of loose dry bulk cargoes from its new bulk terminal, *writes Lev Evangulov, Sales Manager, SAMSON Materials Handling Ltd., England.*

The Port of Sillamäe is a Free Zone port (Class 1) and is navigable year round by bulk carriers up to Panamax size (80,000dwt) at its new Silsteve terminal. The port is within 25km of the Russian border and is the closest deep water port within the European Union. As such, it is well located for the transshipment of bulk cargoes (liquid and solid) arriving by rail from Russia for local storage before transshipment to deep sea vessels. The close proximity to the major Russia rail networks allows continuous delivery of nitrogen and phosphate fertilizers. With close on-port storage, these materials may be accumulated at the port and loaded out at high capacity unlimited by the availability of rail transport and wagon discharge equipment. In addition to the fertilizers, the new equipment is specified to handle cereals and coal and, as such, offers multi-bulk operation and maximum flexibility for the terminal operator.

The appliance is designed to load fertilizers at rates to 1,100tph (tonnes per hour) peak and achieve an average 'through the ship' loading rate in the range of 500–700tph, limited only by truck availability. The boom length of 50 metres allows ships to 32 metres beam (Panamax) to be loaded and trimmed efficiently. With a belt width of 1,400mm and installed power of 200kW for the outloading boom, only the equipment may be developed for higher loading rates using conveyor haulage between storage and shiploader in the event this handling solution were to be adopted in the future. The 'through the ship' loading rate is the key performance indicator and determines the total vessel loading period. For example a shiploader specified to achieve 700tph 'through the ship' will load 70,000 tonnes in 100 working hours, or typically five days at 20 hours' working time per day.

This project uses the 'truck to ship' concept, pioneered by SAMSON from the early 1980s. In this, fertilizers may be transferred from local on-port storage to the shiploader using a fleet of tipping trucks, operating on a merry-go-round principle running back and forth from storage to shiploader continuously. A unique benefit of this solution allows the SAMSON feeders to be mounted integral to the shiploader, and therefore the equipment may be moved as a single piece fully integrated machine. This concept has the benefit of reducing trimming movements along the vessel and within the holds, significantly reducing the total loading period. Moreover there is no need to move individual parts of the machinery separately and no towing vehicles are required and thus delays aligning the equipment are eliminated.

Furthermore SAMSON has developed the 'auto-feed-rate-control' system for use with multiple feeders supplying a single outloading boom in order to maximize the machine performance and take full advantage of the increased handling rate available at low boom operating angles, particularly when using chevron belts.

Chevron belts allow conveying of granular materials to steep angles, typically up to 25°, and thus high free board clearance may be obtained within compact machine dimensions. However, the handling rate capacity of a chevron belt diminishes significantly at steep angles and yet the equipment will only operate at the maximum angle for a short period during the loading operation. Thanks to Archimedes' principle, the vessel goes down in the water as it is loaded. This allows the boom angle to be incrementally lowered down to typically 15° for the majority of the loading period. At 15°, a chevron belt performs very much like a plain belt and may offer an increased handling capacity of up to 50% compared with the steepest working angle.

SAMSON uses this benefit in loading rate capability to increase the actual work rate of the equipment by linking the absorbed power and load level on the outloading boom to the feed rate control system on the feeders. Using this system, each feeder may be set to achieve a much higher loading rate and the auto-feed-rate-control is used trim the feeder output to avoid overloading the outloading boom at steeper working angles. As a result, the trucks may tip to any feeder at random and the system will automatically achieve the maximum possible loading performance in any situation. Of course, when SAMSON quotes a spot loading rate, it always considers the worst case with the boom at maximum elevation and therefore the real performance is always a pleasant surprise.

In addition, the mobile shiploader is supplied with fully comprehensive powered travelling systems allowing both in-line and parallel movements with Ackermann steering in both modes of movement. Included are hydraulic actuators and precision rotary wheel alignment encoders so that the relative orientation of each wheel set may be controlled relative to the desired travel direction. In the 'in-line' mode, the shiploader is steered rather like a conventional truck with the rear wheel axles remaining at 90° to the chassis and the forward axle wheels steering left/right. In the 'parallel' mode, both the forward and rear axles are aligned parallel to the chassis and one pair of wheels on each axle is then steered through a limited angular range to allow directional control.

Shiploader in Port of Sillamäe (photo SAMSON).

Variable angle telescopic trimming chute to spread material across the hold (photo SAMSON).

Since it is not possible to connect the steering wheel units using a mechanical linkage in the traditional Ackermann installation, the rotary encoder system is employed and the PLC system calculates the relative angular displacement to achieve true Ackermann steering geometry, thus avoiding excessive stresses applied to the wheels causing tyre failure.

All of these functions are transparent to the operator and the desired modes of travel are fully automated and selected via an HMI screen at the operators control position. For this project, the mobile shiploader is supplied with an on-board diesel gen-set to drive the powered travel system only, reserving the shore power connection exclusively for the loading operation and the relative movements of the machine within a single vessel hold. In this manner, when the unit is not required for loading, the shore power may be totally disconnected and the diesel gen-set used to power the travelling system, allowing the complete shiploader to be driven off the berth to a suitable storage location. Using the fully integrated design with multi-function powered travel, delays are minimized whilst the equipment is repositioned along the vessel for hold trimming.

By reducing the lost time in manoeuvring the equipment on the quay, the total vessel loading time may be reduced overall, thereby increasing the effective 'through the ship' loading rate. Furthermore, since the feeders are permanently mounted to the shiploader, their relative alignment may be maintained under all working conditions. This practically eliminates spillage and allows for very effective dust control, thereby reducing the total environmental pollution associated with the material handling process from the truck to the hold.

Particularly when handling lighter materials, effective hold trimming is the key to efficient loading, allowing material to be accurately placed in the vessel hold with the minimum of machine movements. For this project, the shiploader is supplied with a variable angle and telescopic trimming chute, including a rotary distributor at the base for maximum operating range such that the effective width of the hold may be trimmed without moving the shiploader. In this manner, the shiploader need only be moved along the hold using the 'parallel' travel feature, again to save time in machine positioning.

This mobile shiploader operating within the Silsteve terminal at the Port of Sillamäe represents the state of the art for mobile shiploaders, offering all the performance of a fixed installation with the benefit of complete flexibility. Using mobile appliances allows a single berth to be used for many different operations including import and export thus maximizing berth utilization with minimum investment. Finally, this solution has one unique advantage over compatible fixed equipment in that it retains value and may be easily relocated or resold should the circumstances demand.

About the AUMUND Group

The AUMUND Group is active worldwide. The conveying and storage specialist has special expertise at its disposal when dealing with bulk materials. With their high degree of individuality, both its technically sophisticated as well as innovative products have contributed to the AUMUND Group today being a market leader in many areas of conveying and storage technology. The manufacturing companies AUMUND Fördertechnik GmbH (Rheinberg, Germany), SCHADE Lagertechnik GmbH (Gelsenkirchen, Germany), SAMSON Materials Handling Ltd. (Ely, England), as well as AUMUND Logistic GmbH (Rheinberg, Germany) are consolidated under the umbrella of the AUMUND Group. In conjunction with the headquarters of the manufacturing companies, the global conveying and storage technology business is spearheaded through a total of ten subsidiaries in Europe, Asia, North and South America and supported by four warehouses in Germany, Hong Kong, USA and Brazil.

RDS Technology shows LIFTLOG range at IMHX 2016

At the upcoming IMHX 2016, due to take place in the middle of this month (September), RDS Technology will be exhibiting its range of on-board weighing systems for forklift trucks — the LIFTALERT, LIFTLOG 100+ and the NEW LIFTLOG 1000.

These systems offer load monitoring and weighing functions with an internal alarm to warn when load threshold is approached and at the overload point. The LIFTLOG products on show also offer a totalizing feature, making it ideal for applications where multiple pallets are to be check-weighed or loading storage systems where weight limits are to be adhered to. Negating the need to travel to a floor-mounted platform scale often sited in a remote part of the warehouse, the Liftlog range provides a time-efficient means of check weighing.

A hydraulic load sensor is used to measure the increase in system pressure and the LIFTLOG unit displays the weight to the operator. Also included is an overload alarm that will sound when the overload threshold is approached and at the overload point to further inform the operator of load status. This helps the driver to avoid potential tip-over, increasing the safety of the forklift and surrounding warehouse.

The NEW LIFTLOG 1000 is the latest product in the LIFTLOG range, offering ±0.5% accuracy for forklift trucks operating in the fastest loading environments.

It is a cost-effective weighing instrument that reduces loading cycle times and maximizes tonnes per hour performance.

RDS Technology, a Topcon Positioning Group company, supplies over 100 original equipment manufacturers worldwide with custom solutions, as well as supplying standard retro-fit products through a network of specialist independent distributors in over 30 countries where customer service is the highest priority. Headquartered in Minchinhampton in the United Kingdom, RDS pioneered the use of electronics for agriculture and continues to lead in other sectors of mobile machinery.

New Bobcat S595 loader: higher ROC

For operators looking for more performance and productivity in a 74-horsepower skid-steer loader, Bobcat Company offers the new S595.

The Bobcat® S595 skid-steer loader has the highest rated operating capacity (ROC) of any of the 500-series loaders in its lineup by boasting a 2,200-pound ROC. This makes it ideal for those who need to lift and carry more material. Operators can move more material in a shorter amount of time and get more work done in the same amount of time for increased productivity.

The vertical-lift-path S595 is able to lift loads higher, making it easier to clear high-sided truck boxes and hoppers. Operators working in construction, landscaping and agriculture, as well as many other market segments, will appreciate this model because of its compact size and performance.

A standard feature for the S595 skid-steer loader is two-speed travel, with a top speed of 11mph. The feature allows operators to choose between low and high travel speeds to match the jobsite conditions and tasks. Operators can switch between travel speeds with a simple press of a button.

The S595 has a best-in-class pressurized cab with a one-piece seal that goes all the way around the door and fits into a special curved pocket. This minimizes the amount of dirt and dust that might enter the cab, creating more enjoyable working conditions for the operator.

S595 skid-steer loaders come with standard controls. Advanced Control System (ACS) and Selectable Joystick Controls (SJC) are available as options. Additional options include an enclosed cab with heat and air conditioning, radio, deluxe instrumentation and hydraulic bucket positioning.

Uptime protection

Bobcat S595 loaders incorporate multiple design elements to help protect the owner's investment and minimize downtime.

- auxiliary hydraulic quick couplers are mounted directly to the front plate of the lift arm;
- a guard bar extends in the front of the quick coupler for added protection;
- hoses are routed through the loader arms for better protection;
- simple checkpoints make it easier to perform routine maintenance; and
- enhanced visibility.

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LIEBHERR

Automatic monitoring of mobile harbour equipment ensures reliability and safety

The increasing globalization of the world economy is pressurizing ports, docks and harbours into handling ever-increasing volumes of cargo, so mobile harbour equipment has to work efficiently and reliably at all times. Tony Ingham of Sensor Technology Ltd explains how monitoring the work rate of cranes, loaders and unloaders means their performance can be optimized and downtime for maintenance can be scheduled for minimum disruption to operational requirements.

Importing and exporting of dry bulk cargoes, from minerals to grains, fertilizers to cement, wood chips to agricultural products, is almost exclusively a maritime operation. Thus there is a need to load and unload ships and barges, and in the modern world this has to be done quickly, efficiently and safely.

So as the volume requirements of world trade increase, harbour operators must ensure their loading/unloading equipment is in top condition, always available for use, able to adapt to new operational, commercial and safety requirements.

The best way to maintain such equipment is constant monitoring while it is working. This will allow the work to be totalized so that pre-emptive maintenance scheduling can be optimized, and will also instantly pick up early signs of emerging problems, such as sticking bearings.

The work done is directly related to the totalized load lifted, a parameter that crane and loader operators should also be measuring for both safety and commercial reasons.

Constant load monitoring used to be very difficult, but Sensor Technology has developed the perfect solution. Called LoadSense, it was originally used with helicopters carrying underslung loads in cargo nets and has now been adapted for use on ground-based materials handling equipment.

The technology involves a sensor being fitted to each crane or unloader. Once installed this does not interfere with handling operations at all, but constantly sends real time data via a wireless link to a computer, where it can be displayed, stored, totalized and analysed to provide performance information to the operators and billing information for the customers.

LoadSense is an intelligent load sensor that can easily be integrated with a mobile harbour crane. Designed and manufactured by Sensor Technology in Banbury UK, it is fully automatic so causes no disruption to normal operations. Special training is not required; instead comprehensive and easily understood information becomes instantly available to operators and managers alike.

The LoadSense sensor is based on proven strain gauge technology, and is calibrated as standard in the range 1–5 tonnes, with other ranges available on request. It constantly monitors the load and transmits this wirelessly, using the unrestricted 2.4GHz waveband, to a receiver for onwards transfer to the control computer. This enables accurate load data to be displayed, typically via a colour touchscreen computer, running Windows XP. The screen shows real time measurement of the load, while the computer records and analyses it.

LoadSense has become a favourite amongst harbour crane operators as an important enabling technology to improve safety, asset availability, productivity and profitability. For instance, you may need to know how much material you have transported, or you could be handling two or more materials simultaneously which need to be accounted individually. A common scenario is where multiple customers' cargoes are being handled at the same time; here LoadSense gives operators the information they need in order to invoice each appropriately.

LoadSense also enhances safety and prevents dockside handling equipment from failing catastrophically. There are typically two reasons for such failures:

- overloading the crane with too much weight. Because LoadSense is a constantly producing a digital signal, it is easy to set up the control computer with an overload value that will trigger an alarm if it is breached. It is equally simple, and practically better, to set the computer so that it will cut out lifting operations if the overload limit is breached, thus ensuring excessive loads are not raised off the ground; and
- ageing cranes and unloaders can suffer fatigue failure. LoadSense can be used to keep count of the number of operational cycles performed, and signal when the equipment's design life is being approached. An inspection can then be conducted to determine the likelihood of imminent failure and remedial works that can be undertaken.

LoadSensor, made by UK-based Sensor Technology, has a computer read-out that can be customized for each application.

In conclusion, to be profitable harbour operators need to work their dockside handling equipment long and hard and the best way to ensure reliability and safety is by constantly monitoring the load and interpretation of the ensuing data. LoadSense from Sensor Technology makes this requirement complete automatic and foolproof.

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Radial telescopic stockpiling coal @ 2000tph
in powerplant receiving from ship unloading system

Hopper Feeder & Radial Telescopic reclaiming/
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Telestack **mobile** coal handling systems offer significant **operating costs savings** compared to traditional methods of material handling (e.g wheel loaders, mobile harbour cranes, stacker/ reclaimers etc.) as well as providing **environmental** and **health & safety benefits**. Additonal benefits include **reduced planning** permission required due to product **mobility.** Also the **flexibility** to move Telestack Mobile Conveyors off site. Telestack Conveyors can be **rapidly deployed** on site with handling rates of up to 3,000 TPH.

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Telestack supplies TITAN TI600-8 bulk reception feeder for barge loading

Titan T1600-8 barge loading at 2,000tph.

TELESTACK SUPPLIES TITAN T1600-8 BULK RECEPTION FEEDER TO LOAD BARGES FOR PRODUCER OF CONSTRUCTION MATERIALS

The aim of this project was very clear — to design and build a bulk reception unit that could handle throughput rates of up to 2,000tph (tonnes per hour) and have the ability to receive a payload from a CAT 777 off-highway rigid haul truck. Most suppliers were understandably reluctant about the project but armed with over a decade of experience of designing bulk reception feeders, Telestack embraced the project with vigour and excitement. Using the latest sophisticated modelling software and a team of ports and inland terminal experts, Telestack designed and produced the TITAN T1600-8 — the largest mobile bulk reception feeder in the international market.

The end user is a significant producer of construction aggregates in North America (primarily crushed stone, sand and gravel). Critical to the project was the client's need to tip directly onto a unit for barge loading that would eliminate double handling of material, thus reducing cost, reduce loading time and offer a higher quality of product due to the reduction of material handling time and methods. To transport the crushed aggregate by truck was expensive, cumbersome and not the most environmentally conscious. Furthermore due to the strategic location of this particular quarry, the transport of the majority of the aggregate product was to be achieved via river barge.

Critical to the success of the project was the continuous and consistent supply of thousands of tonnes of material with minimal downtime and maximum level of throughput.

Titan T1600-8 being fed by off-highway rigid truck.

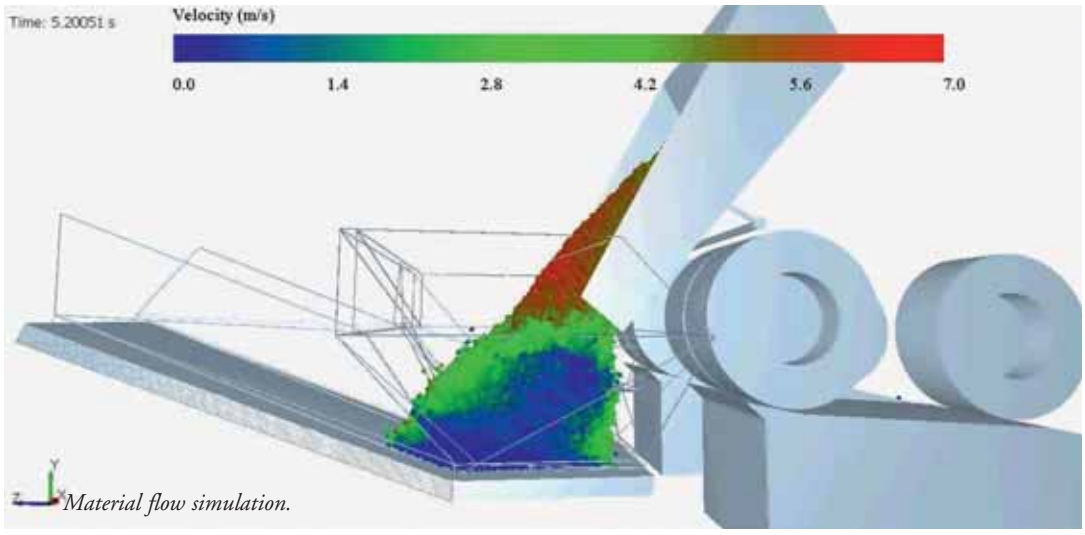
The TITAN T-1600-8 bulk reception feeder is a track-mounted fully mobile conveyor designed to work at production rates of up to 2,000tph (1,800mtph [metric tonnes per hour]). Telestack's TITAN range is designed to be loaded directly from trucks, wheel loaders, grab cranes, excavators etc. and can receive up to 60m³/80yd³. The TITAN range can be used to stockpile material, feed auxiliary equipment, reclaim to other conveyors, directly load ships/barges, trucks, rail wagons etc. and since it is track-mounted, the unit has excellent mobility on site, thus eliminating double handling of material which reduces overall costs for operator.

Weighing 115 tonnes (233,530 lbs), 35m (115ft) in length and 8m (26ft), in height, the unit has a 3m feeder belt (10ft). The unit is track-mounted to allow the operator full mobility and flexibility. Fitted with an independent diesel engine for track movement and hydraulic set up function, the unit also has all electric motors to power the conveyor belts. The dual power functionality allows the customer to connect to local site power thus reducing running costs, reduce noise, reduce maintenance and pollution and makes for an overall more economical and efficient unit.

Padraig McDermott, International Sales Manager with Telestack explains, "This has been an exciting project for Telestack and our Ports and Inland Terminals department. We were confident in our design and build as we have over ten years' experience of bulk reception feeders ranging from tracked, wheeled and static versions in a range of applications across the globe. Our client is a multi-national giant and the feedback is excellent with the unit performing above expectations."

Telestack was able to use sophisticated modelling software to help demonstrate the benefits of the Telestack technology and help understand the load and stresses that the machine would experience during the loading cycle. The cycle analysis also helped to accurately work out the tonnes per hour and cycle times. These statistics also assisted the engineering teams during the design process.

The TITAN range appeals to the ports industry because of its unique design. The reception feeder has a feed width of 6.8m (22ft) and allows the flexibility to accept material from either trucks or loaders and the range has many features that ensure that the unit has the strength to take the surge of material. The heavy duty apron chain belt feeder and trapezoidal steel apron bars absorb the stress/impact encountered from the sudden surge of material discharging onto the belt. Material is then transferred on the belt in a controlled manner and the adjustable plough permits the regulation of the feed throughout the loading process. Furthermore, the chain and sprocket driven belt ensures that there is no stalling of the feed conveyor as you might expect in the regular 'roller type' belt feeder. The TITAN unit was also fitted with a ventilated chassis to allow any spilled material to be rejected, thus protecting the chain and flexible side seal skirting.



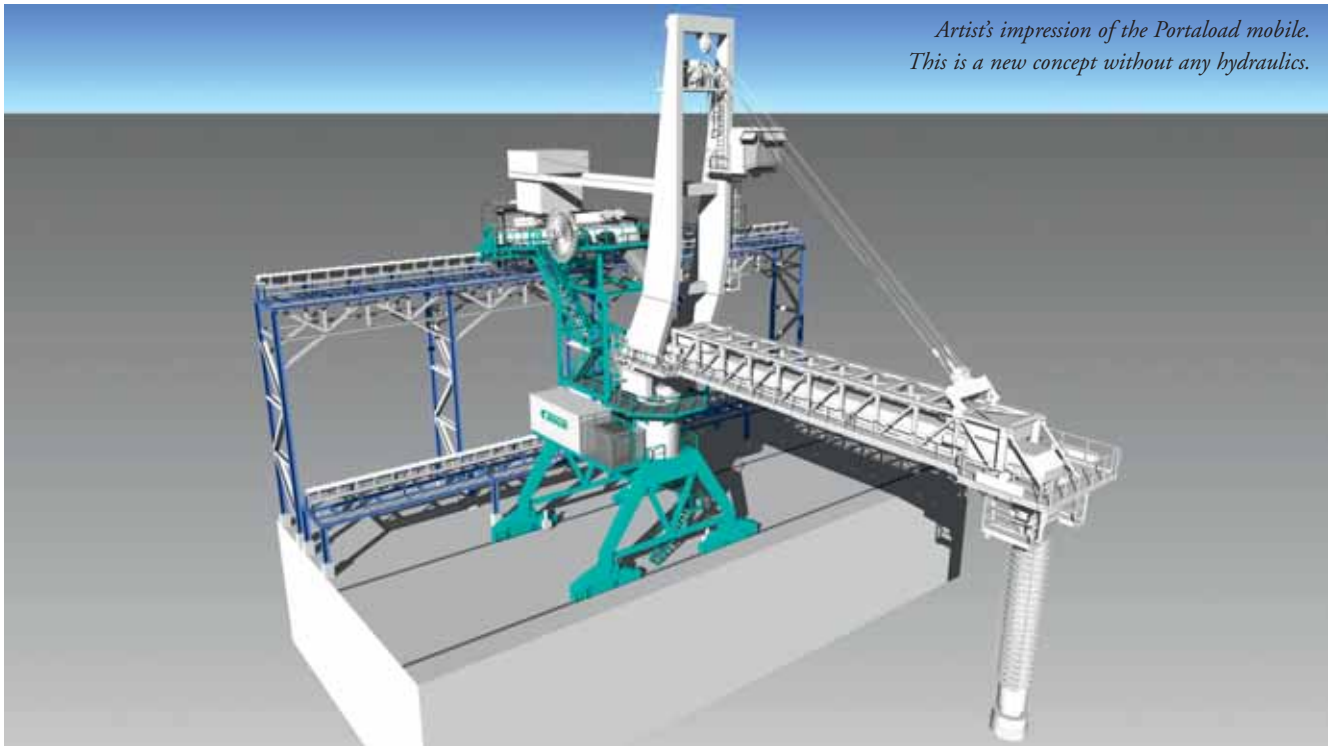
Material flow simulation.

The bulk reception feeder range continues to expand globally and its innovative and mobile nature ensures that the operator has the ultimate flexible solution for handling dry bulk materials in the port or terminal. The 20m (66ft) radial boom with slewing function enables the operator to trim the entire barge from the one feeding position increasing production rates and reducing production downtime. The Telestack range of barge/shiploaders are all custom designed to take into consideration the maximum free-board heights, beam and quayside widths. The range also offers an extensive range of options to ensure that the systems are designed and manufactured to meet the specific needs of the application taking into consideration the differing mobility needs, materials, power and electrical requirements of the application.

Critical to this project was the true understanding of the bulk reception feeder. Malachy Gribben, Commercial Director with Telestack explains "This is an important reference project for Telestack as it demonstrates clearly the experience behind the Telestack equipment. We have been installing static, wheeled and tracked mobile bulk reception feeders for over a decade now and we have an intricate understanding of the technology. We have another large multi-national client who shares our confidence in the design, build and commissioning of the product. Supported every step of the way by the factory and the dealer, our TITAN range continues to grow in numbers and features. Our Telestack Ports and Inland Terminals experience is invaluable in ensuring a successful installation and our involvement from the start is important so we clearly understand the technical and commercial needs of the project that allows us to make specialist recommendations based on our international experience."

Telestack, specialists in the complete design, manufacture, installation and commissioning of mobile bulk material handling systems, have a global proven record in a range of applications including mining and quarrying, stockyard management, ports and inland terminals, power stations, rail yards, steel mills, cement kilns and many other bulk material handling industries and offer a range of solutions and reference sites along the logistics chain from pit, to port to plant.

Sustainability, economy and flexibility with Bühler equipment



Artist's impression of the Portaload mobile. This is a new concept without any hydraulics.

Bühler specializes in solutions for grain terminals, for product intake, storing, conveying, cleaning, weighing, loading and unloading, *writes Vincent van der Wijk, Product Manager shiploading and unloading equipment, Business Area Grain Logistics*. It offers the complete package from initial project ideas up to turnkey solutions. Included in the company's product range is mobile equipment used widely in ports worldwide.

Bühler has great expertise in continuous ship unloaders (CSUs), and manufactures a full portfolio of the Portalink, which are based on the trusted and valued technology of mechanical conveying by high capacity chain conveyer. The Portalink is designed for sea going ships up to 125,000dwt. It offers and unloading capacity from 300tph (tonnes per hour) to 1,500tph, and boasts top-class operating costs through low energy consumption, low maintenance, and ease of operation.

On the other side of the coin, in terms of loading, Bühler has two loading systems in its product portfolio — stationary and mobile. Bühler's stationary Portaload is based on three to four loading towers. These are designed to enable maximum performance and enable continuous unloading without interrupting the large supplying belts ensuring continuous high capacity loading. With the per-boom capacity ranging from 800tph to 3,000tph, a staggering total loading capacity of 6,000tph is possible per installation.

Buhler has designed the mobile Portaload with the key criteria of reducing the environmental footprint and increasing the competitiveness of its customers. One key change to reach an environmentally sound loading installation is the complete avoidance of hydraulic systems on the loading installation. This makes it possible to significantly reduce the total power required by the loader and subsequently reduce the energy consumption per tonne.

Bühler's equipment can be used to handle — store, convey, load and unloading using mobile and stationary equipment — all free-flowing food products, as well as mealy cargo such as soya meal. The mobile loader is available in capacities from 800tph up

to 2,500tph. Its mechanical loaders and unloaders can efficiently handle the delicate product characteristics of the products and offer a clear customer advantage in terms of lower operating costs and increased efficiency due to easy operating use and with the support of the auto sink-in for the unloaders and lower-out function for the loaders, significantly decreasing the burden for the operators. Bühler is able to maintain its solid reputation in the market by actively adapting its product portfolios and setting new standards by introducing new technology.

One of the best examples of this is Bühler's mechanical ship-unloaders. At an early stage, Bühler identified that vertical mechanical conveying is not only cheaper than, for example, pneumatic conveying, but also that it ensures significantly reduced product breakage through gentle product handling. Handling and processing grains presents specific problems that Bühler's equipment can solve, and it also does so in an economical fashion, adding an additional dimension.

Bühler has a worldwide network of experts working for it, so it can ensure that customer problems are solved with the greatest care and specified for each problem.

Bühler's major clients for mobile harbour equipment are naturally the large trading and exporting facilities demanding reliable, high capacity, efficient loading and unloading equipment having low operating costs. Also, direct end users such as millers, brewers, feed plants, etc. are trusted and important customers for Bühler.

800tph SABT mobile unloader on rails.

Up-to-date technologies

Bühler is always looking for new developments, product improvements, and trying new materials. The latest development is the complete revision of the mobile loader, combining market and customer feedback and internal expert knowledge. Next to the complete avoidance of hydraulics, operating efficiency, wear, and product quality are important design criteria for Bühler's customers.

With the development of the mobile loader, Bühler thoroughly assessed the workflow and how operating personnel perform the loading procedure. Based on the assessment, the functions which are needed for the most efficient loading process have

been established — these being driving, turning, and luffing. With these three commands, the operator is able to have full cover of the vessel and can effectively load according to the loading plan.

The mobile loader has a structural design in which wear protection is a central tenet. The product flow through the mobile loader has a dictated route with a steady wear pattern throughout the loader and transfer elements. Elements which are directly impacted by the product have either been engineered in such a way that the impact of the product is reduced, or if this has not been possible, special heavy duty wear plating can be installed.

Reducing the impact of the loading on individual kernels and thus degrading the product quality is another facet of environmentally sound loading. To minimize the impact of the loading sequence on the product, special care has been taken to reduce falling heights where possible, reduce the product speed and enclose the product flow where required.

Combined with the revision of the mobile loader, the operating system has fully been upgraded to the latest market standard. The latest operating system has improved functionalities such as a touch panel directly presenting error messages, individual selection of each motor and sensor, saving precious time during loading and unloading.

A detailed picture of the installation integrated in the software where the individual sensors are situated makes it even easier to identify and optimize the operating efficiency.

Recent contracts

Bühler has received a contract to supply an 800tph mobile Portalink mechanical unloader to a customer in the Middle East, to handle Panamax-class vessels. It has also successfully installed and taken into operation a mobile Portalink on rails with a capacity of 600ph in Asia. The company has also received an order for two large mobile Portalinks on rails, with a nominal capacity of 1,200tph, capable of handling Panamax II class vessels.

Bühler: committed to sustainability,

Every day, billions of people use Bühler technologies to satisfy their basic needs for food, mobility, or communication. With its industrial process technologies and solutions, Bühler makes a significant contribution to feeding the world's population while focusing on food safety and security.

Around 65% of the wheat harvested worldwide is processed into flour in Bühler mills. The company's contribution to global production and processing of rice, pasta, chocolate, and breakfast cereals is equally substantial.

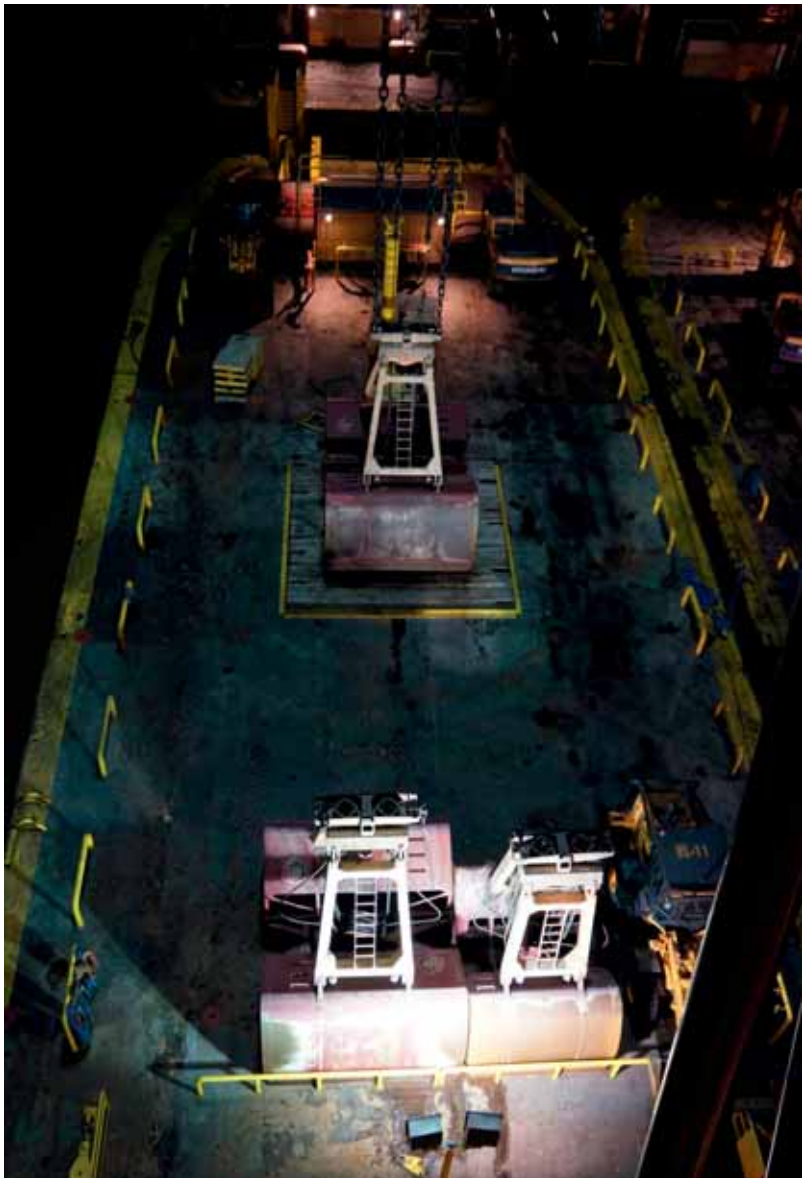
Furthermore, Bühler is a leading solution provider of die casting, wet grinding, and surface coating technologies, with a focus on applications in the automotive, optics, electronics, printing, packaging, and glass technologies. The solutions provided to these industries are characterized by high energy efficiency and sustainable mobility.

As a leading technology group, Bühler invests up to 5% of its turnover in research and development every year. Bühler is proud of its Swiss roots, with 10,600 employees at some 140 sites generating sales of CHF 2.3 billion.

As a family-owned company, Bühler feels particularly committed to sustainability.

Shedding light on mobile harbour cranes with Phoenix

Mobile harbour cranes in bulk terminals serve ocean going vessels and river barges, transloading millions of tonnes of dry bulk commodities every day. These 24 hours-a-day seven days-a-week terminals are faced with many challenges in regards to night operations. With safety being the first priority, a well-lit mobile harbour crane equipped with LED floodlights can drastically reduce the chance for accidents and help a terminal maximize efficiency, flexibility and value to its customers.



Durability matters

Many lighting challenges result from the high-vibration environment on bulk handling equipment. The constant, rapid movement of cranes has always posed a threat to traditional lighting fixtures, making maintenance a significant expense. For a terminal that faces the physical demands that dry bulk terminals experience daily, consistency and productivity are imperative. Cranes operate all day, every day, which leaves no time for unscheduled maintenance. Replacing a broken lamp involves lowering the boom, laying the crane out on the deck of the barge and keeping it out of service for up to two hours. Losses can reach several thousand dollars during this downtime.

Focus on safety

Whether it is to replace a broken lamp or repair a fixture, maintenance on port equipment is time consuming, expensive and dangerous. LED lighting is solid-state technology with no moving parts, fragile filaments, or breakable glass. Quality LEDs

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are also typically rated for 50,000 hours. For a fixture that is illuminated for 12 hours every day, that equates to over 11 years of usable life.

LED technology greatly increases safety at night on barges by eliminating periods of darkness. Traditional lighting fixtures require up to 20 minutes to warm up following an operational shutdown. Safety vests shine brighter under LED lights and in the event of an emergency situation, LED fixtures illuminate quickly so that assistance can be safely and immediately rendered.

Adam Plowman, Strategic Market Manager at Phoenix Products Company, a lighting manufacture located in Milwaukee, Wisconsin, USA, highlights how a unique bulk handling operation on the Mississippi Delta is using LED lighting. "This particular terminal made the switch to Phoenix due to the durable, well-controlled, directional nature of LED technology. Operators of barges operating in bulk terminals, report significantly fewer shadows due to the customized LED optical package." Crane operators also commented that the operational light on the barge is brighter than with traditional lighting and looks more like natural daylight. When considering a 61 yard bucket holds about 45 tonnes of bulk material, the precision of the operation is vital for an operation to be efficient, safe, and competitive. The light quality with LED has provided a huge improvement for working conditions in all circumstances including extreme weather like rain or fog. Other added benefits operators commented on were the increased visibility into the vessel hold allowing for more precise control and efficiency.

Time is valuable

Mobile harbour cranes encounter power load variations which can affect lighting on the boom of the crane. When mobile harbor cranes grab large loads a power surge can occur throughout the crane. This causes lights to shut off and creates a dangerous situation for operators and personnel on the ground. This power surge can still affect LED lighting, but with traditional lighting, crews would have to wait 15 to 20 minutes for the traditional lighting to warm-up. LED lighting, turns on instantly and reaches full brightness in less than a second, which saves time and creates a safer working environment. When a bulk terminal eliminates the warm-up time, it increases productivity by an average of five to seven cycles for every power shutdown during night operations.

The 'green' side

LED technology has become synonymous with environmental sustainability. After retrofitting its mobile harbour cranes to LED floodlights, a terminal operating along the Mississippi river reported that power consumption decreased by 5.6KW equating to more than a 70% reduction in cost and usage. When combined with the reduction in disposal of hazardous old lamps and ballasts, the impactful environmental benefit increases. Finally, the controlled optics with LED lighting helps to reduce light spill and light trespass in areas which are sensitive to light pollution.

Bulk terminals across the globe have the opportunity to improve safety and profitability by incorporating LED technology into their operations. The sooner facilities consider the options available, the sooner they can realize the benefits of increased safety, reduced maintenance, environmental stewardship and a healthier bottom line. DCi

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DCL case study: high-capacity dust-free barge loading at Port Safaga, Egypt

Dust-free loading

Port Safaga located on the Red Sea in Egypt is 53km south of Hurghada. The port is owned and operated by Egypt's Ministry of Transportation and is a vital export facility for the country's economy.

In 2012 the Ministry of Transportation concluded that the current shiploader configuration no longer met the environmental needs that were required. This, in large part, was due to the archaic telescopic loading spout with no dust collection. The result of this configuration led to the entire port being engulfed in a phosphate dust cloud.

DCL was awarded the project in 2013 to supply new load out equipment to Port Safaga. DCL's experience in shiploading — combined with the expertise of local representative, Tech Trade — guaranteed that it would be able to supply the Ministry of Transportation with the equipment that was needed to meet its goals. Tech Trade acted as the general contractor for the project and acquired an experienced crew to remove the existing loading spout and install the new equipment.

The key requirements for the project were:

- Load pulverized phosphate rock with fines at 1,000tph (metric tonnes per hour) into open ships.
- Keep new equipment weight at a minimum so that the existing mounting structure did not need to be modified.
- Maintain EPA type compliance with little to no visible dust emissions.
- The new load out equipment would need to interface with existing controls system.

To construct the load out, three pieces of equipment were custom designed and engineered for the Port Safaga application — a pivoting gimbal, in-line compact filter module and retractable loading spout.

Pivoting gimbal

The single-direction pivoting gimbal mounts below the head chute of the belt conveyor and directly above the compact filter module. The purpose of the gimbal is to provide an articulating

Removal of existing unsatisfactory loading spout.

Pre-installation assembly of compact filter module cartridges.

Compact filter module being hoisted into position.

Loading out equipment installation complete.

point between the boom and the load out equipment. The gimbal allows the load out equipment to remain vertical when the boom is luffed.

Compact filter module

The model CFM1618 in line compact filter module which was designed specifically for this project was constructed from aluminium in order to keep the overall weight of the equipment to a minimum. The compact filter module was sized at 6,000CFM (cubic feet per minute) with a 5.68:1 air/cloth ratio. Installing the compact filter module directly above the loading spout eliminated all duct work and the dust that is collected by the filter module is reintroduced back into the product flow.

Retractable loading spout

The OV66HD-45 designation refers to 'open vehicle' specific loading with a heavy duty structural steel frame drive assembly. There is 45 feet of vertical travel with an outer sleeve diameter of approximately 66". The OV66HD-45 features a three cable design that runs from three lifting pulleys through a series of transfer sheaves. Safety features of the OV66HD-45 include two over-travel limit switches and three strain switches that are located at the lifting cable ends. If the safe working load is exceeded, then an alarm will alert the operator and power will be cut from the lifting spout hoist circuit. For example, if the discharge of the spout is caught under a barge lid as it is being retracted, the additional weight of the lid would trigger the alarm.

The spout is designed to load at 1,000tph, the internal components that control the flowing column of material were sized to handle the high volume and the outer flexible sleeve was sized to limit the carrying velocities.

The OV66HD-45 is equipped with a 'Deadfall' dust suppressor at the discharge of the spout. The 'Deadfall' is a unique DCL design that allows dusty materials to be loaded into open barges and ships. The design involves no mechanical or electrical components, eliminating the need for maintenance and points of failure.

New-generation dust control agents from Instral B.V.

The storage, handling and transhipment of dry bulk raw materials are a few of the many causes that contributes to the formation of fugitive dust — a global nuisance.

Not only does dust cause discomfort, but it also poses a serious threat to public health. Furthermore the liberation of dust represents loss of valuable raw material and gives extra wear to equipment and vehicles.

Fighting the symptoms

The dry bulk sector is making a considerable effort in controlling the dust by using wind screens and other containment methods, filters, dust collectors, fog cannons and by regularly spraying water. The first three methods are similar to closing the stable door after the horse has bolted and do not target the source that generates the dust. Especially in warmer climates the latter two methods only give a temporary relieve, as evaporation of the water rapidly gives recurrence into the starting situation.

Crust forming agents

Most dry bulk raw materials are being stored for longer periods outside in stockpiles at various stages from winning the material until its ultimate destination. To prevent the wind from blowing away dust, lots of water and various crust-forming agents such as latex and paper pulp are being applied. The crust-forming agents have as disadvantage that they flush into the gutter once it starts raining and the spray cannon has to start treating the bulk pile again.

Novel product range

For decades not much efforts seems to have been spent into developing methods to keep the dust where it belongs: in the bulk pile. When companies active in the dry bulk sector wanted improvement the only answer was: 'apply more product!' Instral B.V. in Lelystad, the Netherlands, put a lot of effort into developing C-Force® INDUSTRY, a wide range of solutions that keep dust in the pile or on the ground:

The C-Force® Industry products are non-hazardous and burn ash-less. They can be applied with nozzle installations, spray cannons and even fog cannons. With the products it is possible to treat the surface of bulk piles, roads and open stockyards, raw materials on conveyor belts and open train wagons.

ADVANTAGES OF USING C-FORCE® INDUSTRY

	BENEFITS	COST REDUCTION
C-Force® INDUSTRY	Excellence in binding dust	Less material losses from wind and transport
	Water repellent or water retaining (depending on application)	Saving on water use
	Long-term performance	Lower moisture content of raw materials
	Giving a flexible, non-brittle protection layer	Lower operating costs
	Universally applicable	
	Improved relations with the work force and surrounding community	

C-FORCE® COATINGS IN COMPARISON WITH CURRENTLY USED PRODUCTS

	C-FORCE® INDUSTRY	WATER	LATEX	PAPER PULP
Dust reduction	✔✔✔	✔	✔	✔
Long-term effect	✔✔✔		✔	✔
Environmentally friendly	✔✔	✔	✔	✔
Easily to apply with conventional sprayers	✔✔	✔✔	✔	
Efficiency after rainfall	✔✔✔			
Applicable with fog cannon	✔✔✔			
Multi-purpose deployable	✔✔✔			

DIVISION HENNLICH ENGINEERING

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Stockpile coal loading spout, power plant Ledvice, Czech Republic

Stockpile loading spout, coal up to 450 mm, Kazakhstan

HENNLICH, a company with a tradition dating back to 1922, is the leading manufacturer of dust suppression technologies today. Apart from the telescopic chutes, we also supply dust collectors and fog cannons that are reliably in operation all over the world.

HENNLICH ENGINEERING DIVISION
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Washbox conveyor belt cleaner removes difficult carryback

Martin Engineering, a global supplier of conveyor belt cleaning solutions, has introduced a secondary cleaning system that removes nearly all of the carryback left on a belt, including adhesive materials and fines lodged in surface divots and valleys. The Martin® Washbox™ Cleaning System combines water spray and secondary cleaning blades in an enclosed and self-contained unit, draining residue safely away from the work area. Operators who have installed the system have drastically reduced dust and spillage from carryback, leading to a safer workplace and longer belt life with considerably less downtime.

"We design systems to eliminate nearly all carryback issues faced by every industry we serve," said Dan Marshall, Product Engineer at Martin Engineering. "After extensive before and after testing, we developed the washbox to complement our standard products in some applications to further improve the life of the belts, idlers, pulleys and cleaning blades."

In operations conveying solid material, normal belt wear can yield valleys and depressions on the belt. Dust and fines that get into these blemishes remain after passing under primary and secondary belt cleaning blades, and become dislodged by shaking from return idlers, causing excessive dust and spillage. Water makes bulk material easier to remove by softening it, keeping the cleaner blades free from buildup and extending blade life by minimizing thermal breakdown due to frictional forces.

Users report drastically reduced dust and spillage, leading to a safer workplace, longer belt life and less downtime.

Integrated system

Available in two configurations, a Dual Cleaner System and a Single Cleaner System, the units are mounted on the conveyor frame directly after the return idler to ensure belt alignment throughout the cleaning process and to allow proper time for moisture evaporation on the return trip. Passing through a powder coated steel box with top rollers, the belt is gently washed by spray bars equipped with 10 to 30 nozzles delivering 5 to 60 psi (.34 to 4.14 bar) of pressure, using 5 to 54gpm (20 to 204 L/min) of potable or non-potable water. The belt is then scraped clean by a polyurethane blade and/or a urethane squeegee blade, set on a tensioner for a tight and consistent blade-to-belt seal. Residue drains safely through an outlet funnel below the box, which can lead to a disposal unit or a settling pond/vessel for introduction of material back into the process.

Built for heavy to medium duty applications, the Dual Cleaner System is equipped with three rollers, four spray bars, two Martin® Inspection Doors and two polyurethane secondary cleaners. Recommended for use behind a primary pre-cleaner on the face of the head pulley, the colour-coded, high-performance urethane secondary cleaners can be specified for acidic or high-temperature materials. Optional tungsten carbide or stainless steel tips increase the effectiveness and durability of the blade against difficult or rocky carryback. The cleaner system can be specified from 30–60 inches (762–1,524mm) in length and 44.4 to 53 inches (1,129 to 1,350mm) in height, and fits on most conveyor frames by adding approximately 17 inches (432mm) to belt widths of 18 to 84 inches (457 to 2,133.6mm).

The Single Cleaner System houses a roller, a secondary blade and a spray bar, which are accessed by an inspection door housed on either side of the enclosure. Intended for tight-fitting spaces on light to medium duty applications, the compact unit is 15 inches (381mm) long and can be specified from 34 to 42.2 inches (864 to 1,072mm) in height. The total width of the unit can be determined by adding 17 inches (432mm) to the belt width of 18 to 48 inches (457 to 1,219mm). Recommended for use in tandem with a pre-cleaner, operators have found these units work well for both indoor and outdoor applications where walkways need to be kept free of clutter and pooling.

The system combines water spray and secondary cleaning blades in an enclosed, self-contained unit.

Operators concerned with the amount of moisture remaining on the belt have the option of adding a squeegee roller, which has proven to effectively address wet carryback. Set between top rollers, it lifts the belt slightly and 'flattens' the layer of water on the surface from an average of 50 microns in thickness to 20 microns. This allows the water to better evaporate during its return, particularly on shorter conveyors.

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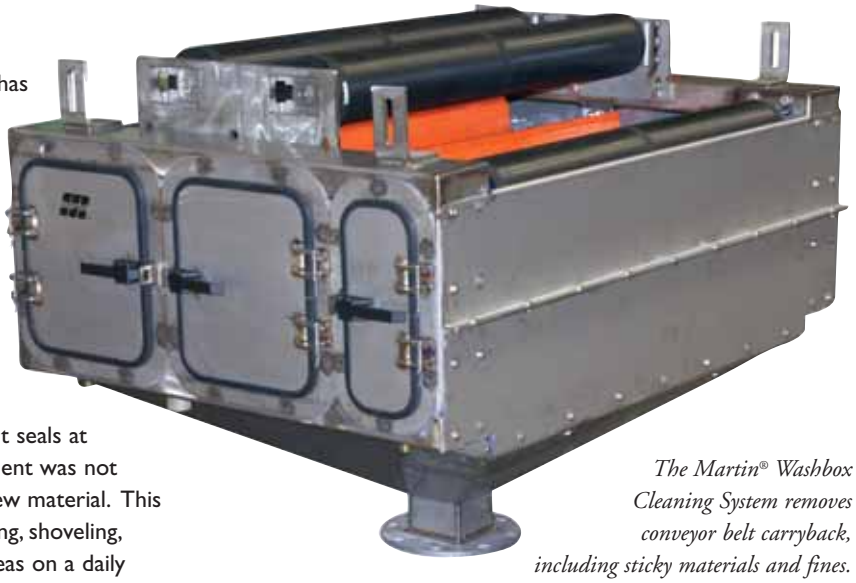
Field tested

Although the Martin Washbox Cleaning System has been proven in a variety of different industries, one of the more challenging field tests was conducted on a coal-fired energy plant located in Michigan. According to the senior plant engineer, the company had switched to PRB coal, a more brittle and dustier product than the previous coal for which the existing cleaning components had originally been intended.



The Martin® Washbox Cleaning System removes conveyor belt carryback, including sticky materials and fines.

Operators were seeing excessive dust build-up from carryback on the largest conveyor. The utility used belt scrapers, brush cleaners and dust seals at various points on the conveyors, but the equipment was not adequately addressing the carryback from the new material. This resulted in hours of removal by workers sweeping, shoveling, vacuuming and/or washing down the affected areas on a daily basis, drastically increasing the cost of operation.

Martin Engineering was invited to come up with a solution. Representatives first took benchmark dust readings and found that the 42-inch-wide belt, moving 817tph [tonnes per hour] (732 metric tph) of coal at a belt speed of 475fpm (145m/min) resulted in an estimated dry weight carryback of more than 20 tonnes of coal dust per year. By adding a primary pre-cleaner on the head pulley and a Dual Washbox Cleaner System, the utility experienced a 99% reduction in estimated carryback over the test period. As a result, carryback now accounts for less than a hardhat's worth of coal dust per day. Operators noticed that visible airborne dust had been virtually eliminated and cleanup frequency was reduced to once per week, pointing out that the unit paid for itself even before the conclusion of the test period.

"Our goal is to help facilities exceed environmental and safety workplace standards," Marshall said. "By engineering a self contained and sealed unit with simple working components that are easy to access and maintain, we have created a solution that could benefit nearly all of our bulk handling customers."

Founded in 1944, Martin Engineering is a renowned global expert in making bulk materials handling cleaner, safer and more productive. The company supplies conveyor products and flow aids around the world for a wide variety of bulk material applications, including coal, cement, aggregate, biomass, grain, pharmaceuticals, food and other materials. The firm is headquartered in Neponset, IL, offering manufacturing, sales and service from factory-owned business units in Brazil, China, France, Germany, Indonesia, Mexico, South Africa, Turkey, India and the UK, and under exclusive licence with ESS Australia.

Dust Control Technology names new president

Dust Control Technology (DCT), a global innovator in dust and odour control, has announced the appointment of a new President. Laura Stiverson has been appointed after her service to the company as General Manager for nearly five years. Her primary responsibilities will continue to revolve around new product engineering, business development and customer service. She is described by CEO Edwin Peterson as "Uniquely qualified in experience and temperament to lead the firm in exploring new markets, services and equipment designs."

Stiverson has been cited as instrumental in developing a number of the company's products, including the OdorBoss® family of machines and the very successful new Fusion™ equipment design. "Laura has been taking us in new directions for some time," Peterson observed. "And we felt it was appropriate that her energy and passion be formally recognized."

Incorporated in 2004, DCT has earned its reputation as a leading supplier of open-area dust suppression equipment, and engineers continue to develop atomized mist technologies to bring new levels of effectiveness and versatility to dust and odour management.

"It's a natural pairing of mechanical and chemical technologies," Stiverson said. "We've demonstrated that the equipment design is far more effective than commonly-used approaches to odour control, and our goal now in expanding our line of additives is to combine product efficacy with the highest level of environmental stewardship." The OdorBoss can be used with a wide range of odour control additives, precise metering of surfactants and odour suppression chemicals.

Joining the firm in 2008, Stiverson earned her undergraduate degree in biochemistry. Her educational background has been a big asset in the company's work with odour control chemistry. Currently the company's primary focus is on natural products that react on a molecular level with odour vapour, eliminating offensive smells with safe, biodegradable formulations.

"During the course of growing our dust control business, we have encountered a variety of opportunities to expand our scope," Stiverson continued. "These opportunities have largely been a result of repeated inquiries from businesses that had an unmet need within their industries," she added. "Over time, we have become more of a solutions provider, with the expertise to address a much wider range of applications. These new business segments are growing far beyond our initial expectations."

Dust Control Technology has named Laura Stiverson as President after nearly five years as General Manager.

The DB-60 Fusion features a workhorse electric dust suppression design with a 45KW generator set.

For over a decade, Dust Control Technology has manufactured atomized mist equipment for applications in recycling, demolition, waste and scrap handling, mining, slag and ash management, coal processing, landfills and other industries. Headquartered in Peoria, IL (USA), the company supplies its dust and odour control products to customers around the world. The firm continues to develop and market new equipment designs and services under the DustBoss®, OdorBoss® and KoolBoss® product lines. DCT equipment can be purchased outright or rented from an extensive fleet of dust and odour control equipment.

The OdorBoss OB-60G can be insulated and heat traced for effective operation during cold weather.

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PROTECTING OPERATING PERSONNEL AND THE ENVIRONMENT WITH FILTER SYSTEMS FROM LISTENOW.
LISTENOW filters offer a guaranteed residual dust content of less than 10mg/m³. Residual dust can be significantly reduced (less than 10mg/m³) through the use of suitable filtering devices. Depending on usage, customers can choose between an integrated filter or reverse air filter. Both types have a remarkably robust design and can transport separated dust back to the loaded material. Access to the filter inserts for maintenance is straightforward and the filter can be adjusted to suit requirements.

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Filter area: 9, 14, 18, 24 or 30m² (special sizes up to 56m²). To optimize the return of separated dust, the dedusting rate is generally adjusted so that no surface is inclined at less than 60°.

SPECIAL FEATURES

- large-size differential between loading mechanism and filter;
- return of separated dust to loaded material;
- guaranteed residual dust content of less than 10mg/standard cubic metre;
- optimized maintenance through removable top section;
- robust and solid construction
- glass-bead blasted stainless steel filter housing; laminated and painted FGR plastic filter hood;
- maintenance of filter inserts from clean gas side;
- fitted blower;
- filter control by timer relay; and optional: control of differential pressure.

EcoCrust: the next generation of dust control chemicals

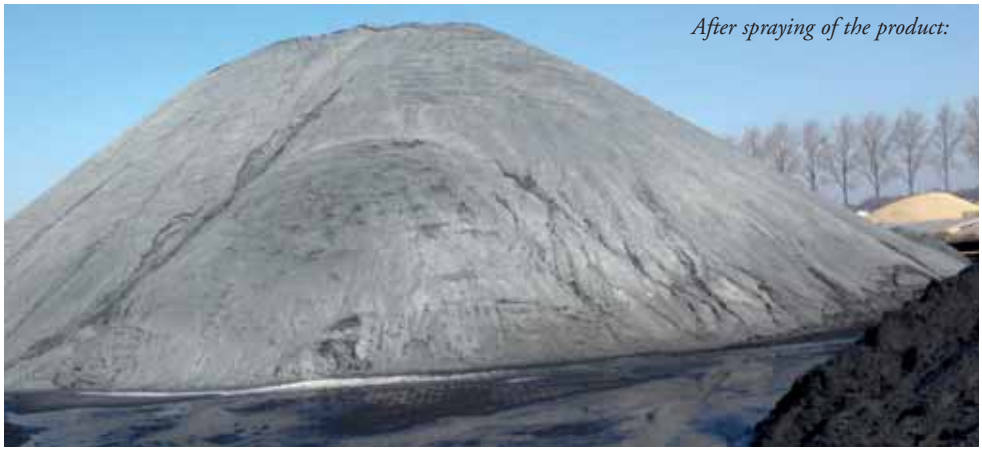
Combating dust problems has become an accepted and logical necessity in the dry bulk business. Traditionally dust is combated by spraying large amounts of water over the goods — a costly and not sustainable approach.

Wuvio Chemicals has more than ten years' experience in developing products to reduce dust emissions in a much more cost-effective way; reducing water consumption up to 80%.

These latex-based products are creating a crust on the surface of stored products and will reduce dust emissions for a period of more than 90 days.

In order to offer an even more sustainable solution, Wuvio has stepped into a joint venture with Oxbow Energy Solutions to develop a new product: EcoCrust.

Wuvio uses recycled fibres as the basis for this new dust controlling product. The other ingredients in the formula are also derived from re-used or renewable raw materials whenever possible.



After spraying of the product:

After 50 days:

All this makes this product one of the most environmentally friendly dust control agents in the market today. Combined with the excellent long term performance, it is also a highly economical way to combat dust.

Another advantage of EcoCrust over traditionally, latex-based products, is its colour. Due to the whiteness of the product, it is clear where the product is applied and where not. This is helpful for local personnel, making it clear which stockpiles need treatment and which piles are already done. But it's also a clear signal to controlling authorities and neighbours that active anti-dust measures are being taken.

In the Netherlands and Belgium, sometimes paper pulp is used. This also has a white colour, but has some huge drawbacks. It doesn't last longer than about two weeks, so it needs to be applied much more often than EcoCrust. In rainy conditions it is flushed of the stockpiles and at higher temperatures it dries out and becomes a source of dust itself. EcoCrust outperforms paper pulp, both economically and environmentally.

The product has proved itself at one of the sites of Oxbow.

Weather conditions were very diverse: heavy rains, snow, strong winds and also dry and hot days. After more than two month the product remained firmly in place and kept its colour.

Combating dangerous dust emissions: the role of the transfer point

It's no secret – dust control is important. Whether you're concerned about worker health and safety, regulations, or product quality, airborne and accumulated dust is a big concern for operations. The performance of your transfer chute can truly make a difference in dust emissions, *writes Brian Smith, Senior Design Engineer, Flexco and Matt Koca, Principal Flowpath Engineer, Flexco.*

Respiratory and Combustion

While large improvements have been made over the past half century, respiratory diseases are still a concern for cargo handling operations. Flat surfaces that contain a layer of dust can also represent slip and fall hazards for workers, and may present environmental issues, especially in waterways.

Dust contamination in waterways can be a serious problem.

Some materials — both when airborne and allowed to build up — are combustion hazards, putting everyone in the plant at risk. While airborne dust can cause a primary explosion, it may not be the greatest danger. Accumulated dust if not properly disposed of can lead to secondary explosions and fires which can be even more damaging than the initial blast. This chain reaction of explosions and fires can propagate throughout a whole facility putting everyone in danger.

Degradation and clean-up

While not the cause, dust is a symptom of material degradation. As material moves through transfer chute and degrades, the breakdown of material creates dust particles that can go airborne. For many industries, such as grain and biomass handlers, the quality of their product and more specifically the amount of damaged particles, is one factor that determines their price. So for many facilities, one added benefit of reducing dust is minimizing material degradation and thus improving their bottom line.

The most common maintenance concern involves the cost of cleanup, specifically how much manpower and time it will take to remove the dust. However, you may experience bigger problems when dust escapes and accumulates, damaging and interfering with the conveyor, electrical, and other equipment. This can not only cause major problems with conveyor components like idlers, structures, and control devices, but it can also shorten the lifespan of these pieces of equipment and produce unexpected periods of downtime for replacement. Another problematic maintenance concern occurs when more than one material is being run in one facility .The maintenance of cleaning up dust from the contamination of two materials presents additional challenges.

Combating dust with effective transfers

Speeding material up, slowing it down, changing its direction, and liner impact … all of these things create some amount of dust. As materials move through transfer points, they experience all of these things. To help achieve a low airborne particle count, CEMA suggests controlled-flow chutes which by design "are characterized by minimal material displacement, turbulence, and dust generation."

When it comes to limiting dust with controlled flow chutes, three key factors come in to play: material impact, material stream shape, and conveyor loading.

Material impact: when you look at how traditional or less complex transfer points move material, you will often see direct or near perpendicular impacts that 'splash' up against surfaces. These impacts cause materials to degrade and particulates to become airborne. The more the material breaks down, the more particulate material is produced. Keeping impacts low, or away from the perpendicular hit, will keep the material going in the desired direction, regardless of size, with less material degradation.

Materials should flow smoothly through the transfer, minimizing impact and material degradation.

Material stream shape: a condensed, controlled stream that does not fold or rollover on itself, especially when changing direction, is optimal when it comes to controlling dust. This design decreases the amount of material that has the potential to become airborne.

Conveyor loading: material can settle faster and generate less dust inside of the skirting if it is centre-loaded in a soft manner, such as with a proper spoon design. A poor spoon design can lead to material turbulence or 'boiling' when it hits the belt.

Proper spoon design is a key to centre loading.

Sealing the load zone

Dust control efforts don't end once the materials load softly onto the belt, however. It is important to note that load zone protection like impact beds are not only needed to shield the belt from heavy materials, but also to control dust in the area. Impact beds provide a consistent belt line for skirt rubber to attach and seal. Without them, the belt can sag and create gaps from which dust can leak.

One of the most important jobs of the load point is to provide a seal that prevents material spillage and controls dust — and a key component in this regard is the skirting system. An effective skirting system not only reduces spillage at the transfer point, but also seals the dust over the conveyor belt and allows it to settle, without becoming airborne.

With a properly-designed transfer point skirting is simply a dust cover for when the belts are running empty. Running the belts while empty is one of the quickest ways to generate dust. In these situations, skirting is used to help contain that dust.

Slider beds and skirt rubber should be paired with the conveyor system to allow for proper sealing in the area after impact. This total load-point solution can be the key to less material spillage, dust control, and making the area around the load point less dangerous for workers.

A holistic approach to dust control

While assessing your transfer points is a good first step in limiting the dust in your facility, a holistic approach is always recommended. Walking the conveyor and identifying where accumulations and leaks occur is still your best bet to identify not only dust issues, but any other issues present at your facility.

DSH Systems moves into the big time with very high-capacity units

DSH unit supplied with quick release fittings for rapid inter-change of different loading devices for different applications

2 dust hoppers wrapped ready for delivery.

Shiploader providing a dust-free pour.

After many years successfully supplying industry-leading dust control systems, DSH Systems Ltd has added to its mainstay markets of truck, train and storage shed loading, by moving into very high capacity ship loading units.

With its global reputation being built around the 200 to 500tph (tonnes per hour) range and having globally supplied hundreds these units into a variety of industries loading numerous types of products, DSH Systems Ltd was asked to supply a much larger unit for the sugar industry in South America.

Designing upward from its existing range models, the company manufactured and installed a DSH7 unit capable of loading sugar 1,500tph. Based on the overwhelming operational results and dust reduction achieved compared to conventional loading spouts, the same end user has now ordered a DSH8 and DSH9 unit. This takes the loading capacity up to an impressive 2,500tph and 3,000tph respectively.

These units follow on from equipment supplied into the European market for barge loading. DSH Dust suppression hoppers are already loading on a daily basis products as diverse as fertilizer, soda and palm kernel extract. The DSH units have been installed to a variety of existing ship loading units ranging from smaller mobile belt loading systems, up to major systems with long drops via telescopic spout units.

The company has not forgotten it roots and still supplies a growing number of units into the small to mid-range capacity market, but the addition of these latest high capacity systems adds another weapon to its already strong stock of dust reduction solutions.

Dust-controlled loading from Cleveland Cascades

Controlling dust emissions during loading has been a perennial challenge for the dry bulk industry. The advance in dry bulk material handling technology has had to balance the drive for ever greater efficiency and increased speed of loading on the one hand, with the increased pressure for protection from air born environmental emissions on the other hand. Dust emissions during loading are not only a health and safety issue for the workers in the port or storage and handling facility, but they are also a potential issue for neighbouring businesses or residents, as well as the local natural environment. Controlling dust emissions during loading has become an issue worldwide and while the advanced economies were the first to demand controls, the requirement is now widespread in developing economies. Most applications nowadays have a requirement to effectively control dust emissions during handling and it is no longer just the luxury of the developed economies.

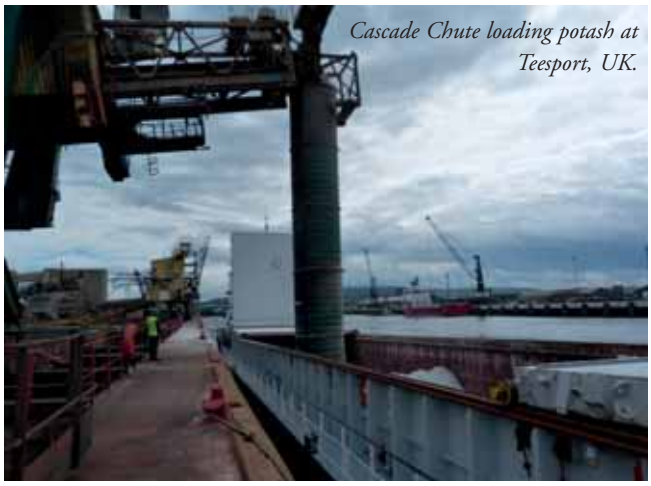
Cleveland Cascades identified this trend early and has built the company's business on world leading dust controlled loading technology. The essence of the technology is to control the flow of the dry bulk to prevent the creation of dust, rather than alternative technologies, which often focus on controlling and confining the dust once it has been created. The Cascade chute loads material through a series of oppositely inclined cones, which controls the flow at low velocity, yet high volume. During its descent, the material is supported through the full length of the chute, ensuring a soft delivery from the outlet to the material pile, for every load. It therefore arrives at the load pile at a controlled speed with minimal dust creation or material degradation.

The controlled descent of the material prevents air separating the particles and largely eliminates dust generation at source. The shape of the cone holds the dry bulk in such a way that prevents particulate separation and minimizes material degradation. The significantly reduced product velocity creates a 'mass flow'. A stream of material moving as a single mass through the chute and onto a stockpile with minimized segregation. By using this technology, dust generation is practically eliminated at source, without the need for expensive, energy-intensive and high maintenance, dust extraction and filtration systems. The Cascade system can reduce dust emission levels to as low as 5mg/m^3.

The Cascade chute is capable of handling a vast range of materials which are prone to dust during loading, but potash and alumina are good examples of materials which are both difficult materials to handle and are particularly prone to dust emissions. Cleveland Cascades has developed a strong global market position in chutes handling both materials.

The dry bulk terminal at Teesport, UK, is a dedicated distribution center for products mined from Cleveland Potash's Boulby mine. The materials arrive by train and are held in a silo storage shed before onward distribution by vessel. The terminal handles over one million tonnes per annum of potash and polyhalite, with shipments sailing to export markets around the world, as well as the home market.

For Cleveland Cascades Ltd this is where it all began. The original idea for a cascade cone loading chute, capable of controlling dust emissions during loading, was conceived here. The company was originally a division of Cleveland Potash Ltd, who diversified in to manufacturing loading chutes when they needed a high capacity loading chute which effectively controlled dust pollution. The innovative solution they conceived was the



Cascade Chute loading potash at Teesport, UK.

Cascade concept, which utilized a series of inclined cones to control the velocity and flow of the potash.

Cleveland Potash, now known as ICL UK, is the oldest customer and over the years has bought numerous chutes for a variety of applications at the mine and the port. The parent company, Israel Chemicals Ltd (ICL) is also a long-term user of Cleveland Cascades loading chutes at its Dead Sea Works operations in Israel.

The system can load up to 500 tonnes per hour through a chute which can extend to 15m in length in fully extended mode. Potash is highly corrosive, so to ensure a long service life, stainless steel fixings are used throughout and the GRP cones are protected with a 4mm UMHW PE liner.

In order to extend the operating life of one of the chutes at the port, even further beyond 24 years, the chute is about to have an upgrade, with the installation of a new shroud and carrier section.

Cleveland Cascades recently won a contract to supply REEL Alesa with an alumina ship loading chute for Ma'aden in Saudia Arabia. The chute has been designed to interface with REEL Alesa's luffing boom conveyor system.

Alumina is a fine, free flowing material which can create dust pollution if loading is uncontrolled, so the Cascade chute is an ideal solution. The controlled descent of the material through the inclined cones of the Cascade system, prevents air separating the particles and largely eliminates dust generation at source.

Alumina is also highly abrasive and requires the cones to be lined with 4mm ceramic tiles to prolong service life. With a 20m chute length, covered by a durable, retractable shroud, the port will load 1,200,000 tonnes of alumina per annum, using the chute.

Cascade Chute Loading Alumina.

AAF International – a dust collection solution case study

Case Study — Industrial Minerals Project

Location: Tanzania, Africa

Equipment: RotoClone® LVN 1000

AAF International's client is part of a global company that manufactures packaged systems, for the production of mortar and concrete.

The process involves mixing a large quantity of additives in a tank which results in dust being emitted into the environment in large quantities. The client contacted AAF International to provide a dust collection solution to ultimately supply its manufacturing facilities with a cleaner and more efficient unit.

To ensure maximum dust collection the RotoClone® LVN 1000 (in stainless steel) was recommended, this economical wet-type dust collector is a compact and efficient solution. It cleans the air by the combined action of centrifugal force and a violent inter-mixing of water and dust-laden air. The client's end customer will use AAF's RotoClone® LVN 1000 to collect dust, filter and remove all dust particles with the use of water and then manually drain the 'sludge' at the end of the production process.

AAF International's RotoClone® LVN 1000 wet-type dust collector.

Outcome:

Working in partnership with the client, AAF International was able to maximize dust collection by utilizing the high performance RotoClone® LVN. This, combined with minimal maintenance requirements, has resulted in the client placing further orders of the RotoClone® LVN for their other facilities on the African continent.

About AAF International

For more than 90 years AAF International has been providing filtration solutions for industrial processes around the globe. Throughout its rich history AAF have pioneered many of the techniques used today to control airborne dust, fume and vapour. Today the company serves all major industrial sectors including metallurgical, minerals, power and utilities, food and beverage, chemical, pulp and paper, metalworking and woodworking. Its extensive research and development programme into filters including dust collectors, cartridge collectors, wet collectors and gas scrubbers continues to extend the boundaries of filtration.

Giant mobile dust control design delivers extended coverage

The new mobile dust suppressor delivers a range of 100 metres, and up to 15,500m² of coverage area.

DustBoss has announced the introduction of its new and largest trailer-mounted dust control system, a powerful atomized mist design featuring a range of 100 metres and the ability to deliver 140,000 square feet (15,500 square metres) of coverage area. The DustBoss® DB-100 Fusion™ is powered by its own 480V/150 KW generator with a 6.8-litre John Deere Tier III flex diesel engine, all securely mounted on one of several roadworthy dual-axle trailer options with stabilizing jacks.

Designed for large open-air applications such as mines, coal handling plants and aggregate operations, the unit delivers effective particle control in a highly-mobile platform that can be positioned directly at the source of dust-generating activities, even on sites without an available power supply. The new design can even be specified with a high-lift pump for drawing water from a stationary source, such as a private pond.

"We had many discussions with customers who were interested in expanding their dust management coverage, after seeing our smaller DB-60 Fusion," commented Dust Control Technology President Laura Stiverson. "We engineered the new design to meet those needs, yet still remain highly mobile, able to be towed easily just about anywhere on a job site."

Thought to be the most powerful mobile system available to control dust in large open areas, the versatile DB-100 Fusion features a 150 gallon fuel tank, providing about 32 hours of run time without refueling. Doors are equipped with hinges and door stops for easy access, and the generator's engine compartment is fitted with sound attenuation. Day-to-day operation can typically be managed by the remotely located on/off switch outside of the enclosure. For convenience, a 120-volt receptacle for auxiliary tools and a plug-in for the battery charger and block heater are also located outside.

To achieve its 100-metre throw distance, the DB-100 employs a 60HP electric fan motor coupled with 10-90 PSI of inlet water pressure that's run through a booster pump to achieve pressures as high as 250 PSI total. Unlike industrial sprinkler systems used for dust management, which can require as much as 500GPM (1,893LPM) of water, the DB-100 Fusion uses only about 38GPM (143.8LPM) to help avoid pooling or runoff. The unit shatters the inlet stream into millions of tiny droplets in the range of 50–200 microns — an ideal size for suppressing fugitive dust particles in most cases. The device can also be customized with alternative nozzle options for specialized applications.

The standard machine is fed by a manifold of 30 nozzles that are specifically sized and positioned for the new design. The DB-100 Fusion features simple, user-defined oscillation,

The unit is powered by a 480V/150KW generator with a 6.8 litre John Deere Tier III flex diesel engine.

To achieve its 100m throw distance, the DB-100 employs a 60HP electric fan motor fed by a high-pressure booster pump.

along with adjustable elevation from –7° to 45°. It can also be outfitted with a dosing pump to accurately meter in surfactants or tackifiers to further enhance binding of dust particles. The unit can be set up to run potable water and can also be outfitted with a selection of filters to handle non-potable water sources. For applications in which the water source contains high amounts of sediment, additional external filters are available. For operation in cold climates, heaters for the enclosure and heat tracing for pipes are available as options, and each machine is equipped with multiple automatic drain valves to enhance freeze protection.

Users can easily set a custom oscillation range via the touch screen controls. The standard unit travels at a rate of 1 degree per second to provide ideal coverage, and the oscillator features a quick-release handle that allows the barrel to be repositioned in seconds, without using any tools. The touch screen on the control panel is also used to turn the fan and booster pump on and off, as well as to adjust the vertical pitch of the barrel using simple up/down arrows. When the generator is turned off, a battery backup feature automatically returns the machine to the horizontal position, which is safe for towing, before it shuts down completely.

By providing mobile power, the design requires only a water source for operation. "Our goal was to design a freestanding unit, which catered to customer needs without compromising performance, delivering easy transport and adaptability to a wide range of locations and conditions," Stiverson said.

Fire hoses and couplings are supplied and stored in easy-access tool boxes, along with a spare set of nozzles and basic tools. "We've equipped the new design as a turnkey solution," Stiverson added. "It may seem like small details, but the objective was to include everything needed for routine operation and maintenance, ultimately delivering the most positive customer experience possible."

Maintenance requirements for the new design are minimal, even though the unit carries a three-year/3,000-hour warranty on the dust suppressor and a two-year/2,000-hour warranty on the gen set. If potable water is being used, nozzles typically need to be inspected just once per year. The turntable bearing on the oscillator should be greased annually or as needed for harsh service conditions and the fan's motor and high-pressure pump should be lubricated every 10,000 hours. Like any diesel engine, the gen set should have regular inspections and changing of oil, coolant and filters.

Although the new design is typically supplied to run on standard 480 volt power, customers can specify the unit in a wide range of voltages to suit locations virtually anywhere in the world.

Dust Control Technology is a global leader in dust and odor control solutions for coal, demolition, aggregate processing, slag handling, material recycling, ports and shipping and other applications. The company's primary mission is the development and manufacture of customized equipment utilizing atomized mist technology for dust and odour suppression. All of the firm's R&D, experience and expertise is centred completely around those applications, and its staff helps customers analyse particle sizes, working environments and other factors to ensure effective performance under real-world conditions. The units are far more effective and efficient than sprinklers or manual spraying, with some customers realizing payback in less than six months. Headquartered in Peoria, IL (USA), DCT's dust and odour control units are designed and manufactured in the USA and delivered to customers around the world, with its equipment sold to users in 40 different countries on six continents to date. The equipment can be purchased outright or rented from an extensive fleet.

Combat dust. Cover your stockpile.

Dust adversely affects employee health, visibility, and adds a variety of maintenance headaches.

Reducing dust emissions at a large bulk handling operation is a requirement driven by a combination of environmental, operational, health and safety, and economic expectations.

Within the operation, dust adversely affects employee health, visibility, and adds a variety of maintenance headaches. Dust spreading through an operating area is also lost product and over time, the cost of losses can be significant. Externally, the hazards and irritation caused by fugitive dust can have a major effect on neighbours and community relations. Increasingly stringent environmental regulations add yet another layer of concern.

Finding a solution that balances all these issues while keeping your operation competitive is a complex challenge.

Many industries have tried foams, sprays and windbreaks, but while these may buy some time, they are seldom sufficient to control dust over large areas and they are ineffective for runoff. While the application of water (with or without additives) is the most common way to address dust, the amount of water used is staggering. In many regions, due to water scarcity, this isn't a sustainable solution either.

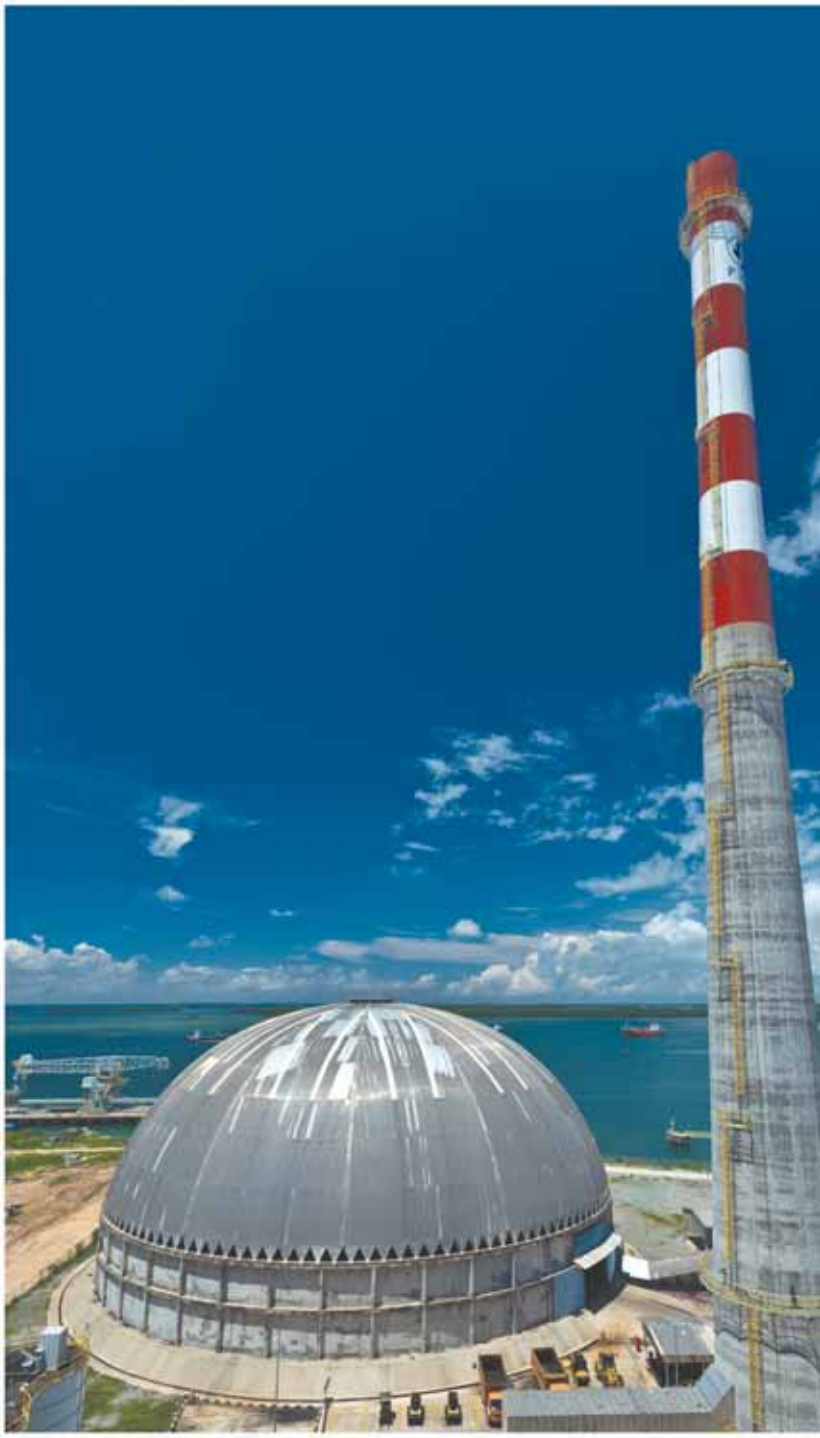
Why not cover your stockpile? Geometrica designs long-span domes and vaults that cover stockpiles, prevent runoff, contain dust and spare landscapes. Operations, employees, and neighbouring communities are protected against fugitive dust.

Geometrica has a practical solution that saves both time and money.

Geometrica's assembly process ensures a fast, safe and easy installation. With on-site expert guidance, our structures are

TABLE 1
EXAMPLES OF GEOMETRICA DOMES

LOCATION	STORAGE APPLICATION	MAX. SPAN (M)	COVERED AREA (M^2)
Cuajone, Peru	Copper Ore	105	12,300
Carthage Cement, Tunisia	Cement Additives	53	15,815
San Cristobal, Bolivia	Zinc Ore	142	15,394
Aguas Teñidas, Spain	Copper Ore	58	2,650
Pupuk Kaltim, Indonesia	Coal	81	5,153
Kampot Cement, Cambodia	Limestone	86	5,809
Ruwais Sulphur, UAE	Sulphur	134	14,100
CICE, Mexico	Urea	52	6,240
Lafarge Lichtenberg, South Africa	Limestone	113	20,057
JEA Northside, FL, USA	Pet Coke	122	23,380



DEFEAT DUST WITH A DOME.

Tread softly around Mother Nature. If your stockpile produces dust, tame it with a freestyle dome or barrel vault. Whether quayside or on a mountain, protect the surrounding environment while preserving your own stockpile from erosion and loss of fines. We'll build right over your live operations and eliminate downtime. Corrosive saltwater? No problem. Typhoon-force winds? No worries. Torturous snow loads? Never fear, we've got you covered. Build a Geometrica dome for your raw materials and the dust is history.

Geometrica®

www.geometrica.com/bulk-storage

dry, ready for immediate handling and it's not depleted.

Since 1992, Geometrica has completed installations in over 35 countries around the world.

Design and functionality are hallmarks of Geometrica. The company has delivered domes for just about every stockpile shape imaginable. Table 1 has a few examples.

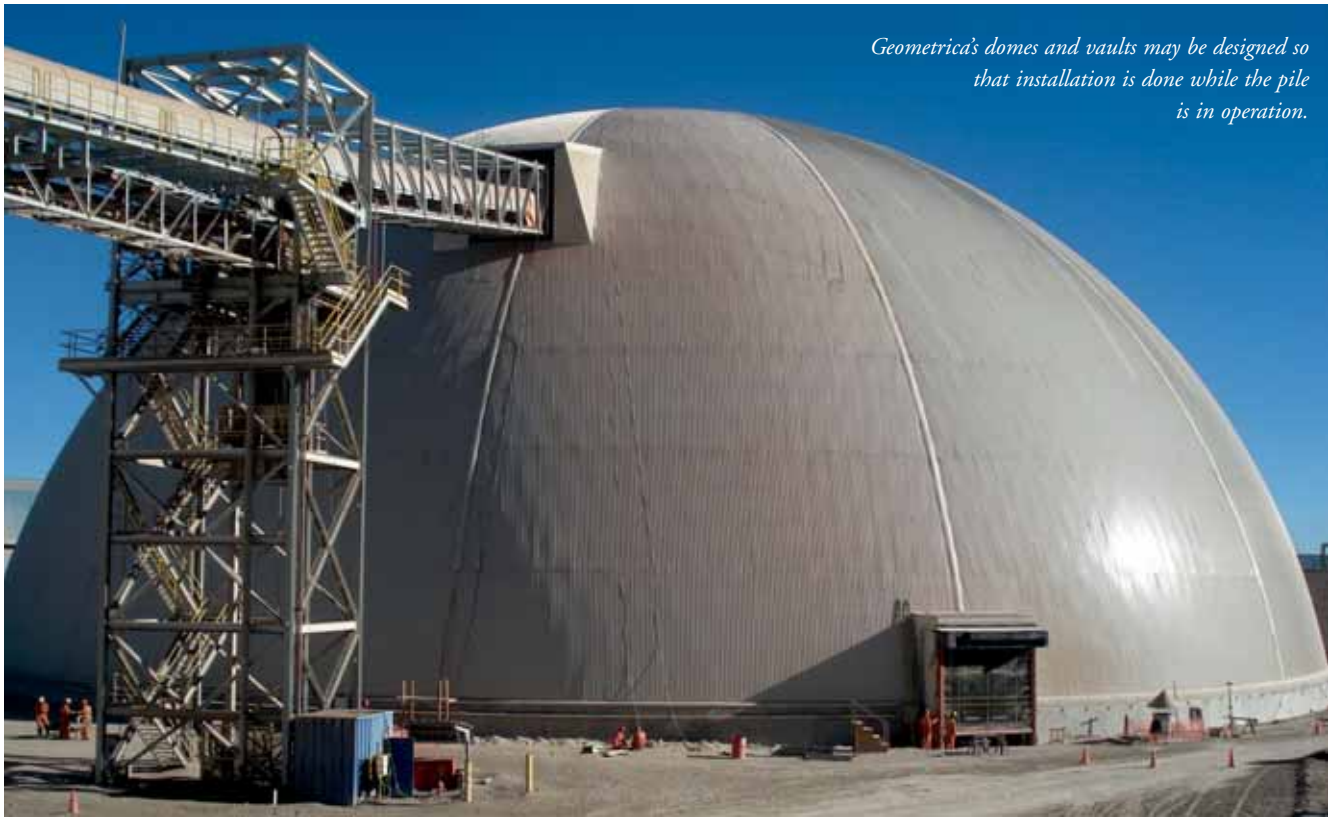
Regardless of geography or climate, Geometrica solves unique problems with endless design options. The company believes that industry can be dust-defiant, tread more softly around Mother Nature, and be a good corporate citizen — without breaking the budget — sustainably.

Geometrica's mission is to provide solutions for industries around the world.

installed with locally-sourced labor. Any crew member that has installed scaffolding, or knows basic carpentry, has the required skills. All of our structure's connections are mechanical so no welding is required.

Geometrica's domes and vaults may also be designed so that installation is done while the pile is in operation. Maximum space is achieved due to the absence of internal columns. This allows for the free flow of inventory, traffic, personnel, and equipment. The goal is to seamlessly connect bulk storage solutions with operations - and, importantly, with zero downtime.

Covering your stockpile also helps protect the bottom line. Fighting off wind, rain and other contaminants safeguards inventory from erosion and deterioration. Material is kept

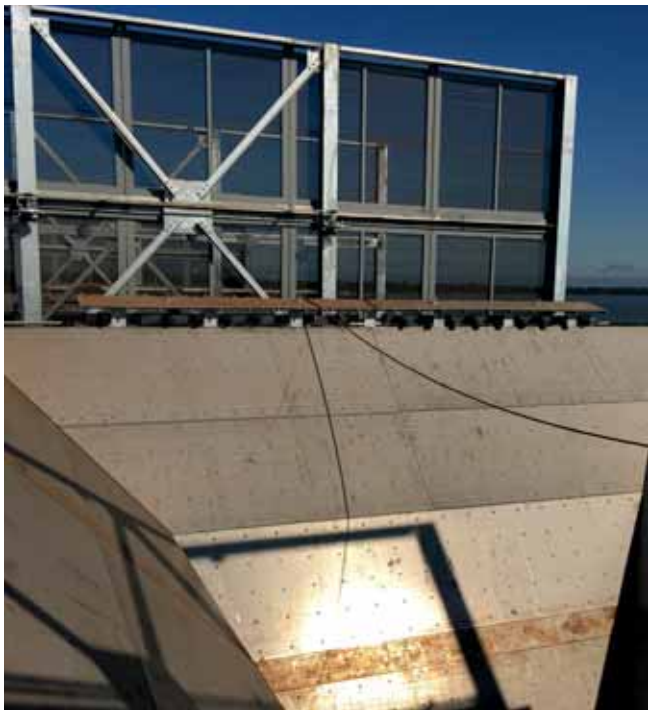


Geometrica's domes and vaults may be designed so that installation is done while the pile is in operation.

Dust dilemma: suppressing dust during hopper loading

Ports and loading terminals which handle dry cargo are often confronted with complex material transfer challenges. Unlike the movement of standard containers or cargo, dry bulk materials are transported in large volumes and must be discharged by grab-type or continuous unloaders, conveyed between various locations and sometimes stored within the port zone before being moved onward for processing via road or rail vehicles. The combination of material movement, potential for material spillage and wind makes dry bulk commodities highly prone to dust pollution, even for facilities handling low tonnages.

One of the more challenging applications during handling operations occurs when dry bulk is being loaded into a hopper. The first opportunity for dust creation occurs when large volumes of material are in freefall in open air conditions. The second opportunity can occur even in calm weather as material is dropped into the hopper below. The rush of displaced air causes air turbulence, enabling dust particles to become airborne. Dry bulk such as cement or bauxite are extremely susceptible as their powdery composition can be easily carried by wind to neighboring areas. Other bulk materials such as coal,



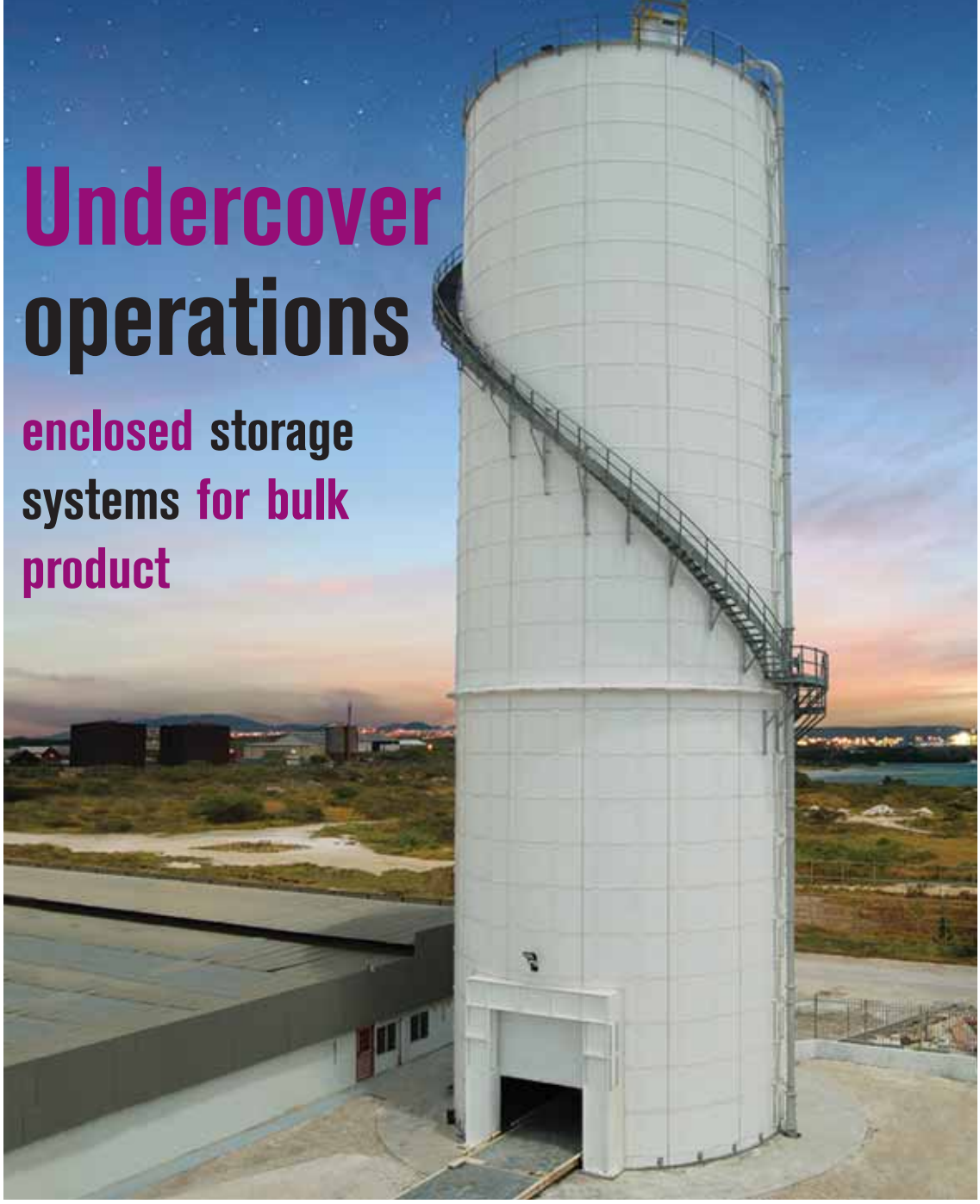
iron ore and bauxite, while not powdery, are inherently dusty and have a high proportion of fines. In some instances, particles are so lightweight, that they may stay suspended in the air for long periods of time enabling them to migrate long distances.

Dust Solutions, Inc. (DSI), a US-based manufacturer, has successfully implemented Dry Fog dust suppression systems for ports and loading terminals around the world, most recently for clients unloading iron ore, limestone, clinker, coal, and grain. Unlike dust treatment systems which require chemicals to increase the wet-ability of the material to overcome surface tension, Dry Fog systems aim to treat the material in such way that dust ceases to become airborne in the first place. DSI's systems use compressed air and plain water to create a sub-micron fog which collides and effectively agglomerates with dust particles. The agglomeration increases the particles mass enough to drop the material back down into the process. During system design, engineers work with sites to ensure that sufficient fog is created to blanket the hopper opening, preventing the dust that is normally generated by air displacement as it is dropped into the hopper from escaping into the air. As a supplemental control, DSI's DustTamer wind fence material can also be used in combination with Dry Fog to prevent wind from carrying the fog out of the hopper and enabling a longer agglomeration time.

Dry Fog is an appealing option for sites working in below freezing temperature because while fog agglomeration with dust increases the particle weight, it still lacks sufficient mass to freeze. Additionally, DSI President, Richard Posner, says that dust reduction on bulk handling applications can exceed 90% efficiency without wetting material. Unlike misting systems and chemical systems, typical moisture is said to be less than 0.05%, making the solution favourable to organizations working with materials highly sensitive to moisture. In the last year, installed Dry Fog systems have enabled cement, bauxite, and coal unloading operations to continue at several environmentally regulated sites that were in danger of being shut down due to dust emissions exceeding acceptable levels. In all cases, systems were installed without the need for shut-down time and customized to specific client needs so that operators had control to increase or decrease fog output based on material volume being unloaded.

Undercover operations

enclosed storage systems for bulk product



Tank Connection: where customer service really counts

Tank Connection is an experienced provider of dry bulk and liquid storage systems, providing a complete performance package to suit its clients' needs. It is the only company that designs, fabricates and installs all four major steel storage tank types including bolted tanks, field welded tanks, shop welded tanks and hybrid storage. Its bulk storage tank systems are recognized around the globe for quality and field performance.

Tank Connection offers a complete line of support services throughout the entire storage tank purchasing process. From prompt quote responses (in most cases, single-day turnaround), knowledgeable sales engineers, professional engineer (PE) stamped designs, on-time approval drawings, project management excellence, precision manufacturing, ISO 9001:2008 certified quality programmes, .59 EMR safety ratings and on-time shipments, to the leading and safest tank installation methods, Tank Connection partners with its clients to ensure a successful project completion. Its single goal throughout is to leverage 'Golden Rule' customer service to exceed the expectations of its clients.

Tank Connection is an ISO 9001 certified company that is also employee owned. Clients get the best of both worlds when an extensive ISO programme is implemented by employee owners. The company starts each day with a mindset and focus for excellence to deliver storage tank products and services of unmatched quality. All products are American-made in multiple facilities in the United States dedicated to the best in storage solutions. Tank Connection's focus has led it down a path to excellence in design, manufacturing and installation of high-performance bulk storage silos, and much more.

Tank Connection's service markets are worldwide, extensive and diverse including: minerals/mining, water/wastewater, power industry, dry bulk storage, food product storage, oil/gas, chemical/petrochem, fire protection, industrial liquids, municipal utilities and government/military.

Tank Connection's precision rolled, tapered panel construction is the #1 bolted tank design selected worldwide. TC Engineering is the innovative developer of RTP bolted hopper tanks for dry bulk storage applications. These tanks feature a smoothwall (no ledges) tank interior, exact manufacturing tolerances and the #1 rated powder coat process

available for bulk storage applications. Bolted RTP tanks install in one-third the time of a field welded tank and are available in sizes from 2,500ft^3 to 150,000ft^3 (70.8m^3 to 4,247.5m^3).

Tank Connection specializes in all types of 'material flow' discharge systems including functional mass flow, funnel flow, expanded flow, active/vibratory discharge and numerous configurations of fluidized hopper designs. In dry bulk storage tank applications, it can minimize and eliminate the problems of yesterday by prescribing the right storage tank system to interface with an existing or new material handling system.

Additionally, Tank Connection offers the top performance Fusion powder coating systems available for steel storage tanks. It utilizes the premier powder coat system for bolted storage tanks worldwide. Its proprietary, state-of-the-art powder coat technology is unmatched by any other bolted tank manufacturer. Tank Connection maintains two of the most extensive coating lines in the world running over 200 yards each (182.9m). These coating line systems include 14 stations, 21 stages and over 110 application processes, checks and inspections.

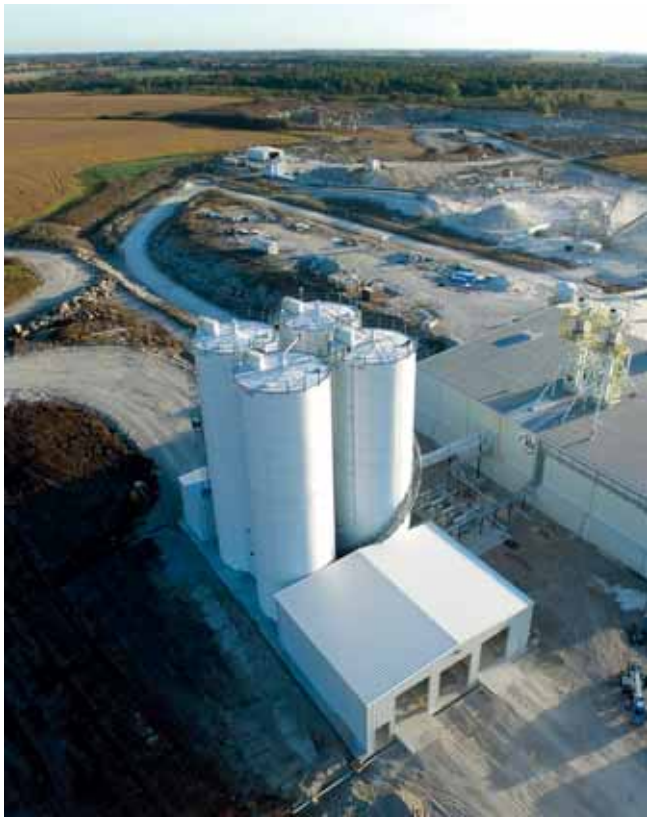
Tank Connection's proprietary synchronized jacking process

commands the highest field performance ratings in the industry for safety and quality control. This process allows it to jack the largest tanks in the world safely at grade level.

At TC, design credentials and certifications are unmatched in the industry. Common code requirements include: IBC, UBC, NFPA, FM, ASME, NSF, FDA, AWWA, ASTM, OSHA, ANSI, MSHA, ACI, API and more. The company's in-house staff of project engineers, project managers, and drafting detailing services allow it to offer all types of steel tank construction, tailored for any global location. Its client base consists of Fortune 1000 companies and the leading international engineering design firms. From 3-D modelling to SIT (system installed tanks) shipped to the jobsite with the client's components installed, TC engineering capabilities are well established as the industry leader for bulk storage applications.

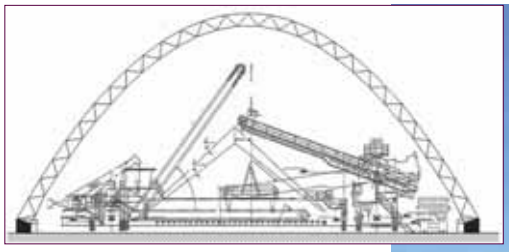
Tank Connection takes a full service approach to construction

and field services. Other services include consulting, project management, repair and auxiliaries. Its services are geared to helping its clients find success with their projects. It offers total turnkey responsibility. It provides a complete performance package including auxiliary equipment, fill and discharge equipment, foundation design and supply, weigh scales and automated controls. Tank Connection not only maintains the highest quality ratings in the industry, but its company operations are vertically integrated, which promotes its global position as a competitive price leader. Starting with steel procurement at the mill and finishing with construction services in the field, all value-added design, manufacturing, project management, system integration and field installation services are performed by its experienced personnel. The Tank Connection Affiliate Group is the 'single source' provider for all types of storage tank solutions.



Environmentally friendly bulk storage solutions from Geometrica

Geometrica's barrel vaults start at 40m and can span up to 150m.



Parabolic: *These work best for the longest spans with heavy gravity loads such as snow, and moderate wind loads. Above, parabolic profile. Right, limestone storage in Mexico.*

Geometrica builds bulk storage solutions for ring stockpiles, conical piles, longitudinal piles, and hazardous bulk materials. Column-free environments permit maximum use of space without the traditional restrictions of post and beam systems. Now mines, plants and factories can opt for a new vanguard in long span design in any terrain or climate.

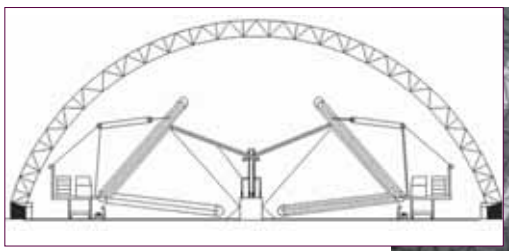
Covering bulk stockpiles

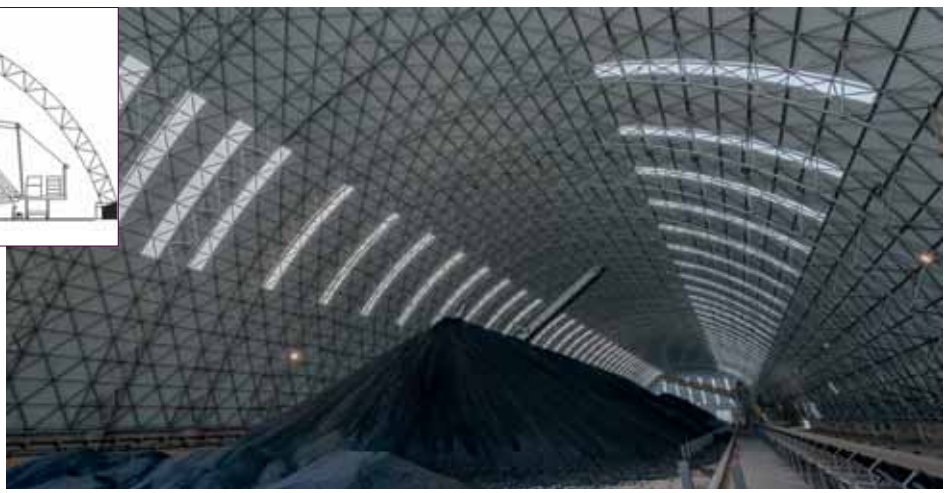
Power plants, mines, cement plants, ports and many other industries need to stock large quantities of dry bulk materials. These were traditionally left uncovered, or stored in vertical silos. But open stockpiles produce dust and contaminated runoff, and silos are small and expensive. Due to increasing environmental concerns, many organizations desiring covered storage have looked for and found a cost effective way to solve their problem: Geometrica's geodesic domes.

Long span for long piles

If mines, ports, power and cement plants around the world have one thing in common, it's the need to have enormous stockpiles of dry bulk material. And managing these stockpiles for greater sustainability, efficiency, safety and protection is an increasing challenge. Geometrica has the solution.

Geometrica's geodesic domes cover any kind of stockpile regardless of shape, material and size to provide an economic-, operations-, and planet-friendly solution.

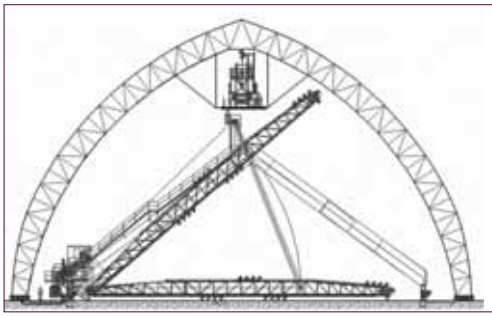




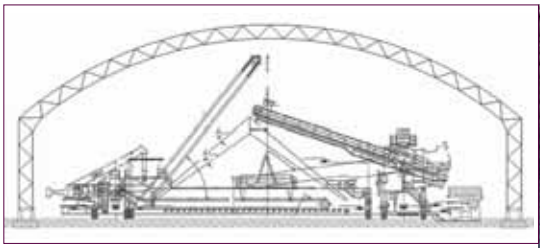
Circular: *Ideal for high wind loads. Above, circular profile. Right, coal storage in Tunisia.*

Generally, stockpiles may be classified into four categories by their material handling method and shape:

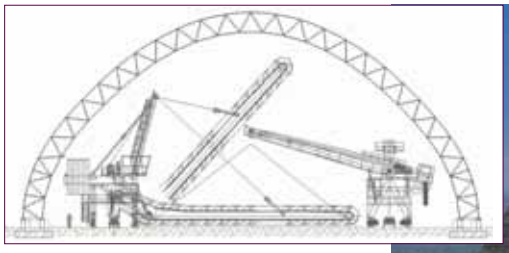
- **ring piles:** formed by automated circular stacking/ reclaiming equipment with a fixed drop;
- **conical piles:** material is dropped from the end of a fixed conveyor belt;
- **free-form pile:** irregular piles shaped with moveable conveyors or trucks and reshaped with front end loaders; and
- **longitudinal piles:** long, prismatic piles loaded with a side stacker, or tripper car from above.



Acute: *This geometry is designed to carry concentrated loads such as walkways or tripper cars, and to shed snow. Above, acute profile. Right, mineral ore storage in Peru.*



Bent: *This is selected when the footprint space is very constrained. Above, bent profile. Right, raw material storage in Chile.*



Compound curve: *Alternative to 'Bent' when space is constrained. Above, compound curve profile. Right, coal and limestone storage in Mexico.*

For this article, the focus is on the most common shape to store a large volume of bulk material — longitudinal piles.

Vaults for prismatic piles

Barrel vaults enclose long, prismatic piles and provide clearance for the equipment that stacks and reclaims the pile. Piles are typically formed with a side stacker or an overhead tripper conveyor, and reclaimed with scraper or front-end loader.

Geometrica offers barrel vaults that suit virtually any operational condition. To fit the specific site requirements and maximize storage volume, the company can design parabolic, circular, acute, bent and compound curve profile structures.

Easy and quick installation

Geometrica's assembly process ensures a fast, safe and easy installation at every job site. With on-site expert guidance, Geometrica's structures are installed with locally-sourced labour. All of the structure's connections are mechanical so, no welding is required.

To build the vault, work usually starts near the centre. Half arches are pre-assembled on the ground, then lifted with cranes and joined at the apex to make one rib. Additional ribs are added, and joined (or 'stitched') together. This process is repeated and continued towards each end. When the main section is complete, ends are then built and lifted into position, if required. Cladding is added and the structure is complete.

Structures may be designed so that installation is done while the pile is in operation. Geometrica's goal is to seamlessly

Half arches are pre-assembled on a project in Tunisia.

Half arches are joined together to form a rib.

connect bulk storage solutions with operations — and, importantly, with zero downtime.

Hazardous materials

Ensuring bulk materials maintain consistent properties over time without varying chemical composition is one challenge. Storing corrosive bulk materials such as coal, wood chips, urea, fertilizer, sulphur and other sensitive stockpiles, present even more challenges. These may include corrosive attack on a structure's metallic components or, because of combustibility, present a high explosion risk.

Geometrica's barrel vaults are the answer to a host of challenges. There simply is no substitute for a structure custom designed to protect raw material from the elements — and the environment from the stockpile.

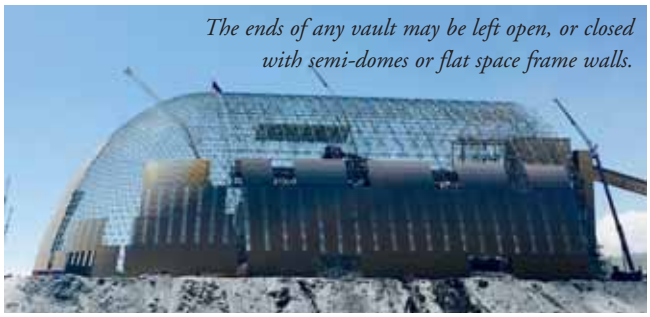
Geometrica tames hazardous atmospheres with a combination of corrosion-resistant materials suited for a particular site and application. For instance, steel tubes are always galvanized, and may be powder-coated over the galvanizing. Vaults may also be fabricated with aluminium tubes. And interior cladding may also be added to the structure. For the most aggressive interior environments, fibre-reinforced polymer cladding can be applied to help control combustible coal dust or corrosive stockpiles such as urea or fertilizer.

The ends of any vault may be left open, or closed with semi-domes or flat space frame walls

Planet-friendly solutions

Geometrica specializes in the design and installation of long span storage solutions that help stockpile operators tread more softly around Mother Nature. Efficiency, economy and environmental responsibility are hallmarks of its designs. By enclosing a stockpile, dust is contained and runoff is eliminated.

Geometrica believes that industry and nature can coexist on some of the largest scales imaginable. Regardless of geography or climate, Geometrica designs domes that deliver both business- and eco-friendly solutions.



The ends of any vault may be left open, or closed with semi-domes or flat space frame walls.

Aluminium structure with internal cladding protects the stock and the environment from each other.

ESI Eurosilo case studies: Yara Fertilizer plant upgrade, Oman petcoke storage

ESI Eurosilo was commissioned by Yara to build a new 20,000m³ calcium nitrate Eurosilo, as part of an upgrade programme at its fertilizer plant at the Porsgrunn site in Norway.

A Eurosilo from ESI Eurosilo combines enclosed storage with a choice of ingenious reclaim mechanisms, designed to enable reclamation of even such sticky bulk solids as FGD gypsum. With over 40 years of experience, ESI Eurosilo has now built over 135 units around the world. Two recent examples are detailed below.

Yara expands fertilizer capacity

As a result of the bamboo growth strategy of producer Yara, the fertilizer plant at the Yara Porsgrunn site in Norway is being upgraded to expand its production capacity. Part of the upgrade programme is a new 20,000m³ calcium nitrate Eurosilo.

This new silo is needed to increase the on-site storage capacity of fertilizer or calcium nitrate (CN). Yara finally came to select ESI Eurosilo as a partner due to its expertise, the technological advanced system for fertilizer storage and the ability to execute the project.

Comparing to Yara's existing silos, the feeding and discharge can be handled more accurately, offering an uninterrupted process that is fully controlled by the automated auger system. This results in increased productivity and cost savings.

The project was awarded to ESI Eurosilo at the beginning of 2016 and the project is now in the execution phase. The project is executed and monitored in close co-operation with Yara. At this moment the silo foundation is ready and the silo mechanism is in the final stages of production.

Eurosilos for petcoke in Oman

Recently Larsen & Toubro assigned ESI Eurosilo to design and deliver two Eurosilos that will serve as a logistic link between production and shipping at the Orpic refinery in Sohar, Oman. The proven performance in coal storage made Eurosilo the best option for green petroleum coke (petcoke) storage and handling.

Orpic is one of Oman's largest and most rapidly growing businesses in the Middle East oil industry.

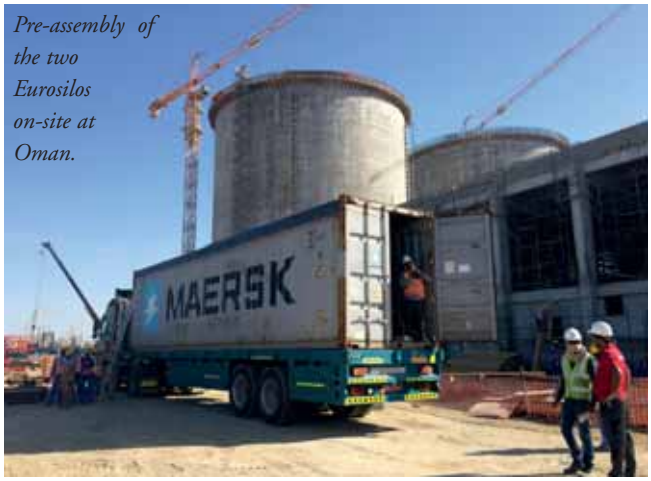
The remarkable integration of refinery and plant operations, together with ambitious growth plans, has positioned Orpic as one of the industry's most forward-thinking companies.

Following the strong commitment to safety and sustainability of Orpic, the contractor Larsen & Toubro, chose the Eurosilo system for the storage of green petcoke. Also the very limited space was decisive. Two silos of 42,000m³ each, will streamline the logistic flow between the continuous production of green petcoke and the periodic loading of transport ships at the nearby port. Therefore the filling rate of the silos amounts up to 80tph (tonnes per hour), while the reclaim amounts up to 1,040tph. The 3D impression shows the positioning of the silos including four truck loading lanes. At the moment the concrete silos have been slip formed. The equipment is being pre-assembled on site.

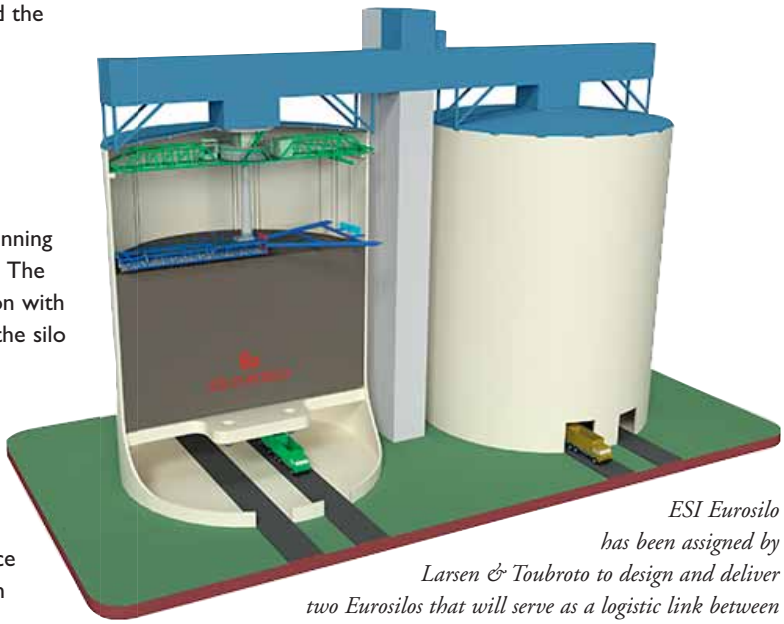
Eurosilo benefits

The main criteria to select a Eurosilo storage system are:

- minimum footprint;
- no dust emission;
- no segregation;
- well proven fire protection system; and
- high degree of automation.



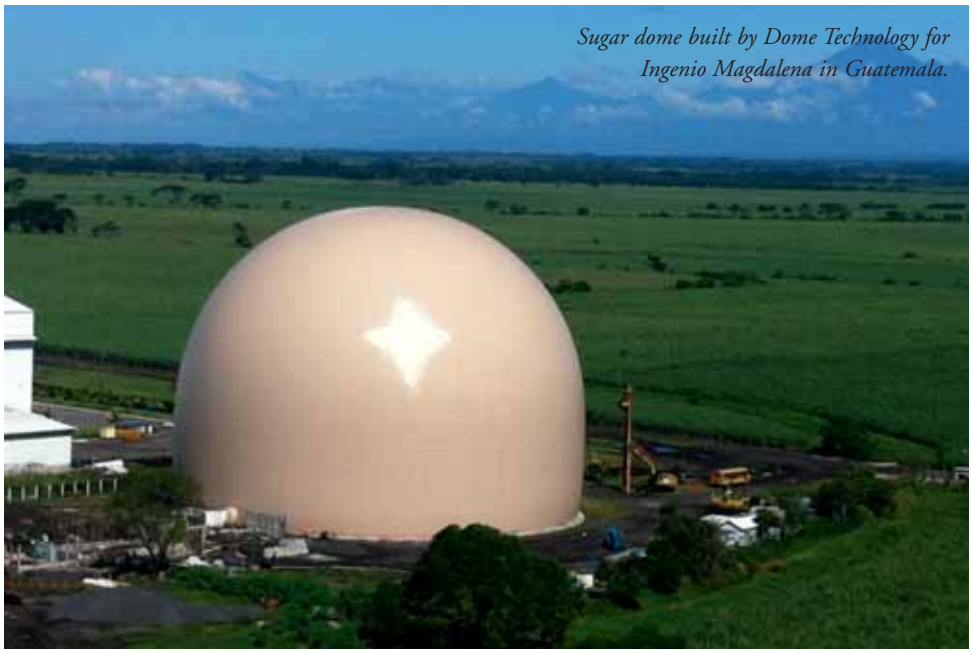
Pre-assembly of the two Eurosilos on-site at Oman.



ESI Eurosilo has been assigned by Larsen & Toubro to design and deliver two Eurosilos that will serve as a logistic link between production and shipping at the Orpic refinery in Sohar, Oman.

The big three: domes, silos, and flat storage

Three bulk-storage options dominate the market today: domes, silos, and flat storage (warehouses). By understanding the qualities of each, customers can make informed decisions about which option is best for them.



Sugar dome built by Dome Technology for Ingenio Magdalena in Guatemala.

Foundations

- **Domes:** traditional bulk storage often requires expensive deep-foundation systems based on the amount of weight the structure will hold. But a dome's strength and geometry provide a tolerance for differential settlement. That quality combined with geotechnical engineering and site analysis ensures proper foundation performance. In contrast to a flat storage, the dome is continuously supported by the ring foundation; as a result, some differential settlement doesn't adversely affect the structure, where some differential settlement in flat storage is generally not acceptable. Customers can save millions as the need for deep foundations may be reduced or eliminated based on the ability to accommodate some global and differential settlement.
- **A silo** often requires a deep foundation. A slender structure towering 120 feet with a base just 40 feet in diameter will naturally demonstrate some instability, and any movement at the base translates into large movements at the top.
- **Flat storage** is comprised of traditional, but disparate, building materials — often a wall of concrete topped with a wood or steel structure. Because flat storage is constructed of different materials, any differential settlement will cause the materials to separate from each other. A deep foundation is necessary unless the structure is built on firm ground, an uncommon benefit since many warehouses are constructed near rivers or by the sea.

Space requirements and storage ability

- **Domes** store a large volume in a smaller footprint, stacking product deeper and taking up less property at the site. While some customers require three to five warehouses to store product, one dome will be likely to accommodate the same amount of material in one structure. The double curvature of a dome provides strength at all points of the structure, even near the apex. The entire interior of a dome, then, can be used to contain product, so a dome will store more than a silo of similar diameter and height, especially for products with a low angle of repose like cement and fly ash. In essence, the greater quantity a customer wants to store, the more competitively priced a dome will be.
- The space requirements of a **silo** are similar to a dome, and when customers are storing a large volume of product, it is common for a bank of silos to be constructed very close to one another. A silo can also be built quite tall; a 3:1 height-to-diameter ratio is typical. However, a traditional conical roof cannot support product, so the entire interior cannot be used for storage. Silos can be advantageous when a customer is storing different types of product with low tonnage — for instance, a plant storing four different types of product totalling 20,000 tonnes. Four small silos or bins storing 5,000 tonnes each would work better than a single dome due to their ability to keep products separate, and this is the case for any company storing small quantities that will be mixed or blended.
- **Flat storage** in general requires a larger footprint since product is usually stacked a maximum of 20 to 30 metres deep. Customers can expect a warehouse to utilize 100% to 150% more area than a dome or silo holding a similar amount of product. For customers storing multiple types of product needing strict separation in bunkers, flat storage may be a good option. The space within flat storage can be easily divided so different products are kept distinct. This is often the choice for fertilizer companies, though a low-profile dome often competes with flat storage.

Cost savings

- For customers planning to store more than 10,000 tonnes, **domes** beat silos budget- and space-wise. Domes are built with locally available concrete and rebar, reducing transportation costs for materials. The dome's double curvature requires fewer construction materials, and there's significantly less waste with a model utilizing shotcrete, sprayed-on insulation, and an airform that remains in place indefinitely. These qualities yield cost savings for customers and benefit communities too.
- When customers plan to store less than 10,000 tonnes, a **silo** will likely be an economical option due to its small size.
- A **flat storage** that will house small quantities of multiple products is difficult to compete with in price, especially if the product will be reclaimed by a front-end loader. But if the product is homogenous and can be stacked to a workable depth, the dome is generally a more economical option.

For these reasons and others, domes are often selected for the storage of bulk materials, and are available from companies including Dome Technology.

Slipform Engineering: safety, quality and reliability in high-rise structures

Slipforming is a construction method which enables skilled specialists to create a wide range of structures, from bridges and towers to roadways, with great speed and uniformity.

The technique involves concrete and rebar being placed into a continuously moving form. It is used for high rise and structures with a large footprint, such as building lift and stair cores, chimneys, silos and bunkers to name a few, and has obvious uses in the bulk industry. The technique makes a virtue of the quick-setting properties of concrete, striking a balance between this and its workability — vibrating the form as the concrete is put in place. The result is a continuous, cast-in-place structure with no joints.

The company Slipform Engineering is the UK's only design and build contractor specializing in projects using slipforming construction methods. This competitive advantage allows it to add great value to construction projects of all kinds, across multiple industry sectors. And by employing safe and economical methods of working, efficiencies are passed onto clients.

A big advantage that Slipform Engineering can offer clients, aside from the high speed of working, is that there is much less need for a crane in projects, as formwork is lifted by hydraulic jacks. The quantity of scaffolding and work platforms is also optimized, as the slipform work system pre-supposes the use of its own platforms.

The company uses the following bespoke features in its projects:

- pre-installed extendable trailing deck;
- designated walkways and enclosed external slipform rig perimeter provides a solid barrier solution; and
- novel top deck construction.

Its service also includes as standard: a manager for each individual element of a construction project; design which addresses the individual details of each project; help to remove the risk of falling objects from the rig, and external penetration of cladding; and an hourly advanced mapping technique provides clients with a real-time update of the construction date of their structure.

Current work at the Port of Tyne biomass storage and rail loading

Slipform Engineering's biggest contract to date, worth £5 million, commenced on 6 June 2016 at the UK's Port of Tyne biomass storage and rail loading facility. One rail silo has already been successfully created using slipforming methods, with specialists working 24/7 to complete the structure within one week. Work has also begun on three much larger silos for the storage of biomass fuel.

The specialist slipforming contractor is currently working on a project for Spencer Group for the design and build of wood pellet facilities at the Port of Tyne. The facilities will handle up to 1.8 million tonnes of wood pellets every year, offering to meet the full requirements of Lynemouth Power Station in the

conversion to biomass. Slipform Engineering will be assisting Spencer Group with the construction of storage silos, delivering enhanced quality and safety performance.

Previous work at the Port of Tyne

In 2009, Slipform Engineering completed a world-first project at the Port of Tyne. Its specialists constructed a 30-metre-high rail loading silo capable of storing 2,000m^3 of biomass pellets. This and subsequent projects have given the company an industry-leading understanding of biomass process engineering and the critical issues associated with handling a fuel of this type.

Drax Rail Unloading and Storage (2010)

The Drax rail unloading and storage facility was constructed with minimal disruption to the existing petcoke and coal delivery lines supplying the power station. Slipform Engineering constructed the 35-metre × 6-metre cofferdam for the subterranean biomass train unloading facility within three metres of the live petcoke delivery line. This required meticulous and innovative design and programming to maintain the operational capacity of the line at all times.

The company's specialists also created two concrete bulk storage silos, each measuring 15 metres high and 30 metres

in diameter and capable of holding 24,000m³ of biomass wood pellets. These were cast in 60-hour time slots and were fitted with a steel roof and explosion relief panels. The total value of the project was £18 million.

Port of Hull – biomass rail loading (2013)

In this contract, Slipform Engineering provided a biomass fuel import, road unloading and train loading facilities. For the construction of a 42-metre-high rail loading silo, construction specialists had to overcome a two-week delay in the four-week contract programme. This was achieved by working 24/7 from build, allowing assembly to be completed in four 12-hour shifts. The silo was completed with a diameter tolerance of +-10mm to allow the cone to drop freely onto the internal shelf.

Since the flagship, industry-first project at the Port of Tyne was completed in 2010, Slipform Engineering has returned to construct four silos of equal or larger size, storing a combined

capacity of just over 75,000m³ of biomass pellets.

Slipform Engineering's management team has a combined background of 30 years with the company, comprising a wealth of knowledge that helps clients to create the most complex and difficult structures available. As managing director Eamon Hanley said: "Its all about providing a high quality product for our clients within a system that allows our employees to work safely — and feel safe — at any height.

"Our system has been designed around safety, quality and efficiency."

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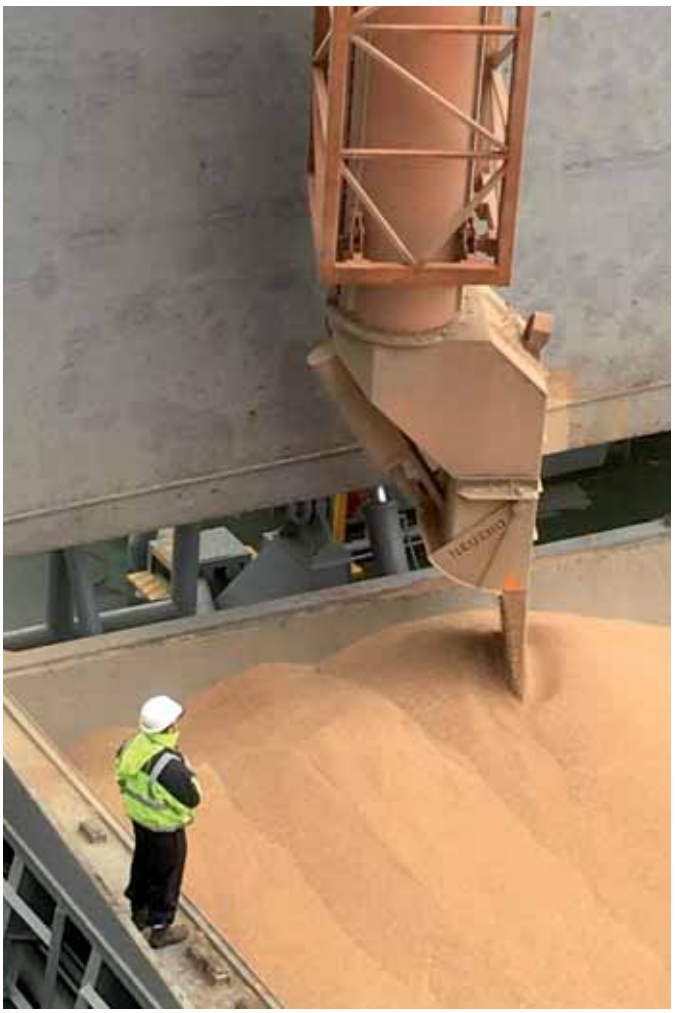





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