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ISSUE NO. 232 FEBRUARY 2020

FEATURES

- Global Coal Trades
- Covered Storage
- Coal Terminals
- Coal Handling Equipment
- Offshore Stevedoring & Transshipment

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MAIN FEATURES

MAX LOAD ON THE GROUP	36.000 kg
TRACTION RATIO	1 : 163
MAX TRACTION OUTPUT PEAK TORQUE	2x45.000 Nm
MAX SPEED	4 km/h
ELECTRIC TRACTION MOTOR	2x25 kW 400V AC
ELECTROMAGNETIC PARKING BRAKE	2x200 Nm
ELECTRIC STEERING MOTOR	2x4 kW 400V AC
STEERING GEARBOX RATIO	1 : 178
PINION/CROWN RATIO	1:8.57
TOTAL STEERING RATIO	1 : 1526
MAX STEERING OUTPUT PEAK TORQUE	2x5.000 Nm
TIRE	Pneumatic 16.00-25
TILTING ANGLE	±6°
LIFTING CYLINDER	Bore Ø140mm. Rod Ø90mm
STROKE OF LIFTING CYLINDER	400mm
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Twitter: twitter.com/drycargomag
ISSN 1466-3643
Insta: www.instagram.com/drycargointernational

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featuring...

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Dry bulk trade support wobbles

Although some signs of additional volumes are visible, growth in commodity imports into many countries is likely to be inhibited during 2020 by a range of general and specific factors. The coronavirus impact is a prominent uncertainty. Global seaborne dry bulk trade could experience another period of slow or minimal advance.

Towards the end of last month, an updated forecast by the International Monetary Fund suggested the possibility of strengthening economic activity ahead. World GDP is expected to grow by 3.3% in 2020, compared with a weak 2.9% in 2019. However, almost the entire improvement is seen as originating in a few emerging economies — India, Russia, Brazil, Mexico and Saudi Arabia.

Grain & soya

Prospects for grain trade are improving. The latest International Grains Council report revised upwards the forecast for world trade in wheat, corn and other coarse grains, during crop year 2019/20 ending June 2020. A total of 377mt (million tonnes) is now predicted, 13mt or 4% above the previous year's volume. Importing countries which are expected to show large increases include Bangladesh, Colombia, Korea, Mexico, Morocco and Turkey, partly offset by lower European Union purchases.

In the soya sector, an increase is also envisaged. US Department of Agriculture calculations suggest that global soyabeans and meal trade could be 2% higher at 213mt in marketing year 2019/20 ending September. Increased imports into the EU, and additional volumes into China and other Asian countries are foreseen.

Iron ore

Steel production figures now available for the entire 2019 year emphasize contrasting patterns among raw materials importing countries. Data compiled by the World Steel Association shows crude steel output rising by 76mt (8%) in China, reaching 996mt. In India there was a 2% increase to 111mt.

Other significant iron ore and coking coal importers recorded lower volumes. South Korea's crude steel production was 1% lower, at 71mt. Japan, Taiwan and the EU all saw 5% decreases, to 99mt, 22mt and 159mt respectively. Currently signs point to limited potential for increased production during 2020 in Asian countries and also in Europe, suggesting that raw materials import demand also will be constrained.

Coal

At the end of last year the International Energy Agency's new annual coal report emphasized that "coal still fuels India's robust economic growth". Although power generation in India from renewable energy sources is forecast to expand strongly, additional power from coal-fired plants will be needed. This sector is forecast to expand its contribution by 4.6% annually between 2018 and 2024.

How much of India's extra generation is derived from imported coal supplies remains unclear. Envisaging substantial growth in imports into India supports forecasts of further growth in world seaborne coal trade. A positive view of India's purchases over the next few years is based on consumption increases outpacing rising coal output from domestic mines. If this expectation proves correct, it is likely to provide a major contribution to preventing or delaying global coal trade weakness.

Minor bulks

Steel products (coil, plate, sheet and other items) movements around the world are one of the biggest minor bulk elements. Provisional estimates for 2019 show a 3–4% reduction in seaborne shipments to about 320mt in 2019. China's exports were a notably weaker part, falling by 7% to 64.3mt, mostly but not all seaborne.

Bulk carrier fleet

The world bulk carrier fleet experienced a much larger influx of new capacity last year. as shown by table 2. Tonnage of bulk carrier newbuilding deliveries rose strongly in 2019, by 44%, to 40.9 million deadweight tonnes. Almost half was comprised of large ships exceeding 100,000dwt. These included numerous new ore carriers of 300,000dwt and larger, many of which are replacements for old ships being scrapped.

TABLE 1: KEY ASIAN SEABORNE COKING COAL IMPORTERS (MILLION TONNES)

	2014	2015	2016	2017	2018	2019*
Japan	74.1	70.6	74.0	71.9	69.5	68.0
South Korea	29.9	32.5	32.0	32.2	31.2	30.5
Taiwan	10.9	10.8	10.5	11.1	11.2	10.5
China	62.3	48.0	59.3	69.9	64.0	69.0
India	47.1	50.6	51.4	50.3	57.0	61.0
Total of above	**224.3**	**212.5**	**227.2**	**235.4**	**232.9**	**239.0**

source: various & BSA 2019 estimates * *estimate*

TABLE 2: BULK CARRIER NEWBUILDING DELIVERIES (MILLION DEADWEIGHT TONNES)

	2014	2015	2016	2017	2018	2019*
Handysize (10-39,999 dwt)	5.4	6.5	4.6	3.5	3.0	2.9
Handymax (40-64,999 dwt)	11.4	15.9	13.2	10.8	5.6	8.1
Panamax (65-99,999 dw)t	12.8	9.9	9.4	8.9	5.6	11.1
Capesize (100,000 dwt and over)	18.7	16.9	20.0	15.3	14.3	18.8
Total	**48.3**	**49.2**	**47.2**	**38.5**	**28.5**	**40.9**
% change from previous year		1.9	-4.1	-18.4	-26.0	43.5

source: Clarksons Research & BSA estimates for 2019 * *estimate*

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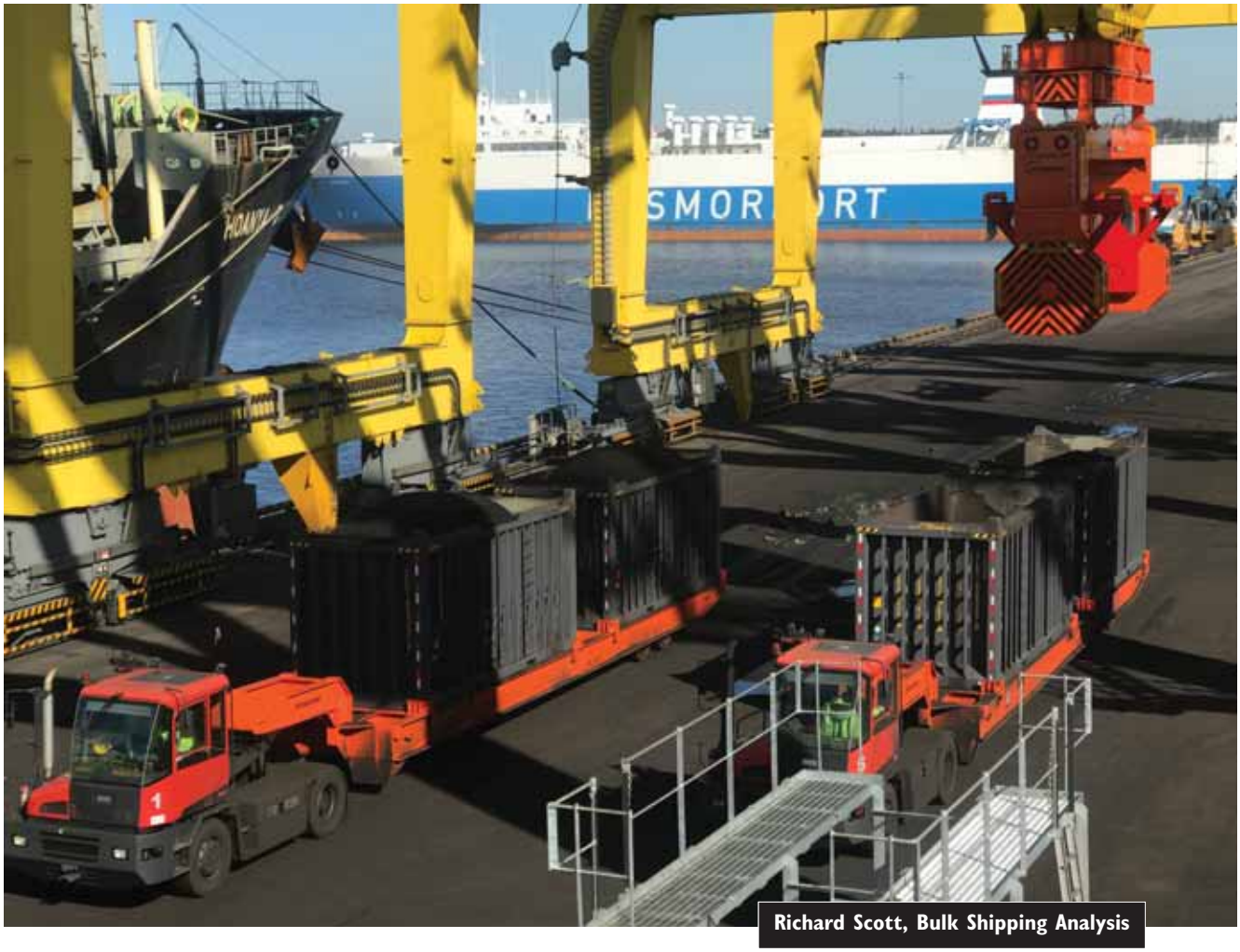
Upwards trend in coal trade sustained



Richard Scott, Bulk Shipping Analysis

Although optimism about longer term prospects for global coal trade is often seen as dubious, the upwards trend continues. Several exporters and importers saw positive changes last year when the world total increased, while signs point to possible extended growth in 2020. Looking further ahead, there are signs that sustained pressure to keep reducing fossil fuel use ultimately will weaken trade movements.

Early estimates for world seaborne coal trade in 2019 may need revision. A combination of firm data and guesses points to a sizeable increase, compared with the previous twelve months, of perhaps around 30mt (million tonnes.) Among buyers, a European Union reduction was more than offset by higher volumes into China, India and some smaller Asian importing countries.

Over the past three years substantial growth in the annual global total was seen, following a downturn. But despite this revived performance, and a possible rise this year, some of the main elements are surrounded by great uncertainty. Negative influences may result in flat or lower annual volumes. Political influences — the timing and impact of which is hard to predict — reflecting environmental preferences in some of the main importing countries, are likely to restrain and potentially reverse the advance.

Shaky economic supports

During the past twelve months the economic activity background for energy consumption and coal use was softer, and seems unlikely to strengthen much in 2020. Global growth in gross domestic product decelerated again to a subdued rate last year. Within the period ahead GDP performance may see only a small improvement, and the recent emergence of coronavirus has added to doubts about an upturn becoming firmly established.

Among the principal countries only Japan achieved stronger economic output growth last year. Slackening performances were seen in the USA, European Union and China. Recent forecasts have suggested that any overall acceleration in the current year probably will be minimal. The partial agreement on trade between the USA and China may assist in avoiding deterioration.

Updated forecasts were published by

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the International Monetary Fund a month ago. These were characterized as "tentative stabilization, sluggish recovery?" emphasizing doubts about potential for an upturn. World GDP growth is expected to strengthen by under half a percentage point to 3.3% in 2020. Most of this expected improvement is concentrated in India, Russia, Brazil, Mexico, Saudi Arabia and some smaller economies, and thus appears finely balanced.

The direct impact of slower economic growth, on energy usage and coal consumption, in the recent past has been clearly observable in India where the slowdown affected demand for the output of coal consuming industries. Electricity generation and steel production were affected, with expansion dampened. In Europe too, weak economic progress has added to restraints on some industries' activities.

Links with economic and commercial trends are still influential. But political decisions, coupled with environmental pressures which these largely reflect, have become a greater determinant of coal trade. In numerous countries the increasing intensity of government measures, designed to reduce carbon emissions and cut air pollution, appears set to remain at the forefront as one of the principal, if not the dominant, factor shaping coal import demand.

Trade expansion continues

Last year was the third period of a resumed upwards trend in global coal trade, after two years when there was a large decline and then flattening. But the 2019 growth rate appears to have slowed to below 3% following annual increases of over 5% in 2017 and 2018. Both steam and coking coal sectors evidently saw decelerations in the past twelve months.

While analysts agree that there was growth last year, estimates of the scale of expansion vary. Calculations by the Australian Government Department of Industry, Innovation and Science (AGDIIS), published in late December and summarized in the accompanying table, show a 5% rise. These figures, including land movements but mostly comprised of seaborne shipments, put global coal trade at 1,529mt, 73mt above the preceding year's 1,456mt total.

Alternative estimates published in recent weeks, calculating specifically seaborne trade, have shown a less rapid increase. Such estimates, however, are still based on provisional figures while awaiting more accurate or complete importer and exporter data. In mid-January German coal importers association VDKI suggested that world seaborne coal trade grew by 0.7% in 2019, including a 1.2% rise in steam coal and a 1.0% reduction in coking coal.

The large variation in growth estimates highlights difficulties in calculating a total before or only a few weeks after the end of an annual period, when full information is not available. Two other forecasts have estimated 1% growth, and about 2.5% growth respectively.

Several analysts calculate that both steam and coking coal segments saw higher volumes last year. Enlargement of coking coal trade, the smaller category comprising around one-fifth of all coal movements, probably was limited, because steel production in many coal importing countries was weaker. In the dominant category, steam coal trade, comprising the remaining four-fifths of movements, volumes were strengthened by higher imports into some countries, reflecting a diverse range of influences.

Changes in consumption, domestic coal production and other aspects resulted in higher imports into China and India during 2019, providing a sizeable addition to the world coal trade total. China's overall imports including low-grade lignite rose by 18mt or 7%, reaching 300mt based on official figures, despite weakness at year-end. In India, the volume received may have been over 10mt or 5% above that of the preceding year at over 240mt.

Rapidly expanding purchases by a group of relatively small Asian importers - Malaysia, Pakistan, Philippines, Thailand and Vietnam — also boosted trade. Last year this group apparently raised its steam coal imports by about an eighth to over 125mt, amid rising power station capacity and continued electricity demand growth.

However, one prominent negative change also had a big impact on global trade. Steam coal imports into Europe are still on a declining trend. Power station coal consumption within the European Union is falling rapidly, amid the shift towards cleaner energy sources reinforced by tightening regulations affecting output from coal-fired plants. The 2019 EU overall coal imports total may have been reduced by around 15mt or 10%, to around 120mt.

Changes among suppliers also affected the geographical pattern of global coal trade last year. Final figures are awaited but some changes are broadly visible. Indonesia achieved a large increase in exports, while Russia's total also appears to have been much higher. A smaller rise in Australia apparently was accompanied by downturns in the USA and Colombia, based on preliminary calculations which may be revised.

Expanding trade in 2020?

During the year ahead sustained growth in global seaborne coal trade seems quite likely. Much uncertainty surrounds import prospects for several major buyers, however, which could experience either an annual increase or decrease. Coupled with underlying negative impulses pervading the coal market, there is consequently potential for a reduced world total in 2020. Partly the outcome is dependent on unforeseeable short-term changes in national policies, which tend to have adverse effects on coal movements.

One particular focus for uncertainty among major importers is China. Although buying activity reflects commercial circumstances, the impact of government policy decisions and controls is often evident. General indications about these

WORLD COAL TRADE — PRINCIPAL IMPORTERS (MILLION TONNES)

	2017	2018	2019*	2020*	2020 % change**
China	271	296	313	300	-13
Japan	187	185	187	186	-1
India	208	248	282	292	+10
South Korea	149	142	142	141	-1
other importers	584	585	605	621	+16
total	1399	1456	1529	1540	+11

** forecast ** 2020 forecast compared with previous year*

source: Australian Government Department of Industry, Innovation and Science, December 2019, and BSA calculations

policies may be seen, or envisaged by observers, but the timing and magnitude of likely effects is less clear. Short-term trade flows can be greatly affected. An example, seen in the past two years, is a tightening of coal import controls towards year-end, designed to limit annual volumes recorded,

Adverse consequences for coal trade in recent years have resulted from national energy and specifically coal policy changes in other countries. Measures introduced, intended to benefit the environment, have mainly prioritized switching from coal-fired power generation towards cleaner natural gas or the preferred choice of renewable energy supplies. In Europe this emphasis has greatly diminished coal-fired electricity generation and the coal market.

These features explain why predictions of significant growth in world seaborne coal trade in 2020 are partly speculative, incorporating a substantial element of guesswork. The current potentially positive signs, implying strengthening import demand in a number of countries, may or may not be enough to more than offset foreseeable adverse influences.

A cautiously positive view

An example of a forecast based on a cautious view of prospects is shown in the table, summarizing calculations by AGDIIS analysts, published recently. World trade in steam and coking coal (mostly seaborne but including some land movements) is forecast at 1,540mt in 2020, a small 11mt or under 1% increase from last year's estimated volume.

The breakdown by importing country emphasizes contrasting prospects. Imports by three major importers — China, Japan and South Korea, comprising over two-fifths of the world total — are expected to decline at varying rates, accompanied by a rise in India. Other importers are shown only as a large group, calculated by deducting individual countries from the total. This group is forecast to see rapid growth. In the 'others' category is Europe, which presumably is expected to see a decline, implying that the remaining countries chiefly in Asia have fairly bright prospects.

Another world trade breakdown, by coal type, also has been published by AGDIIS although it is not shown in the table. Steam coal trade is forecast to remain almost flat in 2020, increasing by just 3mt to 1,185mt. Overall growth is expected to be concentrated in the metallurgical coal trade (coking coal plus steam coal grades used in the steel industry) segment, where a 8mt (2%) rise to 355mt is predicted.

Imports into Europe are likely to remain the principal dampening feature of coal trade. After the apparent large decline of about one-tenth in EU import volumes last year, another large reduction could follow in 2020. This part of world coal trade is the major component with the clearest negative trend, resulting from the energy and environmental policies adopted.

Focusing on positive aspects, expanding imports into India and several smaller importers are expected to support trade growth in the next twelve months. Optimism about India's purchases is based on coal use rising, while increases in domestic production of coal together with growth in rail transport capacity is not sufficient to match incremental consumption growth. Requirements for high quality coking coal amid expanding steel output mostly benefits foreign suppliers. In the 'smaller Asian importers group' comprised of Malaysia, Pakistan, Philippines, Thailand and Vietnam, rising coal-fired power generation seems set to strengthen imports.

Limited perspective

Based on this discussion, a continuation of the upwards trend in global seaborne coal trade seen in recent years seems quite possible in 2020, and it could conceivably persist next year as well. Potential for expansion nevertheless is limited. An increase of 1–2% this year, similar to but slightly lower than some estimates of growth during the past twelve months, may be viewed as an optimistic outlook.

Given the range of uncertainties, expectations of a flat or reduced volume this year seem equally plausible. This alternative view reflects the imponderables associated with normal commercial influences, and also with political pressures which are much harder to predict but are having a much greater impact on coal consumption and trade.

Although pessimistic views of world coal trade, envisaging a sustained downwards trend have not been validated so far, arguably that prospect remains intact. In Europe diminishing imports are already a prominent feature, and in South Korea a weakening trend appears to have started. In Japan, China and eventually India as well, there are reasons for doubts about the strength of key drivers, with clear potential for weakening import demand. While these countries may not see reductions in the next twelve months, a longer view suggests potential for reduced volumes.

A restricting influence for 2020 is the subdued outlook for economic activity around the world. With only, at the most, a minimal improvement in the pace envisaged this background is likely to have a limiting effect on steel production in numerous countries which import coking coal, especially as weak capital investment spending (usually steel-intensive) is evident. Slow economic growth, reflected in power demand, also restrains steam coal consumption in countries where there is heavy reliance on this energy source.

At the end of last year the International Energy Agency published a report suggesting that coal trade annual volumes could remain stable over the next few years. In the period between 2018 and 2024 IEA analysts expect steam coal trade to see very limited growth while coking coal trade continues to rise at a marginal annual rate. This seems to be a plausible 'balanced' view. As the report points out "expectations of an imminent coal collapse have come and gone before", and the IEA does not expect a collapse in global coal demand in the next few years, despite emphasizing that the role of coal power generation in advanced economies is shrinking.

One aspect is the significance of Asia for current and future global coal usage, and the regional imports forming a dominant proportion of world seaborne trade in coal. In many Asian countries, coal-fired electricity generation is likely to remain the preferred option for a large part of power supplies, providing reliable and relatively cheap power to satisfy rapidly rising demand for energy amid economic progress. But this supportive effect on international coal movements contrasts with the downwards pressure from environmental policies in many countries, pointing to limited prospects for trade growth. DCi

GB Railfreight and Hanson Cement sign seven-year contract

GB Railfreight has signed a seven-year deal with Hanson Cement for rail freight services from Ketton cement works in Rutland and Ribblesdale cement works in Lancashire, UK, to terminals at London King's Cross, Avonmouth (Bristol) and Mossend (Glasgow).

GB Railfreight will operate on average nine trains a week transporting cement in tank wagons which will support major construction projects in London as well as the development of Hinkley Point C Nuclear Power Station.

The deal is a continuation of a very successful partnership between GB Railfreight and Hanson and will provide a reliable service moving cement to nationally significant infrastructure projects. The movement of cement from road to rail also helps to reduce carbon emissions and congestion on the road network.

John Smith, Managing Director of GB Railfreight, said: "We are absolutely thrilled to be providing more rail freight services for Hanson. We already provide four trains a week between Ribblesdale and Avonmouth, and this deal will see GB Railfreight haul cement for the first time. We are delighted to continue our partnership and look forward to developing this specific part of Hanson's supply chain."

Matt Barlow, Supply Chain Director for Hanson UK, said: "We are working to increase the tonnage of material we transport by rail across the UK. This arrangement helps us to take trucks off the roads and reduce our carbon emissions. We are thrilled to continue our partnership with GB Railfreight, who have always provided us with an excellent service."

About GB Railfreight

Founded in 1999 and headquartered in London, United Kingdom, GB Railfreight is the third-largest rail freight operator in the United Kingdom, with a turnover expected to exceed £200 million in 2019. GB Railfreight is one of the fastest growing companies in the railway sector and transports goods for a wide range of customers.

GB Railfreight warns delaying HS2 decision threatens long-term damage to infrastructure investment in the UK

John Smith, Managing Director of GB Railfreight is urging the next Government to prioritize a decision on the future of the scheme as soon as possible following the General Election on the 12 December. He warns about the impact of continuing delay and that the risk of cancellation poses a threat to the UK's economy and the deliverability of future major infrastructure schemes in the UK.

GB Railfreight is the UK's fastest growing rail freight business employing nearly 900 people across the UK.

About 2,000 businesses have played a role in the preparation for the construction of HS2 between London and Birmingham and 9,000 people are currently employed directly or indirectly by the project.

The Government recently commissioned an independent review of the scheme led by Douglas Oakervee which was aimed at giving a clear go or no-go decision on the future of the scheme by the autumn. The general election means that there is risk that the period of indecision drags on for much longer.

In its submission to the Oakervee review, GB Railfreight warned that the longer that the period of uncertainty goes on for, the greater the risk that jobs and expertise developed in anticipation of construction work going ahead will be lost. One of the justifications for the review was to look at options to cut costs, but a long-term delay could see costs rise If the scheme is eventually given the go ahead as lost expertise and capacity will have to be rebuilt.

Long term uncertainty over its future or a cancellation of the scheme could see infrastructure projects such the Government's promised investment in high speed rail in the North of England having to be delayed and curtailed as the UK will have lost capacity to deliver high-speed rail schemes and the contractors will have to factor in the risk of late stage project reviews.

John Smith, Managing Director of GB Railfreight said: "The decision to review the project at this late stage has led to uncertainty across the construction supply chain across the UK. With a decision on the project now confirmed to be delayed until following the General Election, it is important that the next Government provides a clear view on the future of the scheme as soon as possible.

"Further delay will mean that people and resources which have been built up ready for work on Phase One to start might be lost as business won't be able to afford to keep them in readiness for a final decision to be taken. This could lead to the project facing further cost increases and delay as this capacity will have to be built up again.

"A decision to cancel the project would be a significant blow to the economy of the West Midlands and the country as a whole. It would also cause long term damage to the construction and engineering sector and the UK's ability to deliver major infrastructure projects."

The GBRf submission to the independent review highlights the lesson of rail electrification in the 2010s. Delay and cancellation of previous schemes meant that once the Government made the decision to go ahead with extensive investment in electrification it faced spiralling costs and the project had to be curtailed as the UK had lost the expertise needed to deliver these projects.

'Tohoku Maru' coal carrier for Tohuku Electric Power delivered

On 6 February, Kawasaki Kisen Kaisha, Ltd., Tokyo, ("K" Line) announced the delivery of *Tohoku Maru*, a 91,000dwt-type special coal carrier, to Oshima Shipbuilding Co., Ltd.

Tohoku Maru is same type as "K" Line's specialized fleet for the transport of thermal coal known as the *Corona*-series. The *Corona*-series consists of epoch-making coal carriers equipped with wide beam and shallow draught, which are the most suitable type to enter the ports used by Japanese thermal power stations to discharge cargo.

Tohoku Maru is equipped with the latest energy-saving and ecological technology such as advanced flipper fins and rudder fin which promote her propeller efficiency. She also has the latest ecological technology, such as a ballast water management system which protects marine ecosystems, and an SO_x scrubber which eliminates sulphur oxides from engine exhaust gases, enabling her to comply with the global SO_x regulations which came into force in January.

Tohoku Maru will be principally involved in carrying thermal coal to thermal power plants for Tohoku Electric Power Co., Inc.

VESSEL SPECIFICATIONS

LOA	234.99m	**Deadweight tonnes**	91,818 tonnes
Beam	43.00m	**Gross tonnes**	52,458 tonnes
Depth	18.40m	**Net tonnes**	28,945 tonnes
Full draught	12.885m	**Hold/hatch**	5/5

ABS updates practical considerations for the IMO 2020 trading environment

Whether selecting a SOx scrubber or compliant fuel, owners must understand the implications for their operations, says Gareth Burton, Vice President for Technology, ABS

The IMO 2020 global sulphur limit requirements came into effect from 1 January 2020, with the most common compliance options being the use of compliant fuels followed by the installation of an exhaust gas cleaning system.

To help owners and operators understand the implications of both choices, ABS has updated two guides: *Practical Considerations For The Installation And Operation Of Exhaust Gas Cleaning Systems* and *Practical Considerations For The Transition To Sulfur Limit Compliant Fuel*.

The ABS document on scrubber installation outlines the regulatory requirements and items to be considered during the planning, procurement, engineering, installation and commissioning for scrubber installation and discusses considerations for the operation of scrubbers.

This revised version further elaborates on the considerations for scrubber operations based on the latest regulations and includes feedback on lessons learned from owners and operators of ships with an operational scrubber.

Effective planning for installation of a scrubber onboard a vessel should consider a number of issues, including feasibility evaluation, lead time for the supply of the scrubber, scope of structure and system modification, engineering evaluation and class approval, fabrication, installation and integration, and testing, commissioning and demonstration of compliance.

Scrubber installation typically involves the shipowner, scrubber supplier, engineering company and shipyard and it is important to have defined roles for each party during the various stages of installation.

For existing vessels, the time spent to retrofit a scrubber system depends on several factors with the equipment supply lead time and the availability of a retrofit yard often being critical. Effective planning may allow some of the required steps to be performed concurrently with the possibility for much of the work to be completed before the ship arrives at the retrofit yard, which can significantly reduce time spent in the yard.

For owners who choose compliant fuel as a means of meeting the 2020 regulations, ABS has updated *Practical Considerations For The Transition To Sulfur Limit Compliant Fuel* providing items to be considered when using this option, including industry experience from implementing the approach.

The guide focuses on items to be considered when transitioning from high sulphur heavy fuel oil (HSHFO) to the use of low sulphur compliant fuel (VLSFO or ULSFO) including completing appropriate risk assessment and the development of a Ship Implementation Plan.

For global sulphur limit compliance, low sulphur residual marine fuel of 0.50% maximum sulphur content is considered the most commonly used fuel which according to the International Standards Organization is fully capable of meeting the existing ISO 8217 standard and the general requirements found in ISO 8217:2017.

As the industry transitions through the 2020 period, it is expected that most of the low sulphur fuel available to the marine industry will be blended products, commonly known as 0.50% max sulphur fuel oil.

These fuels are based on vacuum gas oil, or blends incorporating various heavy and light refinery product streams, including residual fuel oils and middle distillates.

These vary from the traditional distillates due to the variation of compositions and ABS uses the Practical Considerations document to point out key quality concerns including compatibility of blend components, stability of the resulting blend, the presence of Catalytic fines, fuel density, flash point and pour point, ignition and combustion characteristics, the presence of unusual components, viscosity and lubricant compatibility.

Safety, service and solutions are the three goals that define the activities of ABS. They are the bedrock upon which it bases its commitment to set standards of excellence as one of the world's foremost marine and offshore classification organizations.

ABS has been able to achieve those goals through the innovative thinking, enthusiasm and professionalism of its highly experienced staff. Years of experience, training and continued education have made ABS confident in its actions and secure in its decisions.

Nippon Paint Marine's LF-Sea hull coating wins Global Warming Prevention award

Nippon Paint Marine Coatings low-friction hull coating system LF-Sea has won a 2020 Japanese Government Award for Global Warming Prevention Activity.

Japan's Parliamentary Vice-Minister of the Environment, Tetsuya Yagi, presented the award to NPMC President Seiichiro Shirahata after a Select Committee found the coating system met all the criteria in the Countermeasure Technology category.

Parliamentary Vice-Minister of the Environment Tetsuya Yagi (Left) presents the Japanese Government Award for Global Warming Prevention Activity Award to NPMC President Seiichiro Shirahata.

In particular, the judging panel found that coating contributed to reduced drag, consequently resulting in lower fuel consumption and reduced CO_2 emissions from those vessels that have applied the hull coating.

On receiving the award earlier this month, Shirahata said: "As regulations to limit ship emissions enter into force in January, we are delighted to have won this accolade. This award recognises the significant contribution the coating is having on reducing emissions and shipping's impact on the global environment. Hull performance monitoring has shown that our low-friction technology is providing a real payback for customers compared to other systems."

Based on a patented 'water trapping' hydrogel technology — a concept derived from the structure of tuna fish — LF-Sea coatings reduce water flow resistance (drag), meaning less energy is required to propel the ship through the water. Ship owners that have applied the coating have benefited from a reduced fuel consumption of between 4% and 10%, compared to regular SPC antifouling paints.

Makoto Nakagawa, NPMC Sales & Marketing General Manager, said: "This award recognizes the wide take-up of the LF-Sea series of coatings as an environmentally responsive system. As an environmentally conscientious company, we strive to deliver state-of-the-art products that contribute to industry initiatives to reduce global greenhouse gas emissions."

Coatings in the LF-Sea series, include the LF-Sea, LF-Sea150 HyB product, introduced in 2007, and A-LF-Sea, which was launched in 2013. However, a new underwater antifouling coating is set to be added to the series next year.

Last month, Nippon Paint Marine reported an annual increase in application of its coating LF-Sea coating products. As of June 2019, the company's low-friction coatings have been applied to the hulls of more than 2,900 ships.

The Ministry of Environment has been awarding Japanese individuals, companies or groups for their "significant contribution towards preventing global warming" since 1998.

The Award ceremony is held each December to coincide with Global Warming Prevention Month.

About Nippon Paint Marine

Nippon Paint Marine is a subsidiary of Nippon Paint, a top five global paint supplier.

Nippon Paint has been producing marine coatings in Japan since the 1880s and has been the leader in the development of all kind of marine paint technology but especially antifouling paints.

Nippon Paint developed and launched the world's first self-polishing (SPC) tin-free antifouling paint in the 1990s and followed that by the launch of the world's first low-friction SPC in 2006. More recently, the company developed Aquaterras, the world's only biocide-free SPC antifouling paint. Aquaterras is a unique micro-domain SPC developed by Nippon Paint Marine from raw materials used in the pharmaceutical fields.

New Guidelines for the Carriage of Seed Cake in Containers published

New Guidelines for the Carriage of Seed Cake in Containers have been published jointly by the CINS (the Cargo Incident Notification System) and the International Group of P&I Clubs. The document is available to download from the CINS website.

'Seed Cake' is the term used for pulp, meals, cake, pellets, expellers and other similar cargo, where edible vegetable oils have been removed from oil-bearing seeds, cereals or commodities with similar properties .

The practices set out in this document are intended to improve safety during the carriage of Seed Cake and to ensure that it is declared, packaged and carried properly. Seed Cake shall be transported in compliance with the requirements set out in the IMDG Code.

The practices set out in these Guidelines include selected provisions from the IMDG Code plus additional precautions to enhance its safe carriage.

Cargo Incident Notification System

CINS is a shipping line initiative, established to improve safety in the supply chain, reduce the number of cargo incidents on-board ships and on land, and highlight the risks caused by certain cargoes and/or packing failures. Membership of CINS comprises over 85% of the world's container slot capacity.

International Group of P&I Clubs

The thirteen principal underwriting associations which comprise the International Group, between them provide liability cover (protection and indemnity) for approximately 90% of the world's ocean-going tonnage.

Wilhelmsen makes landmark commercial delivery of 3D printed parts to Berge Bulk vessel

Berge Mafadi, a Berge Bulk vessel has received the world's first commercial delivery of 3D printed scupper plugs, as part of Wilhelmsen's Early Adopter Program.

The programme, where customers have exclusive access to on-demand additive manufacturing was launched by Wilhelmsen's Marine Products division in December 2019. Customers include Berge Bulk, Carnival Maritime, Thome Ship Management, OSM Maritime Group, Executive Ship Management and Wilhelmsen Ship Management.

"We are very excited with this milestone — completing one of the first commercial deliveries of 3D printed parts in the maritime industry," says Hakon Ellekjaer, Head of Venture, 3D Printing, Wilhelmsen Ships Service. Adding, "This is just the beginning of the journey, and we are quickly expanding our offering, together with our key development partners, enabling our customers to benefit from the savings provided by 3D printing, digital inventory and on-demand localized manufacturing."

Wilhelmsen, as part of their ongoing co-operation with Ivaldi Group, is providing spare parts on demand to the selected six customers' vessels around the globe. Parts in this programme are being monitored in close collaboration with class society DNV GL. Through a unique selection, digitization, and documentation process, every part goes through a quality-controlled process where each part is given a print passport number. All necessary documentation relating to the manufacturing, design, and performance requirements of each part is then captured and enclosed with the delivered part. DNV GL, through the Print Passport Number and its published rules and standards, is providing ecosystem assurance to the Wilhelmsen 3D Printing venture.

"Wilhelmsen, Ivaldi, and DNV GL are testing a new universal part tracking system for purposes of quality control, part evolution and traceability of parts. The first 3D printed scupper plugs have been given unique identifying codes and are logged in a trial system that should enable tracking throughout the lifetime of the part," says Simon Ratcliffe, DNV GL.

Wilhelmsen and Ivaldi have delivered several 3D printed parts to the *Berge Bulk* vessel, and scupper plugs were one of the part categories. There are numerous scupper plugs on a vessel. For convenience and readiness, each drainage hole on the

open deck has its own scupper plug. Scupper plugs are used for closing drainage holes to prevent oil spills or other contaminant spills on a ship.

"Scupper plugs are expensive, and there are no universal dimensions, which means that when you have a broken element, you have to buy a new scupper plug. With additive manufacturing, we are able to procure scupper plugs faster, cheaper and locally. If any part breaks, we can replace that one part instead of the whole unit. We are excited to be part of the Early Adopter Program. On-demand additive manufacturing will revolutionize the spare parts industry" says Sim Teck Siang, Procurement Manager, Berge Bulk.

"It is very exciting for us at Berge Mafadi to try out new technology and the possibilities it will bring. Spare parts are currently a pain point, and we have trouble with for instance scupper plugs as they are easily stolen for their brass components. They are expensive, and we are constantly needing to replace them. By replacing them with plastic, we are eliminating any possibility of theft, and best of all, we get them on-demand within a short period of time. We are looking forward to experiencing the expanding offering from Wilhelmsen Ships Service," says Captain Tarun K Gupta, Master of Berge Mafadi.

3D printed scupper plugs are equally as functional as traditional versions. In addition, they are also an assembly, which means that if a part breaks, that one part can easily be replaced, instead of the whole scupper plug. Making them available through a digital warehousing solution means they are faster and easier to procure worldwide. It also means, thanks to on-demand manufacturing technologies, that only the exact number of parts required are produced, reducing costs and environmental footprint.

"A commercial world first is a significant milestone for Ivaldi and our partners and we are grateful to them for taking the leap with us. Humble as the scupper plug may be, we believe it a step in transforming an entire industry: by sending files rather than scupper plugs we are amongst other things able to reduce CO_2e emissions on this one part by some 54% and this gives me great hope for the possibility of a more sustainable future for supply and logistics" says Espen Sivertsen, CEO of Ivaldi Group.

About Wilhelmsen

With the largest maritime network in the world, Wilhelmsen Ships Service is active in 2,000 ports, in 125 countries worldwide. Supplying marine solutions including Unitor products, Timm ropes, Unicool refrigerants, and Unitor and Nalfleet marine chemicals, along with a complete portfolio of ships' agency services and maritime logistics, last year Wilhelmsen made product deliveries to 27,500 vessels and handled 75,000 port calls.

The maritime industry's trusted partner in port, on board and offshore, its wide portfolio of products and services is available in every market and region, to every conceivable vessel type. Wilhelmsen Ships Service is part of the Wilhelmsen group.

Nippon Paint Marine reports business expansion across coatings portfolio

The total number of vessels applying Nippon Paint Marine hull coatings at drydock increased by 9% in 2019 compared to the company's 2018 figures.

In the 12-month period to June 2019, the marine coatings supplier, a division of Japan's Nippon Paint, registered increased applications across all ship sectors, with growth in supply of underwater coatings to gas tankers, in particular, rising more than other types of vessels.

The number of gas carriers applying Nippon Paint Marine products jumped significantly by more than 30% during the period, followed by a 15% increase in the number of passenger vessels and cruise ships using the company's coatings. Bulk carrier and general cargo ship applications increased by 7% and 4%, respectively.

Studying the detailed statistics of the products' applications revealed that the company's unique self-indicating epoxy coating NOA10M was the coating most frequently applied during the period. In fact, numerous Nippon Paint Marine's dry-docking applications used the self-indicating coating during 2019.

Significant growth was also seen with the class-leading fuel saving coating A-LF-Sea and the company's standard anti-fouling Ecoloflex, both of which saw an application increase of 15%. The number of ships using Nippon's high-end copper silyl-acrylate anti-fouling Ecoloflex HyB, meanwhile, increased steadily.

Niko Yamanoue, Deputy Managing Director, Nippon Paint Marine (Europe) GMBH, said: "While we need to determine whether the increase correlates directly to an increase in the number of ships that drydocked this year, there has been substantial market interest in the self-indicating capability of the NOA10M product. "The success of this product in ensuring applicators easily achieve correct paint film thickness, while reducing time and maintenance costs, has clearly had an impact."

Yamanoue further commented that Nippon Paint Marine secured a higher number of gas carrier and passenger ship projects compared to the 2017 to 2018 period, which resulted in "a rise in up-take of our advanced low friction coatings".

The imminent introduction of regulations to curb ship sulphur emissions has also resulted in an increase in orders for specialist coatings.

John Drew, Director, Nippon Paint Marine (Europe) GMBH, said: "There has certainly been a marked increase in orders to supply our NOA PC700 coating to shipyards retrofitting exhaust gas cleaning systems.

"Shipowners are specifying the system to safeguard scrubber wastewater discharge outlets against corrosion, and we anticipate further orders as the regulation takes effect," he said.

Nippon Paint Marine's self-indicating epoxy coating NOA10M was the coating most frequently applied during the period.

About Nippon Paint Marine

Nippon Paint Marine is a subsidiary of Nippon Paint, a top five global paint supplier.

Nippon Paint has been producing marine coatings in Japan since the 1880s and has been the leader in the development of all kind of marine paint technology but especially antifouling paints. Nippon Paint developed and launched the world's first self-polishing (SPC) tin-free antifouling paint in the 1990s and followed that with the launch of the world's first low-friction SPC in 2006.

There has been a marked increase in orders for the NOA PC700 coating to shipyards retrofitting exhaust gas cleaning systems.

Van den Bosch acquires Swedish Willis Larsson Transport AB

Van den Bosch is strengthening its position in Northern Europe by taking over the Swedish transport company Willis Larsson Transport AB. This acquisition results in a further expansion of the logistic activities in the dry bulk segment.

The family owned company Willis Larsson Transport AB was founded in Lidköping, Sweden, in 1961. The company has acquired a strong position in the intermodal transport of dry bulk goods. With its own modern fleet of trucks and 40ft pressurized containers, Willis Larsson serves Sweden, Norway, Denmark, Poland, Benelux, Germany, Austria and the United Kingdom. The acquisition will result in a further growth of the dry bulk division of Van den Bosch, which will grow into more than 1400 modern silo trailers and silo containers.

Growth as logistics co-ordinator

Rico Daandels, CEO of Van den Bosch: "The acquisition of Willis Larsson represents the next step in our international growth strategy. As a logistics coordinator, Van den Bosch wants to become the European top player in bulk logistics. With the use of data and the right equipment, we can provide intermodal solutions for our customers — both in the field of dry and liquid bulk transport for the food and chemical industry. By taking over Willis Larsson, we will strengthen our logistic network in the Nordics and expand our leading position in the transport with pressurized containers. I'm pleased that CEO Sverker Larsson and his team will continue to be part of the company after the takeover and add their experience to the Van den Bosch organization."

Access to modern data systems

Sverker Larsson, CEO of Willis Larsson Transport: "Joining Van den Bosch connects us with the extensive European transport network and gives us access to the knowledge and experience of modern data systems. We have noticed that digital solutions have become increasingly important for our clients. The strong reputation of Van den Bosch ensures that we can continue to be a high quality partner in the future, both to our employees and our customers. Moreover, Van den Bosch will also bring its expertise in the field of liquid bulk transport to the Nordics, which will result in a further extension of our activities."

About Van den Bosch

Van den Bosch is an international logistic services provider specialized in the transport of liquid and dry bulk products for the food and chemical industry. Using both road and intermodal transport, Van den Bosch serves the global market. Van den Bosch has ten offices in Europe, Africa and the Middle East. The head office is located in Erp, the Netherlands.

Self-unloaders, transshipment and offshore operations

taking the pressure off ports

The Alfred Oldendorff.

Louise Dodds-Ely

Oldendorff is a major dry bulk operator, which includes a large number of self-unloading vessels in its fleet. Each year, the company carries about 320 million tonnes of bulk and unitized cargo around the world. It performs 14,000 port calls in 125 countries. On average, it operates 700 chartered and owned ships at any one time.

From its roots as a small German shipowner, Oldendorff has grown into one of the world's most respected dry bulk operators. Oldendorff has 4,000 employees from 60 countries, 18 offices and eight transshipment projects.

As a specialist in spot business, industrial contracts and offshore transshipment, Oldendorff focuses fully on dry bulk logistics.

Oldendorff was a member of the CSL self-unloader pool, the world's largest fleet of self-unloaders, from 1993 until 2019 and has fond memories of the excellent cooperation. Oldendorff currently operates a fleet of seven hybrid

THE OLDENDORFF CARRIERS FLEET OF SELF-UNLOADERS

Name	dwt	Type	Unloading rate (tph)
Alfred Oldendorff	94,000	cranes, hoppers, belts, 2 x booms	2,000
Antonie Oldendorff	94,000	cranes, hoppers, belts, 2 x booms	2,000
Albert Oldendorff	93,000	cranes, hoppers, belts, 2 x booms	3,000
Anna Oldendorff	88,000	cranes, hoppers, belts, 3 x booms	2,000
Johanna Oldendorff	67,500	cranes, hoppers, belts, boom	2,000
TBN	18,000	cranes, gravity feed belts, boom	2,500
TBN	18,000	cranes, gravity feed belts, boom	2,500

Stern view of the Antonie Oldendorff.

The Alfred Oldendorff *at sea.*

transshipment and self-unloading bulk carriers and has three new vessels under construction.

Most of Oldendorff's current self-unloaders are hybrid vessels, working in its transshipment business in the Arabian Gulf.

The *Alfred Oldendorff*, *Antonie Oldendorff*, *Albert Oldendorff*, *Anna Oldendorff* and *Johanna Oldendorff* are able to unload, lighter, load and top-off other vessels with their side mounted cranes. Oldendorff's 7 self-unloading vessels are true workhorses, they transship and transport an impressive 15 million tonnes of bulk cargo per annum with over 500 port calls.

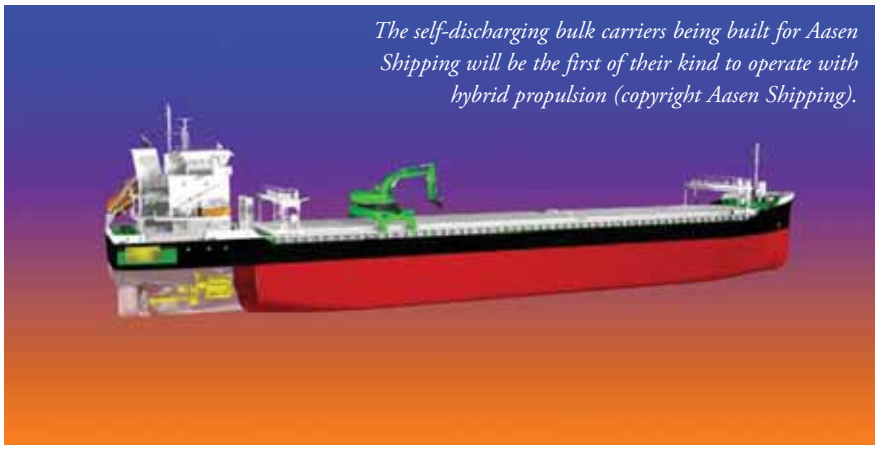
Trading areas

The main trading areas are the Arabian Gulf, Indian Ocean and the South China Sea. The major commodities carried are iron ore, and coal and potentially other bulk cargoes. Short-haul trades are combined in an efficient network, working in close cooperation with clients who depend on Oldendorff's reliable service for their industrial production.

Oldendorff Carriers has earned an excellent reputation with its industrial clients as a reliable service provider. Its clients also use Oldendorff Carriers to provide safe, reliable and cost effective ocean transportation for their bulk cargoes.

Antonie Oldendorff *transshipping cargoes from the Falcon bulker.*

Wärtsilä to supply world's first hybrid-powered self-discharging bulk carriers



The self-discharging bulk carriers being built for Aasen Shipping will be the first of their kind to operate with hybrid propulsion (copyright Aasen Shipping).

The technology group Wärtsilä has been selected to provide the system design and full equipment scope of the hybrid propulsion for two new 9,300dwt self-discharging bulk carriers featuring hybrid propulsion. The ships will be the first of their kind to be fitted with a hybrid propulsion solution. They are being built for Norway's Aasen Shipping at the Royal Bodewes shipyard in the Netherlands. The yard has also designed the vessels. The order with Wärtsilä was placed in December 2019.

Wärtsilä was contacted to determine whether a hybrid installation would be beneficial for these new ships. The company then carried out a detailed study in close cooperation with Aasen Shipping, taking into consideration a broad range of relevant factors. The study determined that the extra initial investment required for the battery installation would be more than offset by the high level of achievable fuel cost savings.

"Wärtsilä's experience and strong track record with hybrid propulsion solutions form the background to this contract. As a complete hybrid system supplier, we have again custom designed a propulsion arrangement that delivers high efficiency, lower fuel consumption, and optimal environmental sustainability," says Harald Tillung, Business Development Manager, Wärtsilä Marine.

"We approached Wärtsilä because of their capabilities in delivering hybrid propulsion systems. We appreciate their support throughout the planning and design processes, which has resulted in the best possible solution for these vessels," says Torbørn Torkelsen, CEO at Aasen Shipping.

The full Wärtsilä scope for each ship includes a Wärtsilä 26 main engine with gearbox and controlled pitch propeller (CPP), a DC switchboard, a battery pack, and a power management system. The equipment is scheduled to be delivered to the yard commencing in mid-2021.

The vessels are bulk carriers fitted with excavators for loading and unloading. The excavators will be electrically powered using the battery pack, which will save fuel and be emissions-free since normally they would be diesel operated.

The investment cost for the hybrid installation is partly supported by Enova SF, the Norwegian government enterprise responsible for the promotion of environmentally-friendly production and consumption of energy.

Wärtsilä in brief

Wärtsilä is a global provider of smart technologies and complete lifecycle solutions for the marine and energy markets. By emphasizing sustainable innovation, total efficiency and data analytics, Wärtsilä maximizes the environmental and economic performance of the vessels and power plants of its customers. In 2019, Wärtsilä's net sales totalled €5.2 billion with approximately 19,000 employees. The company has operations in over 200 locations in more than 80 countries around the world.

Wärtsilä 26: up close and personal

A compact and light unit with low operating costs, the Wärtsilä 26 is also used for generating set applications

The Wärtsilä 26 was developed in response to a need in the market for a new engine in the 260 mm cylinder bore class. The shortest and lowest engine in its class, the Wärtsilä 26 requires minimal space in the engine room.

Wärtsilä works in close co-operation with its customers when conducting field tests and monitoring selected test components. The Wärtsilä 26 has fewer parts, less maintenance requirements, low fuel consumption, reduced emission levels, and has the ability to run reliably on a variety of fuels.

The Wärtsilä 26 engine is fully compliant with the IMO Tier II exhaust emissions regulations set out in Annex VI of the MARPOL 73/78 convention.

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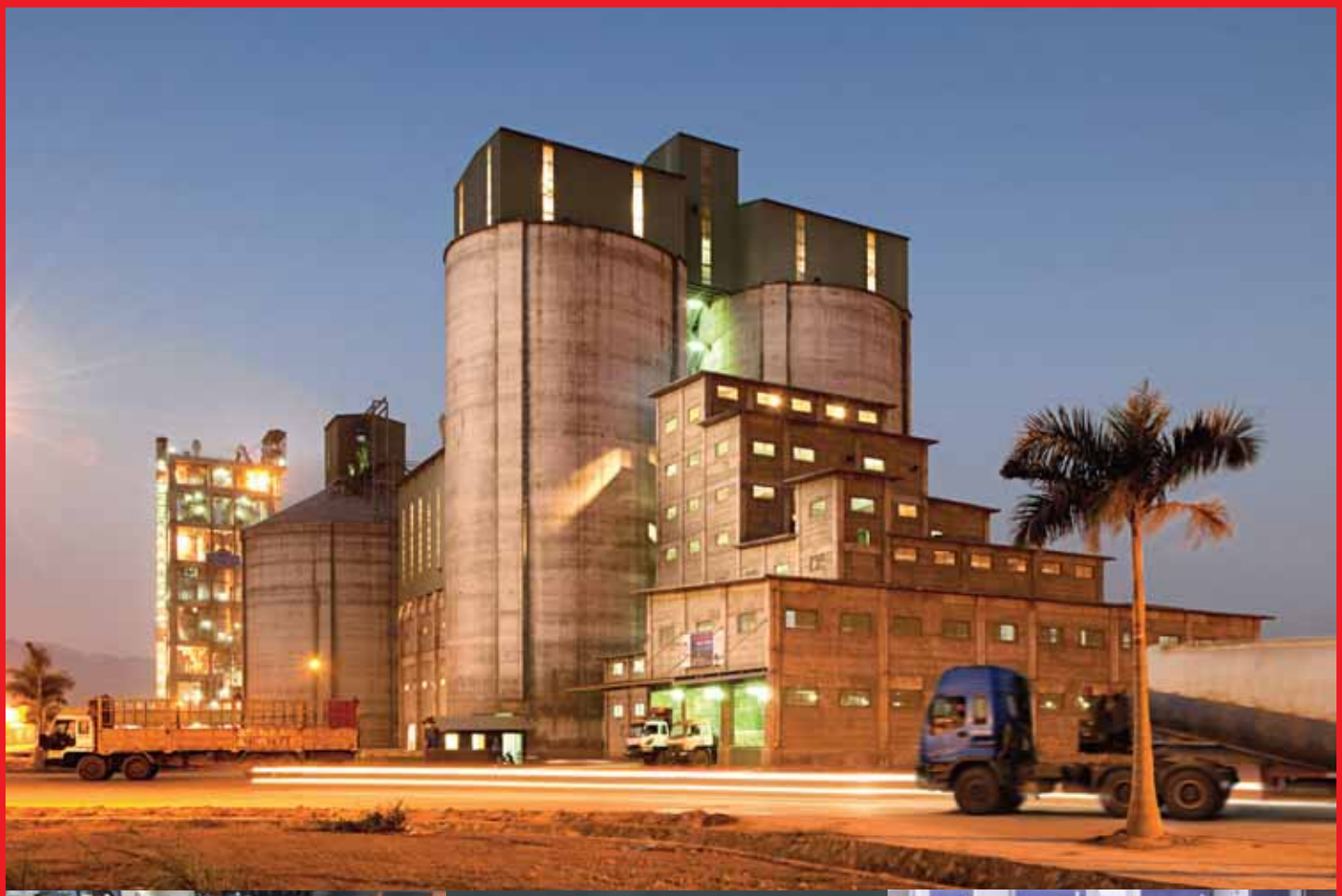

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A HAVER & BOECKER Company

Aasen Shipping AS self-unloaders serve the northern European market

Aasen Shipping AS is a family-business established by captain-owners Hans Martin Torkelsen in 1981. The company today owns and manage in total eight self-unloading bulk carriers between 3,500–8000 deadweight tonnes. All ships are equipped with a large excavator, secured to a travelling. This enables the most efficient and careful self-loading and unloading of any bulk or bagged cargo.

Loading and unloading rates are up to about 900 tonnes per hour, making the vessels extremely efficient. By self-loading and unloading with the vessels' equipment, costly loading and discharging facilities ashore are avoided and customers save both time and money due to Aasen Shipping's fast operations. Customers are free to choose berth, completely independent of shore cranes and stevedores, and can even reduce road transport. All vessels are especially suited when it is imperative to avoid crushing of cargo.

Aasen Shipping's self-unloaders can handle any bulk or bagged cargo, the main commodities being aggregates, cement, coal, grain, fertilizer etc. They can also handle logs and other breakbulk cargoes.

As all vessels' holds are steel-floored and fully box-shaped without any obstructions, they can also trade as modern multipurpose vessels for general cargoes and project cargoes. The excavator can be 'parked' in the forward or aft position on top of the vessel's hatch, avoiding conflict with crane operations from shore.

In total, Aasen Shipping's self-unloaders transport around 3.5 million tonnes a year, with the main trading area being in northern Europe.

As noted on p19, Aasen Shipping has also ordered two new 9,300dwt self-discharging bulk carriers featuring hybrid propulsion, which will be the first of their kind to be fitted with a hybrid propulsion solution.

The company performs all management functions (chartering, technical, crewing etc.) from its office in Mosterhamn, WC Norway.

KenzFigee: floating cranes to meet the needs of the transshipment market

Since its establishment in 1836, KenzFigee has shaped the skylines of harbours and terminals all over the world with a large number of floating bulk handling cranes for the transshipment industry.

With over 4,000 harbour (transshipment) cranes and 350 pedestal mounted offshore cranes delivered and installed worldwide, KenzFigee is a trusted partner in the industry.

The specially designed Lemniscate crane for floating applications has given KenzFigee a prominent position in the industry, and remains very popular. This high quality floating Lemniscate crane offers high capacity transshipment of up to 25,000 tonnes per day, whilst maintaining stability and buoyance of the vessel. The load can be moved in a horizontal direction without vertical movements and thus not requiring any lift capacity (and energy) during the

A complete overhaul of the 75t luffing drive on the Adelaar, *installed with the assistance of a Sarens mobile crane.*

Installation of the completely overhauled luffing drive.

horizontal movement. Originally designed on the double boom principle, one that delivers an optimum balance between weight and centre of gravity, the Lemniscate crane is a three boom system: the main jib (front arm), the jib tie (rear arm) and the jib fly (upper arm).

Refurbishment or lifetime extension services

Transshipment cranes delivered by KenzFigee were originally designed for a life time of up to 30 years. After years of extensive use, the performance of this equipment is nowhere near its productivity at the beginning of its life cycle. A refurbishment or lifetime extension can considerably extend the lifetime, restore performance of up to 100% and is often more economical than purchasing new. As the majority of these cranes are still operational, there is a lot of demand for

Arrival of Rietlanden Terminals' (Amsterdam) Lemniscate crane Adelaar*, for refurbishment at the KenzFigee quayside in Zaandam, the Netherlands (taken from the other side of the river the Zaan).*

Aerial photograph of the KenzFigee facilities in Zaandam, the Netherlands with three boom hoist offshore cranes waiting for delivery.

refurbishment and/or lifetime extension services.

Reasons for refurbishment services by the dedicated team of KenzFigee service engineers are:

- the need to increase productivity or lifting capacity;
- different or change in operations;
- a need to comply with current legislation;
- modifying existing equipment is quicker; and
- it is a more economical alternative than purchasing new cranes.

KenzFigee's most recent project is the refurbished Lemniscate crane the *Adelaar* (Eagle) belonging to the Rietlanden Terminals in Amsterdam. In approximately three months the luffing drive has been completely checked, refurbished, painted and tested. The luffing drive has also been reinforced, where necessary, to prevent tearing again. After completion the *Adelaar* has resumed its duties for at least 15 to 20 years.

New transshipment crane for harsh offshore environments: the Bulkbuster™

The need for a higher speed and an even higher capacity transshipment crane with better seaway conditions in more harsh offshore environments, has encouraged KenzFigee to design the Bulkbuster crane.

Bulkbuster: general layout — artist's impression.

The development of the Bulkbuster is a result of years of experience and practical know-how of the Lemniscate floating transshipment cranes and offshore cranes. For the components' lifespan, KenzFigee has taken a more dynamic load design into account because of seaway conditions during bulk handling. This is based on experience gained with offshore cranes installed on amongst others: offshore vessels and FPSOs.

Removal of the luffing drive of the Adelaar.

GTMaritime gives Rocktree a rock-solid platform for data transfer

A need for reliable data synchronization over multiple systems first led Rocktree to GTMaritime, but the floating terminal operator now has much larger digital ambitions in its sights. With a fleet of six Offshore Floating Terminals (OFT), the Singapore-based transhipment company specializes in the offshore loading of dry-bulk products from barges to bulk carriers at ports with draught restrictions and/or infrastructure limitations.

Essentially, an OFT performs the same functions as a permanent land-based terminal but this approach is considerably less capital-intensive, quicker to design, construct and mobilize than a fixed terminal. And in an age of growing environmental concern, the OFT has a measurably smaller impact on local marine and coastal ecosystems, requiring limited or no dredging before opening for service.

Rocktree OFTs have allowed its clients to bypass the infrastructure challenges associated with ports in emerging markets. Even where infrastructure is not an issue, they provide a fast and cost-effective alternative to ports subject to draft restrictions. Currently, these floating terminals have some 30 workstations and services running onboard.

Rocktree relies on Office365 email and a host of enterprise-grade software for maintenance planning and compliance, safety and accountability in its operations. It is also exploring the possibilities of Internet-of-Things (IoT) solutions as it seeks to reduce downtime and maximize the productivity of its assets.

Yet, while its OFTs are moored close to the shore, they have often struggled to get online when using internet and WIFI services from land-based ISPs. This is largely due to the location and signal strength of the local communications infrastructure. The problem was solved when Rocktree rolled out satellite based VSAT systems onboard its OFTs to handle data exchange across a VPN tunnel between its sites and its headquarters in Singapore.

However, the migration from patchy land-based telecoms to satellite brought its own set of challenges. For example, real-time data handshakes between the planned maintenance system did not work efficiently and the IT team often had to intervene and manually transfer data ashore. An in-house developed fix for the problem did not perform reliably enough for personnel to feel comfortable leaving the system unattended.

Rocktree's IT and technical teams set about researching the market for a more effective and lasting data communication solution, with recommendations from its own employees and trusted IT vendors resulting in a decision to implement a package solution from GTMaritime, comprising GTMailPlus, GTSentinel Antivirus and GTRAFT. The latter allows data file transfer, remote folder synchronization and system monitoring to be fully automated and controlled centrally, removing the need for input from the crew.

Initial planning and preparation for the roll-out started in November 2018. With assistance from GTMaritime's technical support team and an experienced vendor, Precision Infocomm, everything was up and running within just six months. By June

2019 the system went live and Rocktree was successfully delivering mail through GTMailPlus and replicating data between the maintenance, quality assurance and other systems unattended through GTRAFT.

While cost-saving was not an explicit goal of the project, Rocktree believes the migration to GTMaritime has paid for itself many times over in man-hours and stress saved when compared to manually transferring data, as well as allowing the company's applications to operate as they should.

A reliable, robust and easy-to-manage solution helps across the company, de-stressing the IT and technical teams by relieving them of the pressure of having to drop everything and intervene to carry out what should be routine data synchronization. Moreover, the ability to monitor the status of all its OFTs from a single unified dashboard makes managing updates and workflow more straightforward and less resource intensive than was previously the case.

The reaction from HSEQ, crewing, procurement and other operational and back-office functions needed to keep Rocktree's OFTs ticking over has also been overwhelmingly positive.

"Working closely with the team at GTMaritime allowed us to roll out the full solution quickly and efficiently. This has meant that staff has been able to experience the benefits straight away, saving time and costs as well as simplifying the process to easily and centrally manage all the file transfer jobs," says Zoeb Patrawala, Senior Manager Digital Technology and Solutions at Rocktree.

Although Rocktree initially approached GTMaritime to solve a specific challenge — namely, unattended data synchronization — it is now carrying out a comprehensive review of its IT strategy with a view to extracting the full potential of what GTMaritime solutions have to offer.

One idea currently on the table is to send images from the nine CCTV cameras fitted on each OFT back to its Singapore headquarters. Apart from transforming the oversight and accountability the company can provide to its clients, this would allow management staff to take a more proactive role in responding to unexpected and rapidly unfolding situations.

Looking further ahead, Rocktree sees considerable potential in adopting IoT solutions coupled with advanced data analytics to further optimize the operation of its floating terminals. Because releasing the value of such technologies depends on ubiquitous connectivity allowing an almost constant stream of data to flow between vessels, shore and the cloud, such investments can only be justified if a resilient communications infrastructure is in place. With GTMaritime as its long-term partner, Rocktree believes that condition has been met.

Key benefits GTMaritime brings to Rocktree

- hassle-free, resilient vessel/shore communication;
- reliable data replication with minimal manual intervention;
- enhanced visibility on network status across the fleet; and
- straightforward installation of systems on newly acquired vessels

About Rocktree

Singapore headquartered Rocktree Group works with companies in the water-borne dry-bulk supply chain, providing tailor-made, innovative, practical logistics solutions to improve the efficiency and reliability of its clients' shipments.

Transshipment projects for the next twenty years

Fast-changing scenarios and the solution at hand for optimized projects

The transshipment of dry bulk materials is a profitable sector, even though it is always linked to the prices of commodities, *writes Luca Condini, Technical Director at Shi.E.L.D. Services Srl.* Transshipment has spread outside the boundaries of the south-east Asian region, the traditional playground for this specialized activity, and it is now a more common activity in many countries of the world.

Luca Condini.

Still, it is difficult to plan accurately for long-term projects — contracts of ten or more years are rarer today than a few years ago — therefore also the characteristics of the transshipment equipment needed are more difficult to be laid out.

We have seen and experienced first-hand logistics projects that don't perform as planned for various reasons (global crisis and reduction of handled volumes and prices, change of government policies regarding mining and export, required infrastructures which have not been developed). In these cases, the assets deployed are too much for the actual project needs.

In other cases, the transshippers are the actual bottleneck for the development of the project because they can't increase their performances any further, and additional assets should be deployed with extra costs that can't be born.

For these reasons, one asset that is tailored to various project scenarios and whose performances can be improved in steps to follow the possible development and growth of the project would give the final clients and the operators the opportunity to optimize the logistic part of the project and to reduce the costs.

To meet these needs, we developed the concept of 'modularity' applied to the design of transshippers: a unit that starts off with basic characteristics and limited performance, which requires a limited investment, but that already includes in its design the possibilities for future improvements. In this way, it is possible to literally transform the basic-type transshipper into a more complete one with more capabilities in terms of operations to be carried out (coal blending, for instance) and higher performances.

Shi.E.L.D. Services is developing the project together with an owner as partner, who wants to invest in the project.

Let's give an example. The most straightforward type of transshipper is a floating crane, which is essentially a pontoon with a crane installed on the deck. The power generation plant is designed to feed one crane only, and accommodations are suitable for the number of crew members required for this kind of vessel. It certainly doesn't require a significant investment, but it also doesn't provide high transshipment rates either.

Nevertheless, it could be just what the project needs in its early stages.

But the volumes of cargo to be handled could increase after the first ramp-up period, or a high transshipment rate could be desired.

In such cases, one additional crane can be installed, the power generation plant can be increased by installing additional generating sets, and the accommodations can be enlarged for the increased number of necessary crew members.

Should the project requirements change and increase again, then a conveyor system can be installed, along with the necessary improvements of the power generation plant and accommodations.

With the modular design, all these modifications have been taken into account during the design phase; for instance, the required space on board for new equipment or the design of the electrical plant is already compatible with future installations.

Furthermore, the 'modular' concept is applied also to the design of those parts, which are more likely to be modified. The accommodations, for instance, are designed as modules of the same dimensions to be pre-fabricated ashore, only the outfitting is different depending on the destination of use. The space onboard for additional accommodation modules is already anticipated; therefore, in case of need, the new modules can be easily installed onboard, the systems connected, and they are ready to go in a short time and without the need for long stoppages or significant works in a shipyard.

What are the advantages of such modular approach?

- first, the initial investment is lower compared to a more complex transshipper;
- the performance of the transshipper can be fine-tuned to follow the project requirements. Many times, in our experience, the planned capacity of the project is not reached, and a transshipper with lower capacity would be sufficient;
- considering the above-mentioned points, also the final users (mining companies, steel mills) are encouraged to develop new projects because of the lower financial impact of the transshipment solution, especially during the ramp-up phase
- new players, smaller companies, can enter the transshipment market and diversify their business, always bearing in mind that the technical and operating management can be outsourced to specialized companies (like Shi.E.L.D. Services);

In conclusion, Shi.E.L.D. Services' modular design is the answer to the needs of operators to adapt to fast-changing scenarios in the transshipment market, and the solution at hand for optimized projects.

About Shi.E.L.D. Services Srl

Born as a spin-off of Coeclerici Logistics, Shi.E.L.D. Services provides a complete range of services for the logistics and transshipment sector, including feasibility studies, definition, and development of the most suitable logistics solution, vessel design, supervision of new-building construction and vessel conversion, technical, crew and operational management. The headquarters is in Milan with a branch office in Balikpapan (Indonesia).

Shi.E.L.D. Services is currently the technical and crew manager of five transshipment vessels in Indonesia, owned by major mining and shipping companies in East Kalimantan, and of one transshipper in Guinea.

Recent contracts are the design for LDPL, a subsidiary of Louis Dreyfus Armateurs, for the conversion of a Supramax vessel into a transshipper and the feasibility study for Dynamic Mining for the exportation of bauxite from Kamsar, Guinea. It is also working for RINA Consulting on a logistic project in the Middle East for the importation of coal for a newly built coal-fired power plant.

Shi.E.L.D. Services is the winner of the prestigious International Bulk Journal Awards 2019 in the 'Bulk Logistics Excellence' category.

WORLDWIDE NUMBER ONE

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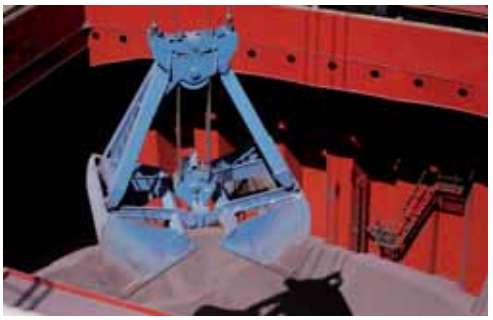

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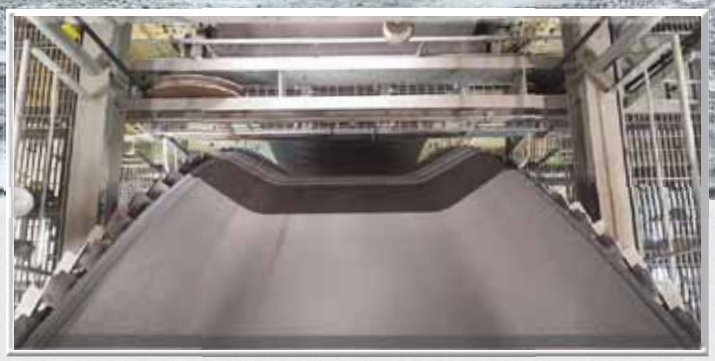
'Green' operations feature strongly in CSL's latest self-unloading activities

Three new converted pneumatic cement ships bring flexibility to CSL fleet

The arrival of *Wyuna* in Australia in May 2019 was the culmination of a process many years in the making that delivered three new converted pneumatic vessels for CSL's Australian coastal cement customers. From 2007 to 2012, the CSL Australia coastal fleet operated under a model of optimum cargo flexibility to service the growing business and changing customer needs. *CSL Pacific*, *Stadacona* and *CSL Thevenard* were CSL's mechanical self-unloaders, capable of carrying both granular and cement powder cargoes on alternate voyages, or as hold separated parcels on the same voyage. This flexibility suited the company's customers annual cargo mix and required a fluid and responsive scheduling regime.

Over the last five years, cement customers changed their trade patterns and committed to seaborne powder cement supply chains through long-term contracts and shoreside investment. This led to a more specialized vessel requirement. CSL acknowledged this change and responded with the design, building and delivery of three pneumatic cement vessels: *Kondili*, *Akuna* and *Wyuna*. The three vessels were built to be interchangeable between trade routes and

TRANSFORMING **engineering** INTO **productivity**



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customer facilities, and now operate around the Southern and Eastern coasts of Australia, from Adelaide to Gladstone. Occasionally the vessels also perform import cargoes from Asia to supplement domestic supply of cement.

CSL's customers value the reliability, efficiency and environmentally friendly nature of these vessels. The seamless connection of pneumatic hoses to their shoreside facilities deliver cement and fly ash directly into silos with minimal impact on the port environment. These vessels have been a welcome addition to CSL's customers' supply chains and are now operating successfully on the Australian coast.

CSL takes first steps towards biofuel powered shipping on the Great Lakes

In August 2019, CSL ran its first test of a marine biofuel on CSL Canada's 36,920dwt self-unloading bulk carrier *Atlantic Huron*. The trial commenced with a 50% bio-content fuel supplied by Canada Clean Fuels and made from waste agricultural products.

Biofuels have several environmental benefits when compared to petroleum-based fuels including reducing lifecycle carbon emissions by 86% and lowering particulate matter by 47%, helping contribute to improved air quality and lower pollution.

The trial began with the use of biofuel on one onboard generator with the aim to extend use to the main engine. The bio-content of the fuel will also increase through the trial phase with the objective to use 100% biofuel on *Atlantic Huron*, making it the first trial of its kind on the Great Lakes.

This R&D project is part of CSL's 2030 Environment Vision commitment to lower the fleet's greenhouse gas emissions and prepare for a low carbon shipping future.

Innovative multifunctional barge for powders

A new approach results in a groundbreaking concept

Reason for the innovation

Belgian company Gitra has been providing solutions for powdered/loose product transport, storage and transshipment via inland navigation for three generations. The loose cargoes carried by Gitra vessels include: granular coal; semi-coke; pulverized coal; fly ash; catalyst; lead oxide; molybdenum oxide; iron oxide; silicon powder; iron ore powder; laterite nickel ore; aluminium hydroxide; copper concentrate powder; sodium sulphate; bentonite; quick lime; lime hydrate; limestone; quartz flour; gypsum; sugar; salt; flour; corn germ; starch; quartz sand; locomotive sand; black cement; white cement; PVC powder; carbamide; potassium chloride; soda; mirabilite; and dust.

Gitra has great expertise in different transshipment technologies, and now operates more than 30 vessels that carry these technologies onboard.

Gitra believes that innovation is vital to the company, which is why it has focused on the problem that a powder tanker could sail from A to B, but 95% of the time it has had to return empty.

The problem of possible cross-contamination from different cargo types, as well as the high investment cost of this type of vessel, has always presented a serious challenge to Gitra, as a family business with limited financial resources.

That was reason enough to take a closer

look at the pros and cons and research ways that Gitra could respond to them.

The company's starting point and objective was to provide its customers with better — as well as cheaper — service.

Gitra's knowledge of the technology, combined with its out-of-the box approach, has resulted in a completely new concept.

Innovation? Why?

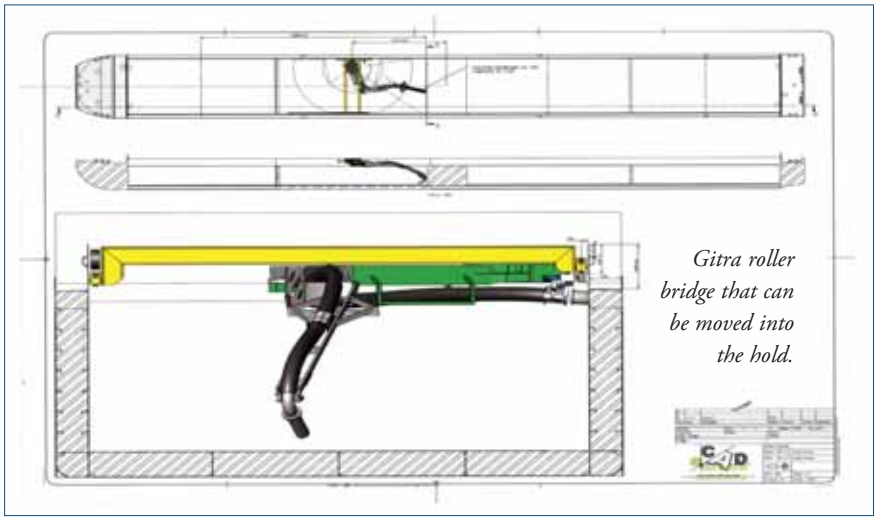
Gitra has succeeded in creating a multifunctional, self-propelled, self-unloading barge that can both load and unload powders in a weather-independent, dust-free way and transport conventional goods such as containers, granulates, pallets, etc. as a return load, combined as part of the same journey and separately.

Gitra's innovative, now patented, transfer method consists of a roller bridge that can be moved into the hold. A hydraulic suction arm is mounted on this roller bridge, which then releases into a suction/press system that pneumatically transports powdered products to a silo, truck or other vessel via a piping system located in the double wall of the vessel.

The entire unloading process is done with cameras under the hatches, which feature an innovative integrated filter system, allowing for dust-free, weather-independent operation. In other words, the hatches stay closed during the entire loading and unloading process. An operator operates the system, which is fully automated and remotely controlled.

Once the vessel is empty, a (box-shaped) conventional hold that is easy to clean with water offers the possibility to load/unload any goods for a return journey, which, compared to a powder tanker, makes a return journey an option.

The hatches are designed in such a way that, like 'normal' traditional hatches, they can cover the load and can be opened during loading and unloading to provide access to the entire hold, e.g. with the grabber on a cargo handling crane, to easily transfer conventional goods.



Gitra roller bridge that can be moved into the hold.

Movable bulkheads make the layout adjustable (cf. sea shipping).

The ecological aspect was also taken into account, resulting in a hydraulic/electric drive for the various components. The aim of this was to make these vessels into an environmentally transport solution for customers.

Existing mode of transport for powdered products by inland waterway vessel or barge

- **Option 1:** powder tanker — ship or barge equipped with pressure tanks.
- **Option 2:** sloped bottom vessel — ship or push barge equipped with fluidization bottoms.
- **Option 3:** conventional ship or push barge unloading with a pump-boat/pump truck.

Choice of barge or motor vessel

Option 1: powder tanker

Advantages:

- self-unloading and weather-independent during loading/unloading.

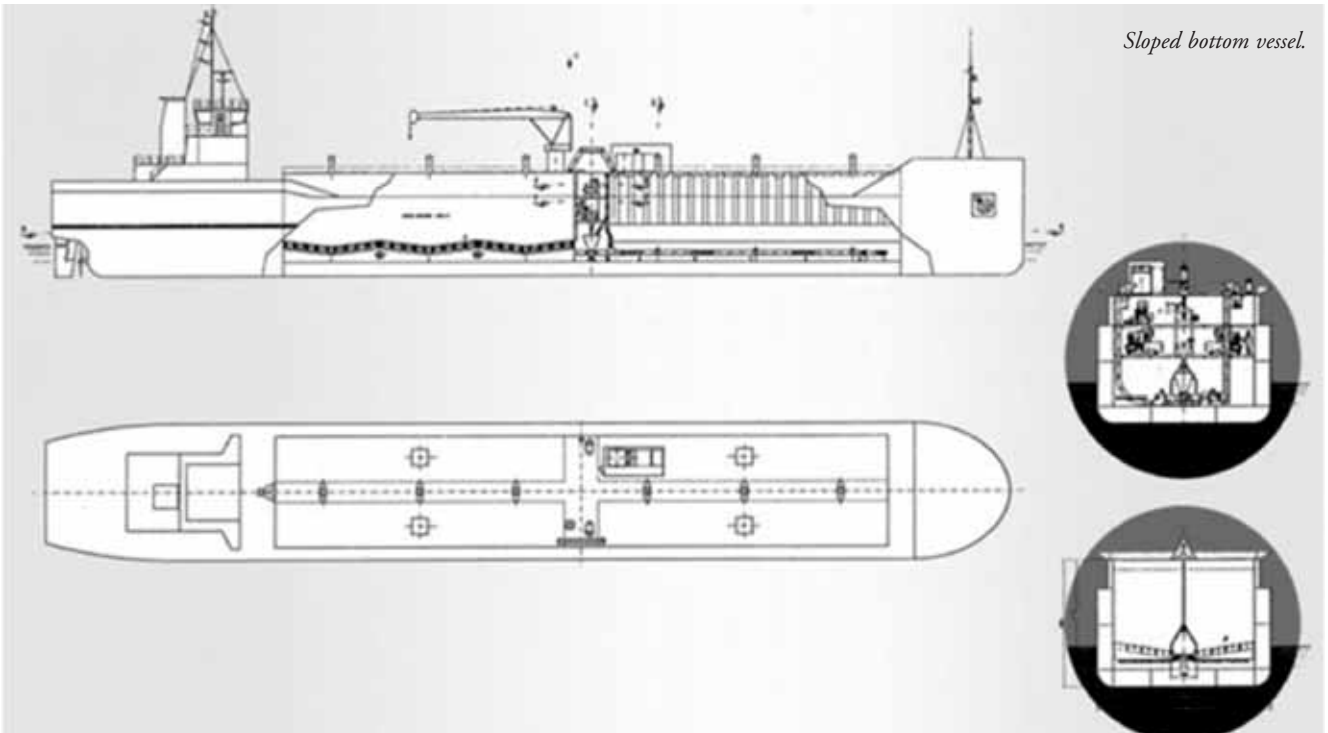
Disadvantages:

- high price;
- only suitable for powders, so return cargo is not an option and the silo ship always has to sail back empty;
- pressure tanks take up a lot of volume and weight, resulting in low payload capacity;
- limited availability;
- if there are no powders to transport, no alternative options;
- risk of contamination with changing product types; and
- difficult to clean.

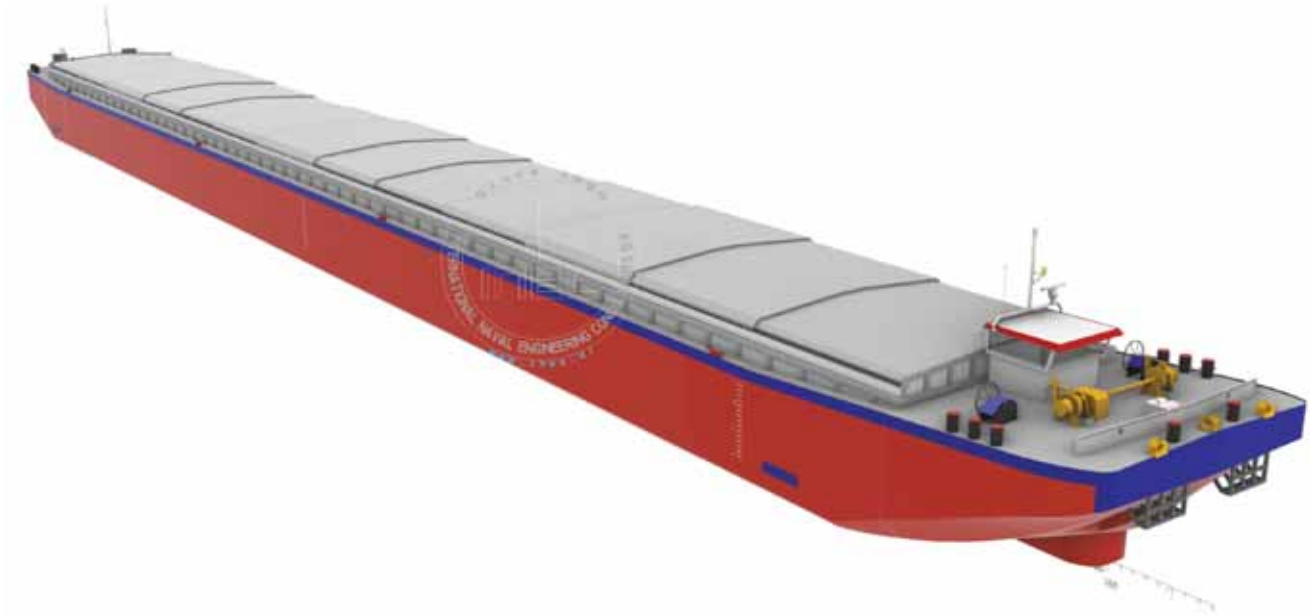
Option 2: sloped bottom vessel

Advantages:

- self-unloading and weather-independent; and
- has greater loading capacity than a silo ship.

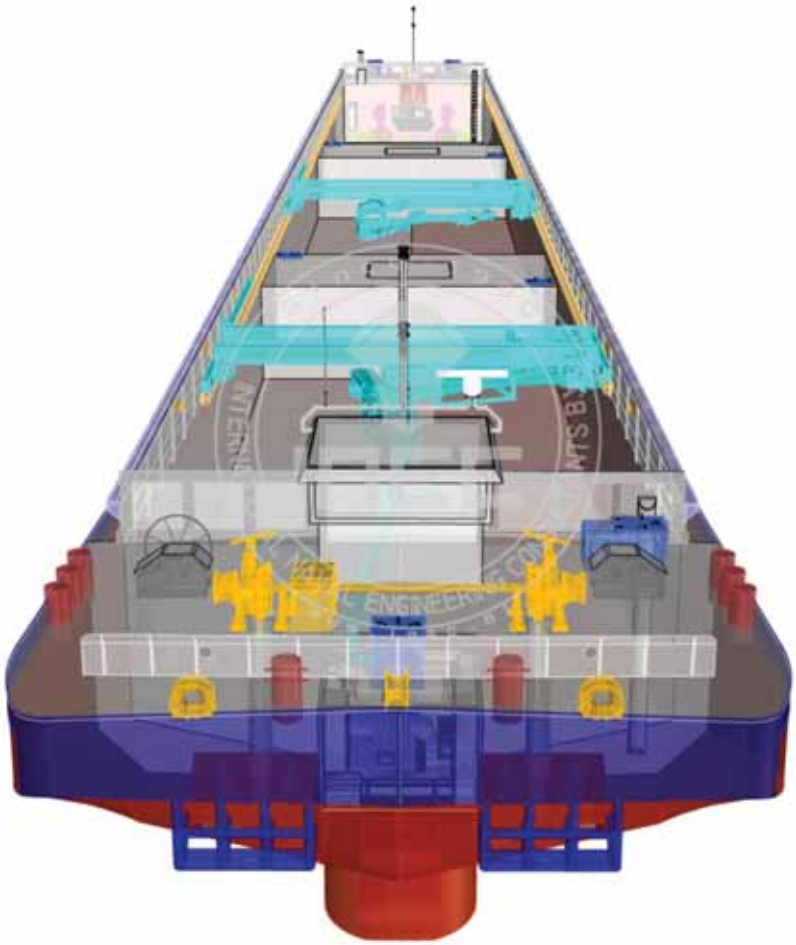


Sloped bottom vessel.



Disadvantages:

- only suitable for powders, which means that a return load is not an option and the sloped bottom vessel always has to sail back empty;
- cost of the system;
- weight and space required for the system;
- suction/press system uses more energy as a silo ship;
- limited availability;
- if there are no powders to transport, no alternative options;
- risk of contamination with changing product types; and
- difficult to clean.



Option 2: Conventional ship

Advantages:

- wide range of ships on the market;
- can carry (conventional) return load, basic cargo area; and
- easy to clean.

Disadvantages:

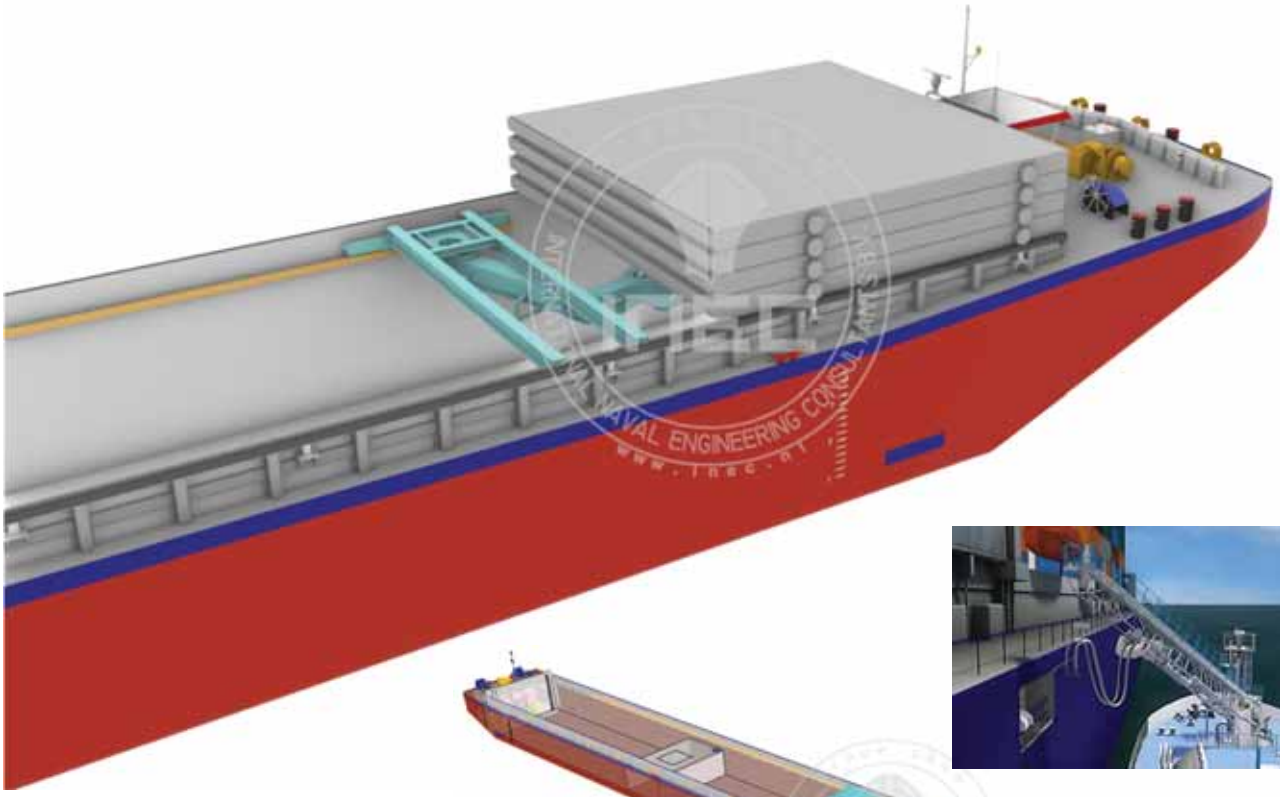
- special system required for dust-free loading;
- ship must have good dust-tight and watertight hatches;
- not self-unloading, a pump boat/pump truck is needed for unloading (logistically complicated); and
- weather-dependent, the product cannot be unloaded in the rain as it cannot be protected from contamination.

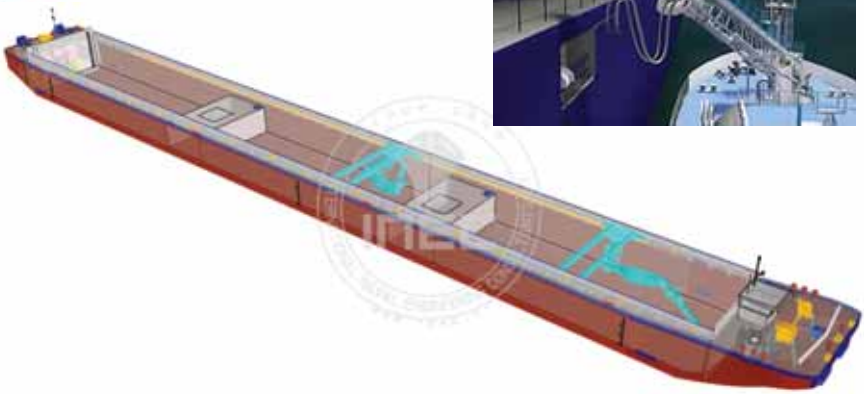
Motor vessel versus barge

Barge

Advantages:

- ideal for use as floating storage in combination with shipping;
- large payload because of its shape;





- standard size allows it to sail with several barges at once.

Disadvantages:

- push boat necessary to move = not self-propelled; and
- because of its shape, it consumes more fuel and moves slower if only one barge is used.

Motor vessel

Advantages:

- faster sailing speed/rotation and crew always on board.

Disadvantages:

- cannot function as floating storage because of (cost of) crew.

Gitra's innovative solution

Gitra proposes a combination of existing methods, maintaining the advantages of each method as much as possible while eliminating the disadvantages.

- a push barge that is self-propelled, there's no need for a push boat, so loading capacity is in line with maximum waterway limitations;
- it is also ideal for use as a floating silo;
- a push barge that is self-unloading and can load/unload independently of the weather;
- after unloading powders, can be easily cleaned to avoid contamination with other types of cargo. After unloading and cleaning, any load (e.g. containers, ores, granulates, pallets, etc.) can be transported as a return load;
- both powders and other types of cargo (e.g. granulates) can be loaded at the same time, with the spacious layout guaranteeing that products are kept separate and mixing and contamination is impossible.
- the ecological aspect was also taken into account, resulting in a hydraulic/electric drive for the various components, empowered by 2 Stage V dieselgenerators. If less power is required, only one generator is in use, in order to reduce CO_2;
- the barge is equipped with a large hydraulic bunker in order to provide seagoing (container)vessels of f.i. magnesiumdoixide for their closed loop scrubbers. The barge can also take powders as (liquid) slurry onboard, so both commodities can be bunkered at same time.
- the barge is 4,500dwt.

Konecranes Gottwald cranes on barge to be operated off the coast of Guinea

Konecranes has successfully delivered two Konecranes Gottwald cranes on barge which will go into operation soon. The order was placed by Winning Logistic Company Limited in 2018. With these new cranes, Winning now operates eight such cranes on the open sea.

This cranes on barge concept contributes to the continuing growth of Winning's bauxite handling activities off the coast of Guinea, Africa. The cranes play a key role in the supply chain, transshipping bauxite from river barges to Capesize vessels on the open sea. Wang Chuanyang, Vice President, Winning Logistics explains: "Our existing cranes have proven themselves to be particularly productive and reliable in the very rough open-sea environment. This is why we have opted time and again for cranes on barge from Konecranes."

Giuseppe Di Lisa, Sales and Marketing Director, Mobile Harbor Cranes, Konecranes Port Solutions, says: "Konecranes Gottwald cranes on barge are derived from our mobile harbour crane technology and highlight our pioneering role in this field. The first cranes on barge went into operation on the Mississippi River in 2004. Thereafter, they quickly found their way to the open sea. Winning's decision to continue to rely on Konecranes Gottwald Cranes on Barge confirms Konecranes' leading role in this segment."

The Mississippi River's contribution to the success of Konecranes' cranes on barge cannot be underestimated. Customers had a strong demand for new bulk handling equipment as the existing equipment was quite old and thus not very efficient. And in addition, most of the manufacturers of these types of floating cranes were no longer present on the market.

Customers were looking for new high-performance equipment to realize a midstream ship-to-ship handling as in this region the quay space is very limited. Since that time more than 20 Konecranes Gottwald Cranes on Barge were sold to this region.

Built for use on the open sea, the Model 8 cranes on barge with a maximum outreach of 43m and a powerful 63t grab curve are designed in accordance with Lloyd's Register Code for Lifting Appliances in a Marine Environment. This allows them to operate at wind speeds of up to 24m/s and maximum wave heights of 2.5m. DCi

Introducing G2 Ocean

an exciting new joint venture

The jib crane vessel the Star Lygra is equipped with four jib cranes (photo: Stephen B. Morton).

G2 Ocean is a new joint venture, entered into between Gearbulk and Grieg Star. Gearbulk was established in 1968, and obtained its first open hatch vessel in 1969. Grieg is older, having been established in 1884, but it acquired its first open hatch vessel at around the same time, in 1965.

G2 Ocean has a major international presence, serving 32 trade routes on six continents. It operates 125 vessels (100 open hatch, 25 conventional bulk), and has a local presence in 15 locations, with regional hubs in Singapore, Rio de Janeiro and Bergen (HQ).

The company has 380 employees of 27 nationalities, and had a gross revenue of US$1,305.5 million in 2018.

G2 Ocean works on the principle of One Team – One way. It operates a decentralized business model and decisions are made as close as possible to the customer. It develops innovative services for its customers, and includes them in this process. Customer service is optimized by:

- experienced ship operators and staff ensure safe and efficient execution of voyages;
- a focus on building and strengthening relationships with key stakeholders;
- the same level of high quality customer service – every time.

The organization is very keen on safeguarding the environment, and makes great efforts in terms of sustainability. Examples of its commitment include:

- **improving fuel performance:** monitoring and reporting on CO_2, sulphur and NO_2 emissions; optimizing vessel scheduling; and hull and propeller cleaning.
- **plastic reduction:** over 200 employees participated in G2 Ocean's Plastic Cleanup Week in September last year; offices are plastic-free; and ambitious plastic reduction targets for itself and relevant suppliers.
- **equipment recycling:** all equipment will be recycled by 2022; and 17,300 web slings have been recycled since 2018.

Safety in focus

G2 Ocean identifies hazards and risks and implements controls to minimize these. It uses 'Safety Moments' at key meetings, and has have appointed Safety and Loss Prevention Representatives who are working to enhance its safety culture. It works continuously to strengthen its internal safety culture and its co-operation with partners to ensure safe operations.

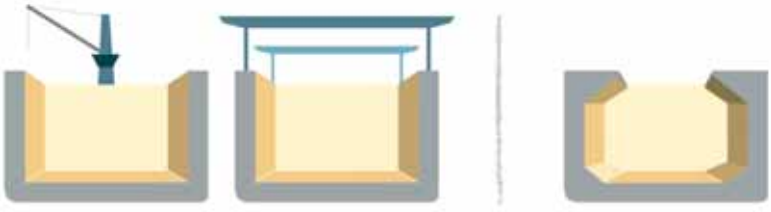
Innovation is key

G2 Ocean knows that the future is digital, and strives to use technologies in the most appropriate and forward-looking way. The company initiated over ten innovation projects in 2019, including the blockchain Bill of Lading project.

Issuing and distributing bill of lading using Blockchain

G2 Ocean is working on replacing the old, cumbersome system with a new web-based platform CargoX, which began trials early in 2019. The platform uses Blockchain to store, distribute and electronically sign the original bill of lading. G2 Ocean and CargoX are working with the international P&I Club for approval of the digital bill of lading amongst the P&I clubs. G2 Ocean has temporary P&I coverage during the pilot phase.

Comparing open hatch and conventional holds



Open hatch vessels **Conventional bulker**

Open hatch vessels have box-shaped holds, and the openings are as wide and long as the hold. On conventional bulk vessels, the hatch openings are smaller than the hold.

02 Ocean fleet

Open hatch vessels

Open hatch vessels differ from conventional bulk vessels, as they have box-shaped holds, and the openings are as wide and long as the hold, ensuring unobstructed lift. The hatch cover is one pontoon, which ensures watertight hatch openings. On conventional bulk vessels, the hatch openings are smaller than the hold, with the accompanying restrictions.

Gantry crane vessels

G2 Ocean's gantry crane vessels each have two gantry cranes, with a lifting capacity from 35–70 metric tonnes, depending on class. There is rain protection on most vessels. G2 Ocean's fleet comprises ten different ship classes.

Jib crane vessels

Each vessel has four jib cranes, with a lifting capacity from 36–75 tonnes, depending on class. Depending on the class (there are six different ship classes), there is the potential for tandem lift.

Tweendeckers

Some vessels have tweendeckers, which makes it possible to stow cargo on several levels, without damaging the bottom cargo.

Cargoes carried

The main commodities that are transported by G2 Ocean are wood pulp and other forest products, aluminium, steels, granite, and industrial minerals. Project cargo is an expanding business area of the company.

G2 Ocean Bulk

The bulk division of G2 Ocean operates approximately 25 vessels, including long- and short-term chartered vessels. Of these, it controls approximately twenty 25,000dwt to 82,000dwt vessels, and it trades worldwide. The company's geographical reach includes:

Europe/North America

- Europe – West Coast North America
- Europe – East Coast North America
- Europe – East Coast South America
- East Coast North America – Mediterranean
- East Coast North America – Europe
- East Coast North America – East Coast South America
- East Coast North America – Far East

Photo: Tage Karlsen.

G2 Ocean's gantry crane vessels each have two gantry cranes (photo: Port Matanee, Florida, US).

- East Coast North America – India
- Mediterranean – Europe
- Saint Lawrence – Europe

Pacific

- Australia – Far East
- Far East – Australia
- Far East – East Coast North America
- Far East – East Coast South America
- Far East – Europe
- Far East – Mediterranean
- Far East – South Africa
- Far East – West Coast South America
- Far East – West Coast North America
- India – East Coast North America
- India – West Coast

South America

- South Africa – Europe
- South Africa – Mediterranean
- West Coast North America – Far East South America
- East Coast South America – Europe
- East Coast South America – East Coast North America
- East Coast South America – Far East
- East Coast South America –

Mediterranean

- West Coast South America – Far East
- West Coast South America – Europe
- West Coast South America – East Coast South America.

Photo: Goutham Laximi.

Ships' Agents

Shipping's Proxy Servers

Nordic Odyssey, *MAG Ships Agent, coal cargo under discharging, Gdynia Port, HES Terminal.*

Jay Venter

MORSKA AGENCJA GDYNIA / Poland: Sea of Solutions

Morska Agencja Gdynia (MAG) was founded in 1951 and is one of the oldest companies involved in transport and logistics operating in the Polish market. Every day, the MAG team co-ordinates dozens of logistics and transport operations.

MAG represents foreign shipping lines, shipowners and insurance clubs (P&I) in Poland and is a member of The Baltic International Maritime Council (BIMCO) and The Ship Agent and Brokers Association at Gdynia.

For years, MAG has been a correspondent of protection and indemnity clubs. MAG works as an emergency agent for the benefit of foreign insurance associations, supporting them during the settlement of claims in sea transport.

In Polish ports and shipyards, the enterprise provides agency services for Polish vessels and foreign flags. Over time, the company extended its range of activity to include chartering ships, port operations and container shipments as well as an employment agency for Polish mariners on ships under foreign flags.

Ships' agency — ISO-certified activity

MAG operates in Gdansk, Szczecin, Swinoujscie, Darlowo and all other Polish sea ports and is an important player in the market.

The experienced team of MAG ship's agency is at the disposal of shipowners and ship crews calling at all Polish ports 24 hours a day during the whole year.

MAG's scope of activities includes, among others:

- assistance when vessels enter the port and when they set sail;
- supervision of port operations;
- organization of all repairs;
- inspections and controls;
- keeping of ship documentation;
- change of crew;
- assistance in emergencies which require e.g. medical care; and
- assistance in all forwarding and customs procedures.

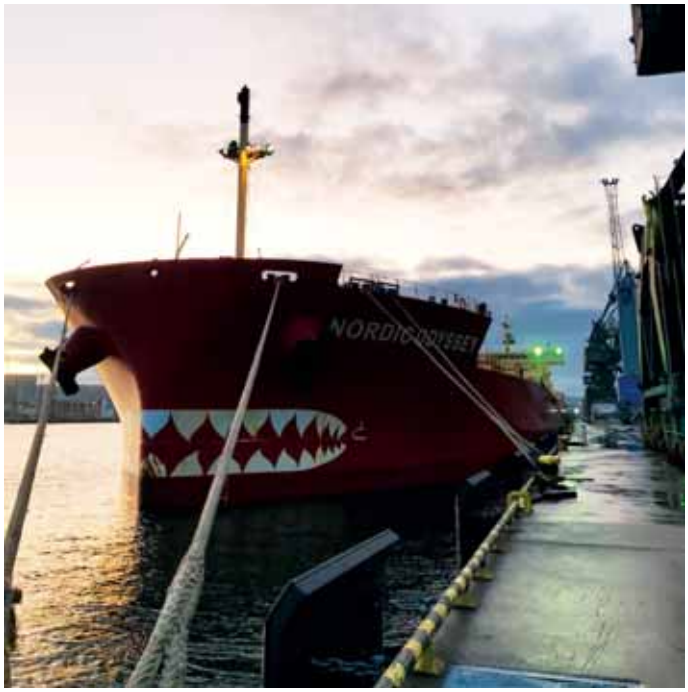
MAG as a ships' agency company providing customs clearance services, to ensure continuity of the logistic chain, secures professional cargo clearance both in ports and in its own bonded warehouses.

An important complementary and supportive part of the agency service is storage of various cargoes and its own transport activity.

MAG owns and leases warehouses in logistically strategic locations in Poland (including temporary and bonded warehouses), which makes cargo transport much easier and cheaper. They are top class facilities with high-storage racks, automatic constant temperature systems, advanced fire safety solutions, surveillance and 24-hour security service.

MAG complies with the EU HACCP standards, which enables it to store food products, such as, for example, grain, sugar or rice. MAG also stores a broad range of industrial goods and textiles and also offers many additional services, such as product distribution to the end client, quantity and quality control, packing and labelling of goods or container stuffing and unstuffing.

MAG, with its own means of transport, guarantees timely delivery and full independence of the transport chain. MAG's processes are supported by the recently implemented WMS, which enables full recording of operations and electronic



information exchange with its clients.

MAG ship agent in the Darlowo Port Terminal

In the middle of the Polish coast — in Darłowo — Morska Agencja Gdynia owns a universal terminal for small-sized ships. There, MAG acts as a ships' agent, organizes transloading and storage of grain, fertilizers, wood, aggregates, coal, steel as well as goods on pallets and in bags.

The Darlowo Port has its own handling wharfs, warehouses and paved storage yards. MAG offers comprehensive services to shipowner companies, forwarding companies and individual clients: land transport by rail and by road, transloading and sea transport to a specific port. The terminal has the ISO certificates, and the warehouses meet the sanitary and GMP standards.

The number of ships handled last year totalled over 1,150 making MAG the number one ships' agency in Polish ports — approximately 30% with bulk cargoes including aggregates, fertilizers, wooden logs, wood chips, grain, coke and coal, chemical products and wheat pellets.

The company strives to ensure the highest possible quality of services, thus gaining the confidence of shipowners and customers. This enables MAG to build long-term business relationships, emphasize representatives of the management board. "We make sure to always combine what is best in people — their professionalism and commitment — with the right choice of optimal techniques, methods and tools. The scale of our projects and our readiness to engage in pioneer undertakings result from our crucial ability to learn from our own, unique experience of nearly 69 years in business," says Michał Śmigielski, President of the Management Board and Krzysztof Laskowski, Vice President of the Management Board.

Colley West Shipping Ltd. – Vancouver-based Shipping Agency

Agency services

Formed in 1993, Colley West Shipping Ltd. is based in Vancouver, Canada. The company provides shipping agency services to both local and international clientèle.

As one of Vancouver's major agency companies, it attributes its success to its staff of highly trained and qualified industry people, as well as the implementation and maintenance of the ISO9001 international quality management system.

Colley West's experience ranges from a vast variety of inbound and outbound cargoes including grain, sulphur, coal, potash, vegetable oil, concentrates, forest product, and steel to name a few. The company's dedication lies in delivering professional, efficient and reliable service coupled with individual knowledge, experience, and most importantly, trust.

The Colley West team.

Formed in 1993, Colley West Shipping Ltd is a Vancouver based company that provides shipping agency services in all West Coast Canada ports for local and international clientèle.

Software for ships' agents supported with digitalization grant

Software solutions provider, Softship, has been selected as a 'pre-approved vendor' under the Maritime and Port Authority of Singapore's (MPA) Sea Transport Industry Digital Plan (IDP), a SG$3.7 million fund to support ships' agency and harbour craft businesses in Singapore to build stronger digital capabilities.

Softship is one of only two companies to be listed by the MPA as a pre-approved vendor and provider of a maritime-specific digital solution for small and medium sized (SME) ships' agency businesses seeking to upgrade their digital capabilities. The Sea Transport IDP and @SMEGoDigital Programme was established to provide SMEs with step-by-step guidance to support them in the adoption of new digital solutions and provides a list of vetted and approved maritime-specific digital solutions which qualify under the grant.

As Softship have been pre-approved, Singapore-based ship agency SMEs can access Sea Transport IDP funding for up to 70%, or up to SGD$30,000, of the cost of Softship's Advanced Port Agency Solution (Softship.SAPAS), a cloud-based software solution designed specifically for ship agency businesses. Softship.SAPAS allows ship agency businesses of any size to manage all port agency and husbandry activities through a single on-line platform, from any web-enabled device.

Lars Fischer, Managing Director, Softship Data Processing Singapore, said "Agents require software solutions that enable greater mobility so that staff can multitask, have better visibility over suppliers and transparency over accounting and customer relations.

They must upgrade from Excel spreadsheets and basic IT tools to more fluid, reliable and future-proof software solutions based on cloud technology. This will make it possible for them to have the same IT capabilities as even the biggest global players.

"The MPA has recognized the challenges that smaller and independent ship agency businesses face in what is a rapidly digitizing maritime economy — and they recognize how valuable these businesses and individuals are to the Singapore maritime economy. Under the Sea Transport IDP, eligible ships' agency businesses can benefit from this additional support and can continue to provide services that are vital to ship owners and operators calling at Singapore's ports, and beyond."

The Sea Transport IDP is a joint initiative between MPA and Infocomm Media Development Authority (IMDA), Enterprise Singapore (ESG) and SkillsFuture Singapore (SSG).

About Softship

Softship provides software solutions to the international shipping industry and port agency sector.

The company offers its Softship LIMA software suite and associated applications to serve the needs of liner shipping carriers; Softship ALFA, its software suite for liner agents; and Softship.SAPAS, a cloud-based software package for port agents.

Softship products serve more than 120 companies globally and are designed to streamline tasks in order to deliver greater efficiencies to the full list of processes that comprise shipping. Softship additionally provides a range of business management tools that allow shipping executives to fully analyse their commercial and operational activities.

Software is offered in a modular format which provides clients with a range of flexible licencing options. Software can be easily modified to meet specific market or company requirements and is delivered as a locally installed application or through a hosted or cloud-based solution.

Founded in 1989 and headquartered in Hamburg, Germany, Softship employs more than 140 industry experts across a global network, with offices in, Singapore, The Philippines and the USA.

Wilhelmsen Ships Agency expand operations in Brazil with new Fortaleza office

Opened early December 2019, the new Wilhelmsen office in the City of Fortaleza in Brazil serves both the Pecém Port, in São Gonçalo do Amarantes City, and Mucuripe Port, in Fortaleza City.

Taking the total number of Wilhelmsen ships' agency offices in Brazil to eight, running from Barcerena and Belém in the North, all the way to Paranaguá in the south, the new Fortaleza location will support customers' port calls to steel mills, thermoelectric mills and regasification units in the area. both in Ceará State.

Antonio Carvalho, Wilhelmsen Ships Agency Director, Americas says: "Our new office is in response to the rapid expansion of many cargo segments in the region, including dry bulk, breakbulk, liquid bulk and containers. Our customers wanted the same industry-leading expertise they receive from us elsewhere in Brazil, close at hand in Pecém and Mucuripe and this

new site will provide this 24/7."

Along with enabling better on the ground support to existing customers working with the region's major commodities, such as iron ore, coal and steel products, this new branch will also enable Wilhelmsen to capture further agency opportunities in a region.

Active in Brazil since opening their first site in 1976, Wilhelmsen Ships Agency support a wide variety of national and international customers with a full portfolio of husbandry, agency and logistics services.

In safe hands with Mentor Shipping

Mentor Shipping is a family-run Southern African shipping and transport agency.

The company strives to honour long-lasting client relationships and service excellence in every step of its clients' cargo journey.

The company is the appointed agents for many local and international shippers, and receivers and handlers of oils, chemicals, granite, project cargo including heavy lift cargoes and bulk shipments such as coal, maize, wheat and chrome ore.

History

Mentor Shipping Agency (Pty) Ltd was initially established in 1976 as a subsidiary of Devonia Shipping (Pty) Ltd. In April 1993, the company became fully independent with the shareholding being purchased by Graham Jones, then Managing Director. In June 2014, his son Mr Darryl Jones bought the company as sole director.

The Jones family have excelled at attracting the confidence of numerous prominent ship owners, traders, charterers and operators worldwide over the past two decades and have taken the company from strength to strength.

More recently, Mentor Shipping is proud to have expanded its role from being primarily a shipping agency to also include cargo handling, clearing, forwarding, transport and hospitality.

Service excellence

Mentor Shipping is proud to be the independent agent of choice for numerous vessels calling for discharge or loading of wet and dry cargoes and bunker or repair vessels at its Southern African ports.

Having offices at each port has proven highly beneficial to the company's Principals. Its teams of enthusiastic professionals provide service excellence at each port, whilst always ensuring that its Principals' interests are kept fully protected at all times.

Agency

Receiving and handling wet and dry cargo throughout Southern Africa and also in Mozambique's ports of Maputo and Beira.

As shipping agents, Mentor Shipping takes care of all the regular routine tasks of a shipping company professionally and efficiently. The company ensures all essential supplies, crew transfers, customs documentation, and waste declarations are all arranged with the port authorities without delay. It also provides the shipping company with updates and reports on activities at the destination port so that shipping companies have real-time information available to them while goods are in transit.

Transport

Mentor Shipping provides safe and efficient hospitality and transport for personnel.

From booking accommodation, to providing recommendations, to hosting and transport, Mentor Shipping will be there to assist with each step of the journey.

Clearing & forwarding

As a licensed clearing and forwarding agent, Mentor Shipping arranges customs clearance and pay taxes on the principal's behalf.

The company also ensures that all forwarding instructions are correctly documented, after which it arranges the safe and secure movement of the cargo to its destination.

Real time, on the ground knowledge with Wilhelmsen Ships Service ships' agent

Ships' agency

Providing full agency, husbandry and protective agency services in 2,200 port locations means there is always a Wilhelmsen Ships Service ships agent taking care of its Principals' interests, wherever in the world it is they do business.

Matching real time, on the ground, local knowledge and expertise with its strict operational standards, whether it is vessel, crew, cargo, or cash the company is looking after, its agents can be relied on to consistently make its clients' port calls as efficient as possible. Wilhelmsen Ships Service ships' agent uses its expertise to make its clients' everyday life more convenient with workshops and online tools.

Ms Teresa Yuen, Wilhelmsen GM Commercial, Liner Logistics, receiving the Technical Innovation Award on the company's behalf at the Seatrade Maritime Awards Asia 2019, held in Hong Kong last year.

Seatrade Maritime Asia Awards 2019 — Technical Innovation Award

Last year Wilhelmsen's Ships Agency received the Technical Innovation Award with its Agency by Air project.

2019's Seatrade Maritime Awards Asia was held in Hong Kong, with Wilhelmsen's GM Commercial, Liner Logistics – Ms Teresa Yuen, receiving the award on the company's behalf.

More details about this win can be found on the page opposite.

About Agency by Air

Wilhelmsen and Airbus trial world's first commercial drone deliveries to vessels at anchorage

Agency by Air is a collaboration between Wilhelmsen and Airbus in piloting the delivery of maritime essentials via unmanned aircraft system (UAS) from shore-to-ship. The UAS is an innovative system-of-systems that includes aviation-standard UAVs, ground control stations, weather monitoring, air navigation systems, operational and maintenance procedures.

The first trial flight took place in Singapore in March 2019, with the drone autonomously navigating along pre-determined aerial corridors for 1.5km and depositing its 1.5kg cargo of 3D printed consumables onto Swire Pacific Offshore's AHTS vessel. This marks the first time in the world that shore-to-ship drone delivery technology is deployed in real port conditions, setting the benchmark for the global maritime industry on operational feasibility, technology development and regulatory framework.

Commenting on the successful first delivery flight, Johansen, said, "The now proven, seamless operation of drone deliveries from shore-to-ship, in one of the world's busiest ports, proves the hard work, investment and faith we, and indeed our partners, placed in the Agency by Air drone delivery project over the past two years was not misplaced".

Operations began with a Toolbox Talk with the Wilhelmsen, Airbus and SPO crew to ensure that the risk assessment was understood by all parties. With final safety checks completed, Wilhelmsen's Marina South Pier team loaded the drone. Supported by spotters stationed on board the vessel deck to ensure the safety of the crew and vessel, the drone took off towards the vessel, landing on the dedicated area on the main deck where the parcel was retrieved by the officer on board.

Offering a more cost effective, quicker and safer means of delivering, small, time-critical items to vessels, Wilhelmsen sees delivery by drone, rather than launch boat, as part and parcel of their continued evolution of the agency business.

Johansen added, "Delivery of essential spares, medical supplies and cash to Master via launch boat, is an established part of our portfolio of husbandry services, which we provide day in and day out, in ports all over the world. Modern technology such as Unmanned Aircraft Systems (UAS), is just a new tool, albeit a very cool one, with which we can push our industry ever forward and improve how we serve our customers".

GAC awarded Ship Agency of the Year at The Maritime Standard Awards 2019

The GAC Group has won the Ship Agency of the Year title in the Middle East and Indian Subcontinent's premiere shipping and maritime awards event, The Maritime Standard Awards 2019, held in October last year.

GAC's award recognizes it as the agency that has made the greatest contribution to the shipping industry in the Middle East and the Indian Subcontinent, measured across a range of variables including customer service, efficiency, network outreach, new products and services launched, and new business secured.

"The maritime industry is experiencing a profound period of change and therefore, service providers have to navigate more factors than ever before", says Fredrik Nyström, Group Vice President – Middle East.

"This award is testament to GAC's clear strategy for responding and adapting to changes in line with customer demands. As the world's leading provider of ship agency services, we will continue to listen to customers, innovate and develop new products, services and technology to help them thrive in today's competitive market."

About GAC Ship Agency

Representing more than 3,500 Principals and handling over 96,000 jobs annually, GAC is alongside to ease the way for its clients' vessels plying the world's shipping lanes.

One agent, global coverage

The GAC Group is one of the few global organizations with the resources, reach, expertise and infrastructure to support shipping operations on a local, regional and global scale.

Its global network of four regional hubs, 300 owned offices and trusted partners elsewhere covers thousands of locations worldwide. The group's 24/7 operations are backed by in-depth local expertise and excellent relations with port authorities for fast and efficient vessel turnaround.

GAC's range of international shipping services caters for all kinds of vessels, from container ships, bulk cargo carriers, Ro-Ro vessels and tankers to cruise liners and superyachts; and all cargo types from grains, cement, steel, minerals to crude, LPG and chemicals.

GAC has an extensive range of complementary services covering global hub agency, husbandry, bunker fuel supplies, ship spares logistics, underwater hull cleaning, weather routing and more. Whether you're controlling an entire fleet or a single vessel, its comprehensive portfolio of services can be tailored to its client's needs.

Wilhelmsen wins Technical Innovation Award at Seatrade Maritime Asia Awards 2019

Last year Wilhelmsen announced that its ships' agency has successfully clinched the Seatrade Maritime Awards Asia – Technical Innovation Award, with its Agency by Air project.

Last year's Seatrade Maritime Awards Asia was held in Hong Kong, with Wilhelmsen's GM Commercial, Liner Logistics Teresa Yuen, as its representative, receiving the award on the company's behalf.

Marius Johansen, VP Commercial of Ships Agency said "It is a genuine, but completely unexpected honour to win this award and especially when I look at the innovations developed by the forward-leaning companies in this category.

"When we announced two years ago that we would be using drones, rather than launch boats, to deliver essential spares, medical supplies and cash to Master, many in the industry likely dismissed the idea as nothing more than a marketing stunt."

"As we celebrate Asia's Maritime Excellence together, this award will serve as a constant reminder for us to continue our active role in innovating digitally and remain at the forefront of competitiveness. As one of the important industry players, we will strive to push more boundaries' and create even more value in the heart of our operations and customers with our digital transformation."

About Agency by Air

Agency by Air is a collaboration between Wilhelmsen and Airbus in piloting the delivery of maritime essentials via unmanned aircraft system (UAS) from shore-to-ship. The UAS is an innovative system-of-systems that includes aviation-standard UAVs, ground control stations, weather monitoring, air navigation systems, operational and maintenance procedures.

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This marks the first time in the world that shore-to-ship drone delivery technology is deployed in real port conditions, setting the benchmark for the global maritime industry on operational feasibility, technology development and regulatory framework.

Quequén posts third best year ever for traffic

In Argentina, the Port of Quequén handled a record 312 vessels in 2019, which transported more than 7mt (million tonnes). However, in terms of tonnage, 2016 remains the best ever year, when 7.5mt were handled, followed by 2012 with 7.033mt.

All main commodities shipped were agribulk, with soyabeans (1.75mt), corn (1.4mt) and wheat (1.078mt) being the leading three.

In terms of companies, COFCO International (1.6mt) was the main exporter, followed by Asociación de Cooperativas Argentinas (ACA), which shipped more than 1mt.

Deepening the draught to 15 metres helped keep the port open longer whilst also improving nautical safety. Prior to dredging work commencing, Quequén had just 267 operational days in 2014, with wind shutting down operations on 32 days. Compare this to last year, when the port was open for operations during 309 days, closing for 21 days because of high winds. *Barry Cross*

Vale re-signs with Wilson Sons Agency

Wilson Sons Agency has been engaged by Brazilian mining company Vale to service its vessels in the ports of Ponta da Madeira, Itaguaí and Tubarão.

Luiz Maluza, Business Manager at the agency, noted, "The expectation for 2020 is very positive. It is not the first time that we have served Vale and this new contract reinforces our partnership."

Indeed, the current forecast is that Wilson Sons will look after a monthly average of 20–25 vessels, each of which will be transporting consignments of up to 150,000 tonnes of iron ore, mainly to China.

Vale chose Wilson Sons because of its existing presence in all three ports and also because of price and quality of service, according to Maluza.

Wilson Sons is Brazil's largest independent maritime agency, with 18 branches in Brazil. In 2019, it provided services for more than 1,500 vessels, handling commodities such as ore, coal, steel, sugar, grain, fertilizer, liquids bulk, as well as vessels for the offshore segment and passenger ships. *Barry Cross*

Overall Russian maritime traffic up in 2019, despite dry bulk decrease

In 2019, Russian maritime ports handled 840.3mt (million tonnes) of cargo, which was an increase of 2.9% on 2018. Exports totalled 654.0 (+4.9%), imports 37.2mt (+2.8%), transit cargo 67.2mt (+4.5%), and short-sea traffic 81.8mt (–11.9%).

Port of Vostochny.

Dry bulk accounted for 376mt, equivalent to a decrease of 3.0%. In this total, there were 176mt of coal (+9.0%), 38.6mt of grain (–30.9%), 26.7mt of ferrous metal (–12.6%), 18.9mt of mineral fertilizers (+6.3%), 8.9mt of ore (+29.4%), and 5.1mt of timber (–7.8%).

Ports in the Arctic Basin handled 104.8mt, up 13%, of which dry bulk accounted for 31.7mt (+4.1%). Murmansk handled 61.9mt (+2.0%), Sabetta 27.7mt, Varandey 7.2mt (+2.3%), and Arkhangelsk 2.7mt (–3.0%).

Ports in the Baltic handled a combined 256.4mt (+4.1%) including 110.2mt of dry bulk (+0.4%). The port of Ust-Luga handled 103.9mt (+5.2%), Primorsk 61.0mt (+14.1%), St. Petersburg 59.8mt (+0.9%), and Vysotsk 19.4mt (+3.3%).

In the Azov-Don region, ports handled 258.1mt (–5.2%), which included 96.1mt of dry cargo (–19.4%). Here, Novorossiysk handled 156.8mt (+1.3%), Tuapse 25.2mt (–1.5%), Kavkaz 20.9mt (–30.6%), Rostov-on-Don 16.0mt (–4.1%), and Taman 15.0mt (+6.2%).

On the Caspian Sea, traffic amounted to 7.4mt (up 1.5 times), including 2.8mt of dry bulk (+4.2%). The best performer was the port of Makhachkala, with 4.7mt (up 1.9 times), followed by Astrakhan with 2.2mt (+13.7%).

Finally, in the Russia Far East, maritime ports reported traffic of 213.5mt (+6.5%), of which 135.3mt was dry cargo (+7.8). As always, Port Vostochny led the way with 73.5mt (+6.2%), followed by Vanino with 31.4mt (+6.6%), Nakhodka 25.6mt (+5.3%), Vladivostok 23.9mt (+13.1%), De-Kastri 13.6mt (+7.5%), Posiet 7.7mt (+8.3%), and Prigorodnoye 16mt (–5.8%). *Barry Cross*

AGD opens Timbúes river terminal

Cereals company Aceitera General Deheza (AGD) says that it has completed its investment programme begun in March 2017, which has resulted in the construction of a new river terminal at Timbúes. In total, the company has put $120 million into its Argentinean projects, with a final $7.5 million spent on this new terminal.

The port, which is situated on the banks of Coronda River, can accommodate either ocean-going vessels or barge traffic. In terms of capacity, it is expecting to handle around six million tonnes of grain annually, with a static holding capacity in the port of 250,000 tonnes.

As for access, it is forecasting traffic of up to 1,200 trucks per day during peak periods and will also have a branch line to the Belgrano Cargas railway. *Barry Cross*

Bergé Marítima awarded new Bilbao dry bulk concession

Bilbao Port Authority has awarded Bergé Marítima Bilbao a concession to operate an additional 26,269m² area on Princesa de España Quay, which is situated in the Santurtzi zone of the port. The 25-year concession, which could be extended, specifies that the space must be used for dry bulk handling traffic.

Within the port, Bergé Marítima already handles a variety of cargo traffic: dry bulk, general cargo, project cargo, containers and rolled cargo. It has 22,100m² of covered operating area and 561,500m² of open air handling. This latter area is additionally equipped with 70,892m² of covered warehousing and 125,847m² of open storage across various commodities.

The company has a further presence in 26 different ports. *Barry Cross*

Vostochny doubles coal export capacity

In Russia, more than 300,000 tonnes of export coal was shipped from the Phase 3 expansion development of Vostochny Port's coal terminal, following its official launch. President Vladimir Putin was present at the first vessel loading, as was India's Prime Minister Narendra Modi, since the very first shipment was bound for India's JSW Steel Ltd.

The Phase 3 development, which is Russia's most ambitious private investment project, cost $652 million and was implemented as part of a public - private partnership, albeit not involving state financing. It effectively doubles annual throughput from 25mt (million tonnes) to 50–55mt.

In 2018, Vostochny Port handled 24.3mt of cargo. *Barry Cross*

Infrastructure upgrades at the Port of Indiana-Mount Vernon

Port of Indiana-Mount Vernon is completing a $2 million capital investment in the port's general cargo terminal, including a new overhead gantry crane and concrete floor to make the terminal an asset for generations.

The new overhead gantry crane will have a 60-tonne capacity, and can be used for transloading any general cargo between barge, rail, truck and warehouse. The terminal has been recognized as one of the best on the U.S inland river system for handling "container on barge" shipments.

The Port of Indiana-Mount Vernon, located on the lower Ohio River, offers year-round access to the Gulf of Mexico and the Great Lakes through the US inland waterways system. The port provides efficient global access and multimodal connections and is ideal for companies seeking transportation alternatives and improving overall logistical costs.

Port of Indiana-Mount Vernon is the sixth-largest inland port in the US, and handles nine million tonnes of cargo, primarily serving agriculture, energy, construction and manufacturing industry sectors. Also, the Port of Indiana-Mount Vernon has nearly 1,240 acres of land and 8,000 linear feet of riverfront, with more than 600 acres of greenfield industrial sites available for development.

The port offers existing infrastructure with the capabilities to efficiently handle both general cargo and bulk commodities by barge, rail and truck modes. Regarding recent investments, the Port of Indiana-Mount Vernon is completing a $2 million capital investment in the port's general cargo terminal including a new overhead gantry crane and concrete floor — to make the terminal an asset for generations.

The new overhead gantry crane will have a 60-tonne capacity, and can be used for transloading any general cargo between barge, rail, truck and warehouse. The crane is well-suited to handle steel coils. As well, the terminal has been recognized as one of the best on the US inland river system for handling 'container on barge' shipments to which Ports of Indiana is actively marketing.

The new overhead crane was manufactured in the US near Milwaukee, WI., by Zenar Corporation. Local construction company, TMI Mechanical Contractors, is assembling the crane which is scheduled to be complete and operational by the end of February. The crane will be operated by Consolidated Terminal and Logistics Company (CTLC), a long-time port company and general cargo terminal operator.

Earlier in 2019, the port updated the floor of its general cargo terminal, which will bring the 40-year-old facility to a nearly like-new condition. The new 53,000ft^2 transit shed floor is constructed to sustain load-bearing capacity to accommodate the maximum weights of any general cargo. The port awarded Rivertown Construction, a southwest Indiana company, the contract for the installation of the transit shed floor.

"The planned capital projects are a key component of our targeted marketing strategy to attract a steel-related facility to the Port of Indiana-Mount Vernon's 544-acre megasite," said Ports of Indiana-Mount Vernon Port Director Phil Wilzbacher.

This port is poised for significant growth and among its available sites is a 544-acre megasite positioned for a company to live for the next 50-plus years. Additionally, the port offers long-term sustainable advantages, a favourable business climate, smaller specialized sites, and synergies with port companies.

TMGA requests additional land in La Coruña's Outer Harbour

Marine Terminals of Galicia (TMGA) has requested additional land in the Port of La Coruña's Outer Harbour.

The terminal operator already has two concessions there, totalling 30,000m^2, which are used to handle both dry bulk and general cargo. However, with business growing, it needs a further 12,884m^2 where it plans to build an additional two warehouses and an auxiliary road, which will take up almost 43,000m^2 of surface area.

To date, La Coruña's Outer Harbour, which opened in 2012, is home to 13 terminal concessions, all operated by private companies. Between them, they have invested around €220 million. With the extensions requested by TMGA and liquid bulk operator Oleosilos, the total area given over to concessions will amount to 293,000 square metres.

As demand rises, the port authority has opened more land, with a new 350-metre berth due to enter service in 2020, bringing the total berthing line to 1,500 metres.

Barry Cross

Coal terminals in the spotlight

Multi-purpose terminal, HES Gdynia Bulk Terminal, is located at the main entrance of the Port of Gdynia (Poland).

Jay Venter

HES Gdynia Bulk Terminal ready for 2020

HES Gdynia Bulk Terminal (former Maritime Bulk Terminal Gdynia) is a multipurpose terminal, located at the main entrance of the Port of Gdynia (Poland). It provides services in reloading and storing of bulk commodities like coal, coke, grains, feedstuffs, biomass, sugar, minerals, aggregates, fertilizers. It also handles liquid cargoes, including fuels and chemicals of the 3rd, 6th, 8th and 9th classes according to IMDG Code.

Developments follow each other in quick succession at HES Gdynia Bulk Terminal. In March 2019, the name has changed from MTMG (Maritime Bulk Terminal Gdynia Ltd) to 'HES Gdynia Bulk Terminal'. This change has been implemented to associate the company name with the group of HES International that the terminal is a member of. A few months later, HES Gdynia announced an impressive expansion of the crane fleet. The terminal ordered two new cranes and a mobile covered conveyor belt to add to its existing equipment.

The first crane — the Gottwald 6 — can be used with vessels up to post-Panamax and Capesize Bulker class, and is suitable for handling different kinds of dry bulk products. It has a reach of about 51 metres and its maximum lifting capacity is about 120 tonnes. The mobile crane is able to operate on the different terminal quays. It is equipped with a range of features that improve productivity and eco-efficiency. Very appreciated advantages of this model are the constant performance data monitoring, diagnostics messages and a better availability of spare parts, which can be procured locally. The crane is equipped with two grabs: one for soya bean meal (34,2m^3) with high enclosed environmentally friendly shells and another one for coal (28m^3). The Gottwald 6 has been operational since the beginning of January 2020.

The second crane is the Ardelt rail grab-hook crane. Parts of this 40-tonne crane were delivered in September 2019 and now the crane is being assembled on the terminal's quay. By the end of first quarter of 2020 the Ardelt crane is planned to be operational.

In general, this constant investing in new handling equipment and new grabs further increases operational efficiency by:

- reducing the number of single transshipment operations (to protect the environment and neighbourhood from dust); and
- enabling a higher daily handling rate.

It is also worth mentioning that, in 2019 the terminal achieved two new certificates: the ISO 45001 accreditation — among the first companies in Poland to attain the new ISO certificate — and AEO (Authorized Economic Operator).

ISO 45001 is an international standard that aims to improve organizations' occupational health and safety (OH&S) systems. There are a number of benefits to be gained by attaining the standard, including; increased awareness of OH&S

The Gottwald 6 in operation at HES Gdynia Bulk Terminal.

risks, employees taking a more active role in OH&S and, most importantly, a reduced risk of incidents.

AEO is an internationally recognized accreditation that indicates a company's role in the supply chain is secure and reliable, and that any Customs controls and procedures are efficient and compliant. The AEO concept is based on the Customs-to-Business partnership introduced by the World Customs Organization (WCO).

With this certificate HES Gdynia is now entitled to enjoy benefits throughout the EU. This way the terminal is even more capable of meeting the customers' demand, for example time savings and smoother inspection port procedures.

In recent years HES Gdynia also obtained ISO 22000:2005 (FSMS), GMP+B3 and concession for the handling of liquid fuels.

Finally, this year HES Gdynia will be celebrating its 25th anniversary. The terminal is well equipped for the future and looks forward to the next 25 years.

Coal throughput at Vostochny Port rose 5.2% to 25.51mt in 2019

Vostochny Port JSC is Russia's largest specialized terminal with high-tech coal transshipment.

In 2019, Vostochny Port JSC, operator of Russia's largest dedicated terminal offering technologically advanced transshipment of coal (run by Port Management Company, PMC LLC) handled 25.51mt (million tonnes) of coal (+5.2%, or +1.25mt year-on-year), says the press centre of the stevedoring company.

According to the statement, the growth was driven by the launching of Phase 3 of Vostochny Port's specialized coal terminal, increasing the terminal's total capacity to 50–55mt per year.

In 2019, Vostochny Port handled 552 dry bulk cargo carriers of different capacities, including 23 Capesize ships and 333 ships of Panamax and Post-Panamax type, 1.4 times more than in 2018. The largest ship handled by the company was *Aquamarine* (DWT: 182,100 tonnes, LOA: 292 metres, beam overall: 45 metres) involved in exports of Russian coal to China. The shipload was as large as 152,000 tonnes of premium quality coal.

In the reporting period, unloading of open-top railcars exceeded 349,000 units, up 7.5% versus the result of 2018 (325,000 units). The positive dynamics in handling of railcars should be attributed to the launching of the new empty railcars departure facility under the Phase 3 project.

Yard B of general use at Nakhodka-Vostochnaya station was built at the cost of Vostochny Port and handed over to Russian Railways for servicing all companies in the Bay of Vrangel.

In the reporting period, the company exported coal to S. Korea (31%), Japan (29.2%), Taiwan (17.5%), China (5.4%).

Among the new promising destinations, the Republic of India is interested in Russia's coking coal. The country's share of Vostochny Port's exports increased from 6.5% in 2018 to 10.3% in 2019. Vostochny Port is among the most competitive coal terminals in the Far East, with its advantageous geographic location and equipment, hi-tech transshipment of coal and loading of large-capacity ships, as well as the highest level of industrial ecology among coal ports of Russia.

Vostochny Port JSC (Vrangel settlement, Primorsky Region) is Russia's largest specialized terminal with high-tech coal transshipment.

Vostochny Port is a free access facility open for all coal manufacturers of Russia. In 2019, it handled 25.51mt of cargo.

The terminal features covered stations for unloading and transfer of coal, conveyor equipment, rotary car dumpers, shiploaders and the second-to-none system of multi-stage magnetic coal separation.

Vostochny Port is the first coal port in the Far East that obtained a certificate of compliance with ISO 14001:2015 'Environmental Management System: Requirements and Application Guide'. The certificate confirms the company's compliance with both Russian and international requirements on environmental risk management.

Phase 3 of Vostochny Port's coal terminal put into operation in early September 2019 is the most ambitious private investment project costing over RUB 40 billion and implemented through public private partnership without involving state financing.

Phase 3 allows for the terminal to increase its annual throughput to 50–55mt. The Phase 3 project has generated more than 600 new high-skill jobs. By 2026, the project will ensure a total of RUB 25 billion of tax payments that will give a powerful impetus to the social and economic development of the Primorsky Territory.

Teck and Ridley Terminals announce agreement

On 8 January 2020, Teck Resources Limited announced an expanded commercial agreement with Ridley Terminals Inc. (RTI) for shipments of steelmaking coal from Teck's British Columbia operations.

The agreement runs from January 2021 to December 2027, and increases contracted capacity from 3mtpa (million tonnes per annum) to 6mtpa with an option for Teck to extend up to 9mtpa. This will enable Teck to increase its shipment volumes through the Ridley terminal to provide greater flexibility and improved performance within its overall steelmaking coal supply chain.

"This agreement with Ridley Terminals, in combination with upgrades underway at our Neptune Terminal and our recent agreement with CN, will contribute to improved overall performance throughout our steelmaking coal supply chain," said Don Lindsay, President and CEO of Teck. "We are looking forward to building on our strong working relationship with RTI and new principal owners Riverstone-AMCI to safely and efficiently transport our product to customers."

"Teck is a long time, valued customer of RTI," said Robert Booker, Chief Executive Officer of Ridley Terminals Inc. "This agreement further solidifies our strong relationship and demonstrates our commitment to our customers to provide fast, efficient, and reliable service. RTI is proud to be a part of Teck's long term development plan and vision."

The terms of the agreement are confidential.

Ridley Terminals, Prince Rupert BC, Canada.

Forward-looking statements — Teck

This press release contains certain forward-looking statements within the meaning of the United States Private Securities Litigation Reform Act of 1995 and forward-looking information as defined in the Securities Act (Ontario). Forward-looking statements and information can be identified by the use of words such as 'expects', 'intends', 'is expected', 'potential' or variations of such words and phrases or statements that certain actions, events or results 'may', 'could', 'should', 'would', 'might' or 'will' be taken, occur, or be achieved. Forward-looking statements include statements regarding increased shipment volumes through Ridley terminal, and expected greater flexibility and improvement in overall performance throughout Teck's steelmaking coal supply chain.

Forward-looking statements involve known and unknown risks, uncertainties and other factors, which may cause the actual results, performance or achievements of Teck to be materially different from any future results, performance or achievements expressed or implied by the forward-looking statements.

Factors that may cause actual results to vary include, but are not limited to, operational difficulties including those caused by inclement weather, failures in performance of other logistics providers, including rail service providers to Ridley terminal, unplanned disruptions in transportation and terminal services, changes in general economic conditions, permitting issues or changes in laws or regulations, failures in performance by contractual counterparties, and other risk factors as detailed from time to time in Teck's reports filed with Canadian securities administrators and the U.S. Securities and Exchange Commission.

Certain of these risks are described in more detail in the annual information form of Teck and in its public filings with Canadian securities administrators and the U.S. Securities and Exchange Commission. Teck does not assume the obligation to revise or update these forward-looking statements after the date of this document or to revise them to reflect the occurrence of future unanticipated events, except as may be required under applicable securities laws.

About Teck

Teck is a diversified resource company committed to responsible mining and mineral development with major business units focused on copper, steelmaking coal, zinc and energy. Headquartered in Vancouver, Canada, its shares are listed on the Toronto Stock Exchange under the symbols TECK.A and TECK.B and the New York Stock Exchange under the symbol TECK.

About Ridley Terminals Inc.

Located in Prince Rupert, British Columbia, Ridley Terminals Inc. is a multi-commodity bulk terminal, handling Canadian metallurgical and thermal coal, petroleum coke, and liquefied petroleum gas from British Columbia and Alberta, Canada. Ridley Terminals is uniquely positioned as the closest North American bulk terminal to Asian markets, resulting in faster sailing times. Ridley Terminals Inc is owned by Riverstone Holdings LLC, AMCI Group, and a limited partnership of the Lax Kw'alaams Band and the Metlakatla First Nation.

Its 9,000 tonnes per hour shiploading system is the fastest on the West Coast and its berth can handle Capesize vessels up to 250,000dwt. DCi

First Liebherr portal slewing crane in the US

In autum 2019 Liebherr Maritime Cranes handed over the first rail mounted gantry harbour crane to the United States of America.

The customer North Carolina Ports (NCP) opted for a Liebherr LPS 420 with a special designed curve running gear for its terminal at the Port of Morehead City.

The special design of NCP's terminal required the crane to be ready for operation at all quay edges of the rectangular terminal. To ensure this, the rail-mounted gantry crane was equipped with a special curve running gear. This allows the crane to travel through a 90° bend with an inner curve radius of 90 metres.

A special curve running gear enables the crane to travel through a 90° curve with an inner curve radius of 90 metres.

"The addition of the new LPS 420 rail-mounted gantry crane at the Port of Morehead City represents North Carolina Ports' commitment to investing in the future and long-term success of the port, its customers and the North Carolina economy. The new crane will enable us to more efficiently handle a diverse range of cargoes and ultimately better meet customer demand," says Paul J. Cozza, North Carolina Ports Executive Director

Multi-purpose crane

The Port of Morehead City is a breakbulk and bulk facility, is one of the deepest on the United States East Coast, and it's just four miles from the Atlantic Ocean. Therefore, the new LPS 420 is equipped as a multi-purpose crane and will be used by North Carolina Ports mainly for handling grain and fertilizer. It is also used for various project cargoes, including parts of wind turbines, trains and rails. The crane was shipped fully assembled. This means, no time-consuming assembly was required on site and the crane was ready for operation shortly after unloading.

About North Carolina Ports

North Carolina's ports in Wilmington and Morehead City and Charlotte Inland Port link the state's consumers, business and industry to world markets and serve as magnets to attract new business and industry to the State of North Carolina. Port activities contribute statewide to more than 87,700 jobs and $678 million each year in state and local tax revenues.

Max Aicher Umwelt uses a SENNEBOGEN 835 mobile material handler to process slag

Indispensable to the steelworks and also to the recycling system

Steelworks processes are finely coordinated and timed with each other — from the delivery of old scrap, to smelting and right through to loading steel products and processing slag, the system is reliant on constant functionality. Machine downtime means congestion in the flow of the system, or even a complete standstill. To prevent this happening, Max Aicher Umwelt in Meitingen, which processes slag for Lech-Stahlwerke, has gone with its long-standing, tried-and-tested method and acquired its third successive green machine, the new SENNEBOGEN 835 mobile material handler.

For the last 34 years, Max Aicher Umwelt GmbH has been an important part of Lech-Stahlwerke in Meitingen. The site, which employs 25 people, processes all the steelworks' co-products and by-products, in particular the electric arc furnace slag (EAFS). In this way the company sustainably contributes to the reuse of the lava-like, solidified molten material as a construction material in many different areas. For example, when it comes to building roads, slag is a welcome alternative to gravel and grit. The slag as a by-product is thus recycled and conserves natural resources. Max Aicher Umwelt processes 200,000 tonnes of electric arc furnace slag annually on its 35,000m² site in Meitingen.

"A standstill on our site can, in a worst case scenario, lead to a standstill across the whole steelworks. When we are buying machines, a 24-hour all-round machine service is absolutely essential for us!" says Benjamin Kinlinger, Division Manager of EAFS Processing at Max Aicher Umwelt in Meitingen. With the SENNEBOGEN sales and service partner Fischer & Schweiger the ideal support could be found: thanks to their proximity they can react quickly and reliably in an emergency.

Safe, fuel-efficient, robust!

As well as being reliable, the mobile material handling specialist is a multi-functional, powerful, and, above all, robust machine that is used in Meitingen with a magnet and an orange peel grab. It sorts, for example, larger and smaller pieces of slag weighing up to ten tonnes. A 231kW diesel engine, configured to meet stage V emissions standards, drives the huge undercarriage and all the work processes. One highlight: using just 13.9 litres of diesel per hour, the 45.5 tonner's thriftiness has impressed those on site. "You can only really judge a machine's consumption rate once it has been bought and put to work in real conditions. But even here SENNEBOGEN keeps the promises made in advance," explains Kinlinger.

As the name suggests, the diesel machine's efficiency is down to the SENNEBOGEN Green Efficiency principle. The hydraulic oil flow rate is optimally adjusted to the tasks being carried out by the machine, and, depending on the power required, the right amount of oil is pumped through the large-scale pipes to achieve the best level of efficiency. In addition, the machine has series standard in-built automatic idle and stop functions that reduce and/or completely halt consumption when the machine is not in use for brief periods of time. This means that the machine can always be operated in a fuel efficient way, without direct input from the operator.

SENNEBOGEN 835 E series: sorting slag for further crushing into grit measuring less than 150mm.

Bedeschi installs long belt conveyor system at Lafarge Holcim Maroc

Bedeschi S.p.A. is an industrial design and manufacturing company located in Padua, Italy; it was founded in 1908 and has been operating globally for several decades now. In addition to its original brick business unit, Bedeschi can now supply machinery and complete plants for bulk handling, marine, gas cleaning and container logistics.

One of Bedeschi's major projects is currently in the installation phase. Installation works are well under way at Bedeschi's Lafarge Holcim Maroc project site in Souss, Morocco. Following an intense civil work phase, during which the single trusses were preassembled and equipped with the mechanical components, the 4.3km long-distance belt conveyor is starting to take shape. The site team is taking full advantage of Trimble Connect to facilitate the erection works. Bedeschi is designing, executing and delivering every component of this outstanding turnkey project.

Hard environments, high slopes and difficult accesses are not insuperable obstacles in the face of smart solutions.

The conveyor, which trusses up to five tonnes completely assembled on the ground, has been erected on the mountain using a suspended cableway. The system, installed and operated by Bedeschi's team alongside partner SEIK, allowed for fast-track operations with high degree of safety and quality.

This advanced methodology allowed Bedeschi to carry out the installation within a tight schedule and with limited impact on the local environment, to the full satisfaction of the end client. Bedeschi is grateful to its entire team for the effort and dedication to achieve the target.

Bedeschi confirmed its reliability as an EPC contractor for the material handling sector and continues to grow and expand its expertise by the usage of technologies and innovation. The company is proud to share such a smart strategy to erect a long belt conveyor on mountains.

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Continental's closed-trough conveyor system overcame complex infrastructural and geographic hurdles across its 8.1km route through the coal mine in Yangquan, with many tight bends and extreme angles of inclination, protecting the environment from dust emissions in the process (© Continental/YanKan Coal).

Louise Dodds-Ely

Closed-trough conveyor belts ensure energy-efficient and low-dust coal transport in China

In Yangquan, northern China's Shanxi province, Continental is using a closed-trough conveyor belt system to ensure the smooth and environmentally friendly extraction of pit coal. The closed system minimizes dust emissions at operator YanKan Coal's mining site, and is also fireproof and has low rolling resistance, making it particularly energy-efficient. The system, which is one of the longest closed-trough conveyor belt systems in China, covers a distance of 8.1 kilometres.

Be it smartphones, tablets, gasoline and electric drives, buildings, machinery and vehicles, or even their production sites; they all have one thing in common: they all need energy and raw materials in order to be produced and operated. Oil and natural gas, precious metals, rare earths, iron ores as a raw material for steel processing and of course coal, are mined, collected and extracted around the globe. In China, coal serves as a major source for national energy production, making it the most important resource for covering the country's vast energy requirements. The densely populated country has developed tremendous demand for energy due to rapid industrialization, its booming economy and the associated standard of living in recent decades. And there is plenty of coal in China; in particular, the autonomous Inner Mongolia and Shanxi regions in the north of the country have large deposits of the fossil fuel. The People's Republic currently covers about 60% of total energy production by mining it*. This makes the People's Republic one of the largest producing countries in the world.

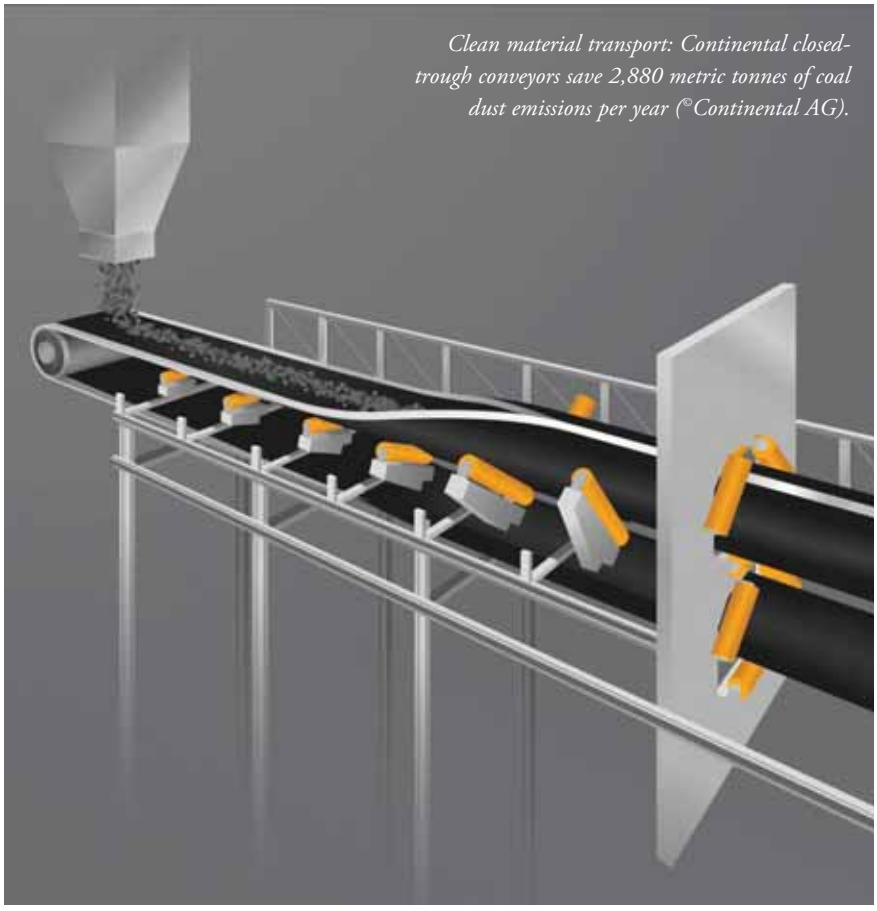
Making coal mining environmentally friendly while at the same time investing in the expansion of renewable energies are important aspects of China's energy policy. This is where the products from Continental help.

* *(source: Reuters)*

Clean material transport for better air and added safety

In China, as is the case around the globe, it is all about balancing the energy needs of the population and industry on the one hand, with climate change mitigation on the other. "For the operators of mining facilities, the fundamental question is which technical solution is the safest, most reliable and cost-effective method of transporting coal and other raw materials from the perspective of climate protection and energy efficiency," says Stephan Weisgerber from Continental in China.

The operator of the coal mine, YanKan Coal, in the northern Chinese province of Shanxi, is therefore relying on Continental closed-trough conveyor belts, also known as pipe conveyor belt. Especially with the demand of the Chinese government for climate protection in coal mining, these are increasingly becoming the means of choice. In general, conveyor belts have emerged as the financially and environmentally more advantageous transport solution within a certain distance compared with alternatives such as truck fleets, since their operation emits less CO_2 and there is no need for empty trips. Closed systems such as tube conveyors also offer other decisive benefits. They minimize dust emissions. In addition, the transported material itself is well protected against environmental influences such as wind, snow, sun and rain. "This is done by rolling up the belt," explains Weisgerber. The outside edges of the belt overlap throughout the entire duration of transportation like a protective casing for the transported material. Only when taking up and delivering material do the closed-trough belts open up and assume the shape of a conventional conveyor belt.



Clean material transport: Continental closed-trough conveyors save 2,880 metric tonnes of coal dust emissions per year (©Continental AG).

It is estimated that coal dust emissions caused by gusts of wind, snow and rain amount to 0.12% of transported materials when open conveyor systems are used. In Yangquan, the Continental tube conveyor, with a width of 1,600mm and an outer pipe diameter of 458mm, transports 1,000 metric tonnes of coal per hour and 2.4 million metric tonnes of coal per year. "This results in an enormous saving of

The Continental closed-trough conveyor belt system is troughed at the loading point and can be filled like a conventional conveyor belt. Subsequently specially arranged finger rollers ensure that the conveyor belt forms a closed circular belt (©Continental/ YanKan Coal).

2,880 metric tonnes of coal dust emissions per year — and thus significantly improves air quality. Thus, our system also protects the health of mine workers and improves the quality of life of the people living in the area," Weisgerber emphasizes.

"We decided to use Continental's closed-trough conveyor belts because they fully meet the relevant requirements with regard to climate protection, safety and efficiency," says BiGui Chen from YanKan Coal. Continental's technology helps meet stringent safety regulations for coal mines that dictate the maximum concentration of dust in the air. This is required not only when it comes to health and air quality, because among the most dreaded accidents in mining are coal dust explosions — a destructive reaction of coal dust with oxygen. These can occur very quickly when whirled particles of coal dust react with the oxygen in the air due to sparks, heated parts of equipment or similar. "The closed system from Continental is ideal, because no dust can escape. The closed-trough conveyor belts in Yangquan are also flame-retardant, adding another layer of safety," BiGui Chen adds.

** *(source: China Tourism)*

Flexible adaptation artist for rough terrain

Shanxi's coalfields account for 37% of the province's total area. There are approximately 200 billion metric tonnes here, which roughly equates to one third of China's coal deposits**. Much of the province is more than 1,000 metres above sea level. Consequently, the 13.37km² mining area of YanKan Coal Ltd. in Yangquan, which is equivalent to approximately 1,870 football fields in size, is also hilly and almost impassable.

In mining, whether above or below ground as well as in industrial applications, large inclines and tight bends with low space requirements and high mass flows must often be overcome. While the angle of incline of troughed belt conveyors is usually 20° or less and curve radii remain very large, a pipe conveyor allows curve radii and tilt angles of up to 30°. The Yangquan closed-trough conveyor belt overcomes elevation differences of up to 172m over its 8.1km stretch from the coal deposit to the transfer station, going through a complex route with over 39 convex, concave and 20 horizontal bends. "Our closed-trough conveyor belt easily masters tight bends and steep conveyor angles and thus adapts perfectly to the landscape to save space. Our system is characterized by the fact that it manages without transfer points," says Ming-Ya Tang from Continental. This also has a positive effect on the installation costs of the assembly, which are generally cheaper than for assemblies with transfer points.

Quickly switching to energy-saving mode

In Yangquan, the closed-trough conveyor belt system transports pit coal at a high speed of 4m/s or 14.4km/h. This is about three times the speed of a pedestrian walking briskly or a cyclist riding at a moderate pace. In terms of efficiency, the system scores points not only with its speed, but also with its energy efficiency. Miles of conveyor belts can consume as much electricity as a small town. Continental has developed a solution for this, too. Using a special rubber compound has enabled it to minimize the rolling resistance of conveyor belts and thus significantly reduce their energy consumption. This arises when the belt runs over the idlers, and accounts for two thirds and therefore the largest share of the total resistive forces of a conveyor system. "With

Hexagonal idler stations along the conveyor route ensure closed guidance of the belt – protecting the conveyed material (© Continental/YanKan Coal).

the right compound, we reduced the energy consumption involved in transporting raw materials by 25%. This special compound is also used in the facility in Yangquan. This will improve the facility's carbon footprint and save on energy costs for the operator," says Weisgerber.

Measurements by the Institute for Transport and Automation Technology of the University of Hanover have confirmed results according to which a conveyor system 5km in length can save over 3,000kW of energy. The energy saved in 1.5 hours is therefore as large as the average annual consumption of a household in Germany or that of five households in China.

The right solution for every application

In co-operation with conveyor manufacturer Sichuan Zigong Conveying Machine Group (ZGCMC) and the Continental experts in China, it has been possible to develop a closed-trough conveyor belt system in Yangquan that meets the highest conveyor system engineering requirements and optimally overcomes geographical hurdles — to the customer's great satisfaction and ensuring the best possible protection for the climate and employees. Closed-trough conveyor belt systems such as the one in Yangquan are also unique. That is because every belt is custom-made to suit the local circumstances. Depending on the requirements, the closed-trough belt is designed with high-quality fabric or steel cable tension members.

One particular challenge is the precise transverse rigidity, which ensures a good tube shape so that the belt does not collapse. If the rigidity is too high, the belt moving resistance will be too high and energy consumption will rise. Here, the expert knowledge of the appropriate engineers is required. In addition, Continental's customer service engineers in Shandong visit the coal mine on a regular basis to ensure smooth belting, measure wear and check the condition of the closed-trough belt. They remain in constant contact with the operator in the process.

Continental closed-trough belt conveyors have already proven themselves in many places in China — in coal mines as well as in power plants and steel mills. Yangquan's Shangshe coal mine has a 4.9km closed-trough conveyor belt system in operation. At the Anyang coal mine in Chenghe (Shaanxi province) and the Hongyuan coal mine in Puxian (Shanxi province), there are also four-pipe conveyors with a total conveying length of 8.7km. Further projects are already being planned.

Every material — whether coal, cement, waste material, hot slag, wastewater sludge or foodstuffs such as sugar and grain — requires its own conveyor system engineering solution. In addition, there are different climatic zones and topographies that impose specific demands on the conveyor systems. In recycling and gravel operations, in wood processing as well as in power plants, mines, cement or steel mills, in production or chemical plants as well as in harbors, deserts, mountains or rainforests — with its conveyor belt technologies, Continental is on hand wherever raw materials and others goods are mined, processed and distributed.

How the closed-trough conveyor belt system works

The Continental closed-trough conveyor belt system is troughed at the loading point and can be filled like a conventional conveyor belt here. Once the material has been loaded, specially arranged finger rollers ensure that the conveyor belt forms a closed circular belt. Further hexagonal idler stations along the conveyor route ensure closed guidance of the belt. As a result, the conveyed material is continuously protected by the closed belt system. At the end of the belting, the closed belt is opened by the arrangement of the idlers and takes on a flat shape on the pulley in order to unload the conveyed material just like on conventional belt conveyor systems.

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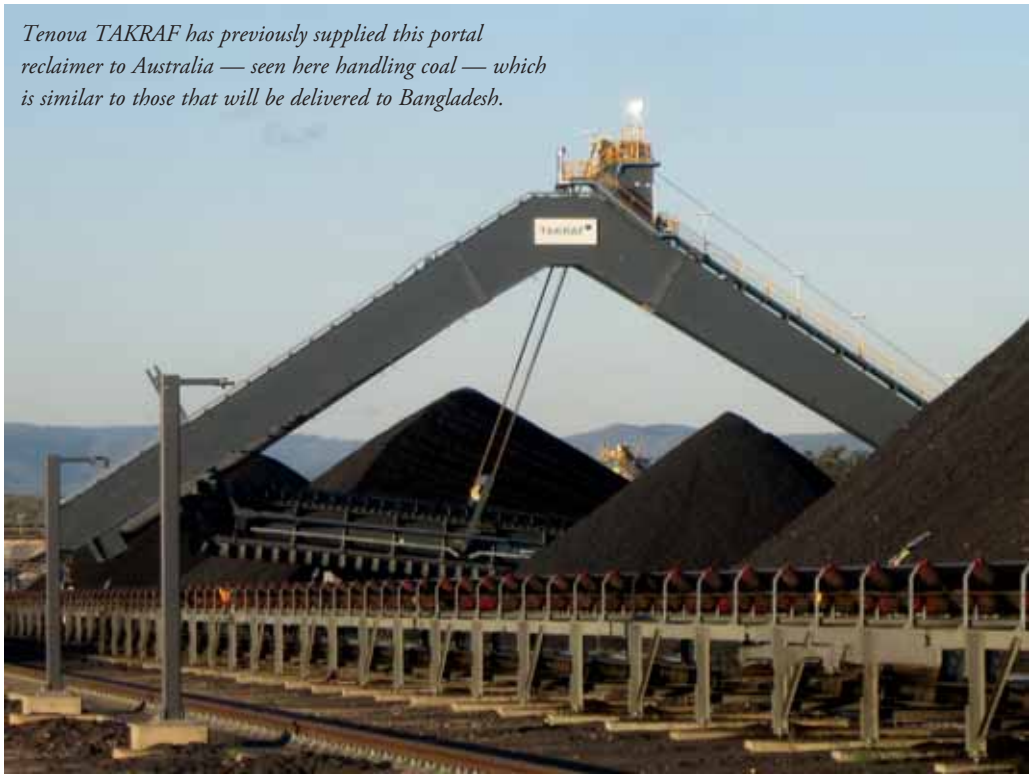
Stackers and reclaimers for power station stockyard in Bangladesh



Tenova TAKRAF has previously supplied this portal reclaimer to Australia — seen here handling coal — which is similar to those that will be delivered to Bangladesh.

Tenova TAKRAF has announced an important project award for the supply of four stackers and four portal reclaimers for a large material handling stockyard in Bangladesh. Construction of this power station will represent a key installation for the development of the country.

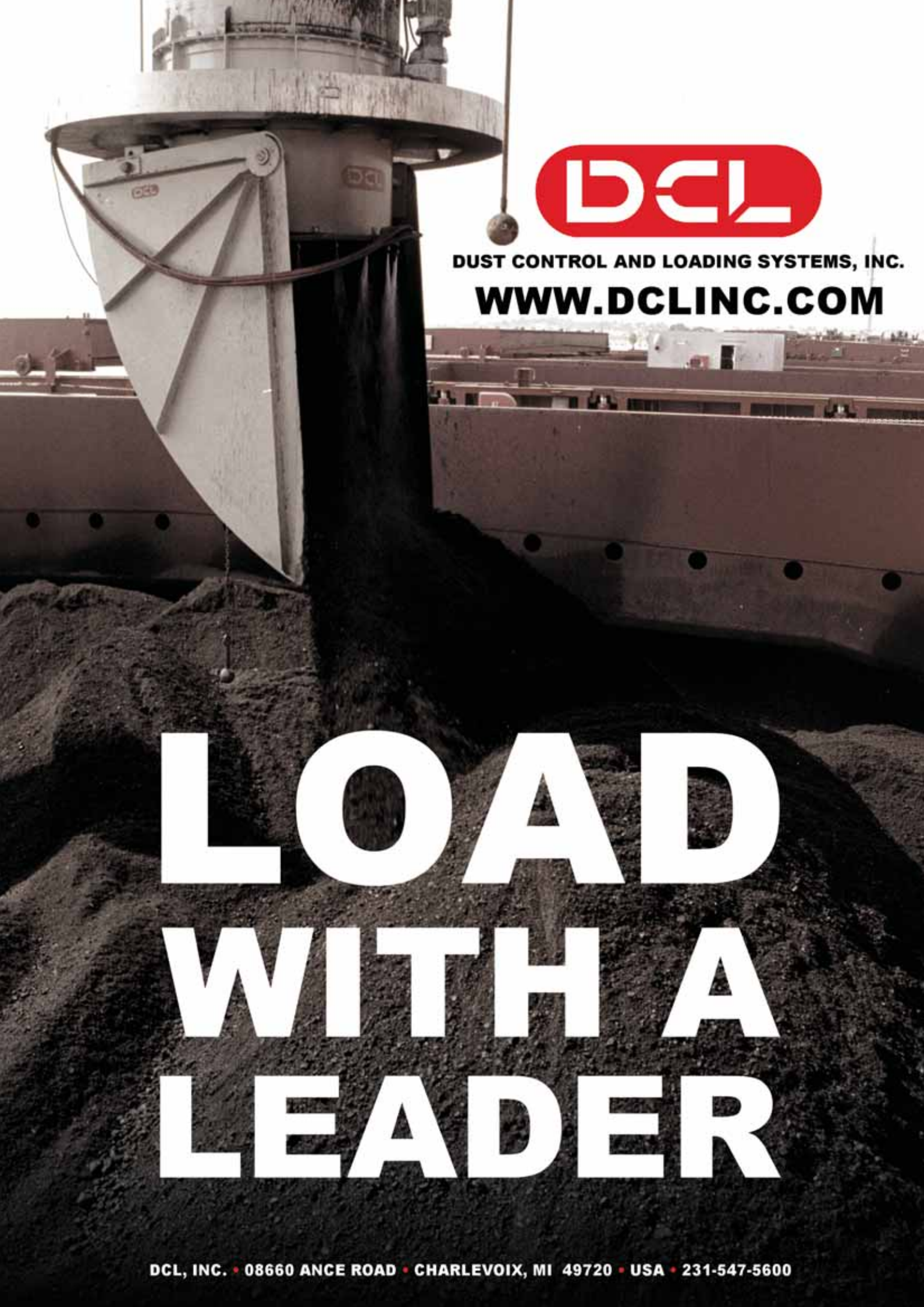
The project concerns the supply of four TAKRAF stackers, each with a capacity of 3,000tph (tonnes per hour), and four large TAKRAF portal reclaimers, each with a capacity of 1,450tph.

Tenova TAKRAF's office in Italy will assume overall responsibility for the successful conclusion of the contract and will provide overall technical co-ordination whilst leveraging competencies from the various TAKRAF global competence centres.

Silvio Leoni, TAKRAF Italy Managing Director, had this to say upon signing of the contract: "Successful award of this project only serves to entrench Tenova TAKRAF as a leading global materials handling specialist. I am proud of the engagement and interaction of our global offices and the willingness of colleagues to find an effective solution to our client's specific requirements. We look forward to our equipment being commissioned and delivering above and beyond expectations."

Tenova TAKRAF offers a wide range of stockyard handling equipment, including:

- combined stacker / reclaimers;
- reclaimers;
- scraper reclaimers; and
- stackers.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Gambarotta Gschwendt's pan conveyors: ideal for moving coal cargoes

Installing the TP pan conveying system.

Gambarotta Gschwendt has developed and manufactured several thousand pan conveyors for a wide range of bulk solid materials, including coal, *writes Fabrizio Gambarotta of Gambarotta Gschwendt, Italy*.

Thanks to its continuous research and development efforts, and to the quality and high reliability of its equipment, Gambarotta Gschwendt is among the most respected manufacturers of pan conveyors.

Conveying equipment used in the handling of coal is required to meet specific conditions to enable safe operation in the cement plant.

This article aims to illustrate the various types of conveying characteristics required to handle coal on the move

TP PAN CONVEYORS

Also known as apron conveyors, standard TP pan conveyors are designed for a maximum inclination close to the angle of repose of the material to be transported. The conveyor's lateral layout can combine horizontal and inclined sections, connected by broad curves.

The TP pan conveyor consists of:

- **drive station:** discharge area end, equipped with a drive unit;
- **take-up station:** the opposite end,

TP pan conveyor in action.

equipped with a tension system;

- **intermediate body:** formed of vertical modular elements made up of H-shaped frames spaced 3m apart and horizontal elements comprising support rails for the metal belt (two for the upper run and two for the lower run). Safety panels along the two sides of the conveyor protect against hazards caused by moving parts; and
- **'metal belt':** this conveys the material and consists of a series of plates placed at a distance corresponding with that of the chains connecting them underneath. The steel plates have suitably-shaped side walls and soles. The overlapping of each plate with the next forms a continuous channel to contain the clinker. The chains connect the plates to each other and also provide the required articulation. A special 'anti-rotation' feature (whereby rotation occurs in one direction only) allows the metal belt to be supported in an almost planar position even though the roller supports have a pitch four to five times that of the chains' pins). As standard, one in every five plates is equipped with a pair of rollers with

The TTP deep bucket conveyor is ideal for coal.

TTP deep bucket conveyor (and below).

bearings that guide and support the belt on the rails.

Specifications of the TP standard pan conveyor

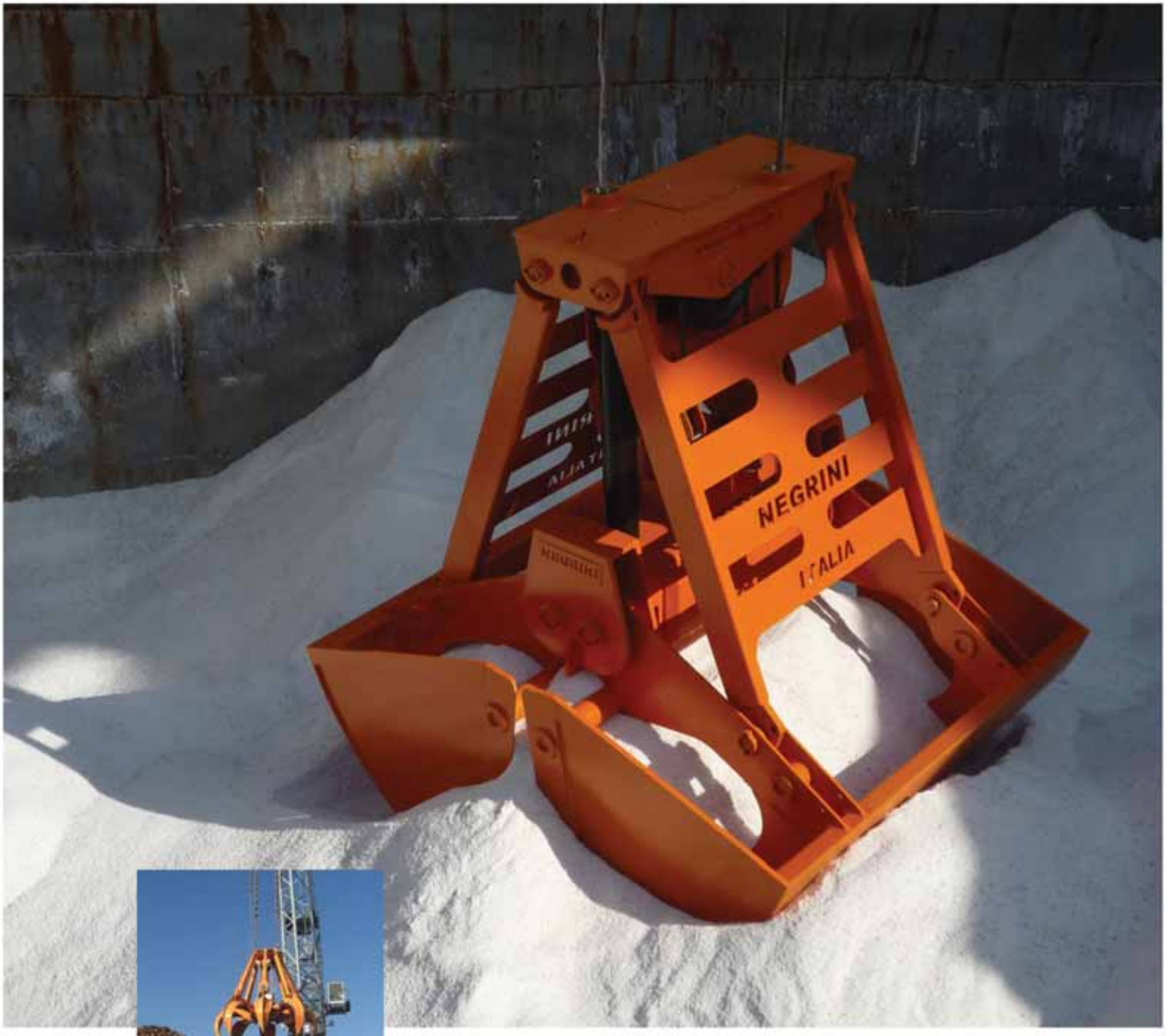
TP standard pan conveyors are manufactured according to the following specifications:

- material is conveyed on the upper branch only;
- one plate in every five is equipped with a pair of rollers with bearings;
- several loading points are permitted, exclusively on the upper branch;
- only one discharge point is permitted, in the drive station area;
- the operating inclination is usually up to 28°;
- the base of the metal belt avoids powder leakage by the shape of the two overlapping ends of the plates, which always remain in contact with one another, even when the belt is wound round the wheels. The seal of the side walls is achieved by the overlapping of each plate with the next; and
- curve radii of no less than 20m are recommended.

Standard TP conveyors (i.e., 1,600mm x 450mm) can achieve capacities of up to 700m³/h (±1,000 tonnes per hour [tph]) of clinker. A conveyor's capacity depends on its width (i.e., 1,600mm) and the height of the side edges (i.e., 450mm), using a conveyance speed of no more than 0.3m/ s to minimize wear on the chains and wheels.

TP conveyor with cross baffles

While the inclination of TP pan conveyors is usually up to 28', a variant model can be supplied for higher inclinations. In those cases, the TP plate conveyor can still be used by fitting several thrust cross plates to prevent the material from slipping. This feature can be used to create TP conveyors with medium to high inclinations. For inclinations between 28–45°, one cross baffle is used for every two plates. For larger inclinations (45–55°) one baffle per plate is used.



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Negrini company, established in 1967, specializes in engineering and manufacturing a comprehensive range of grabs and buckets for rope machines and crawler mounted cranes; they are employed to do many jobs. Negrini buckets and grabs are very well-known for quality as well as for the very accurate and skilful engineering work; in fact Negrini supports their clients by analyzing the job to be done and, if needed, by adjusting the standard design of grabs and buckets to enhance their performance once in operation.

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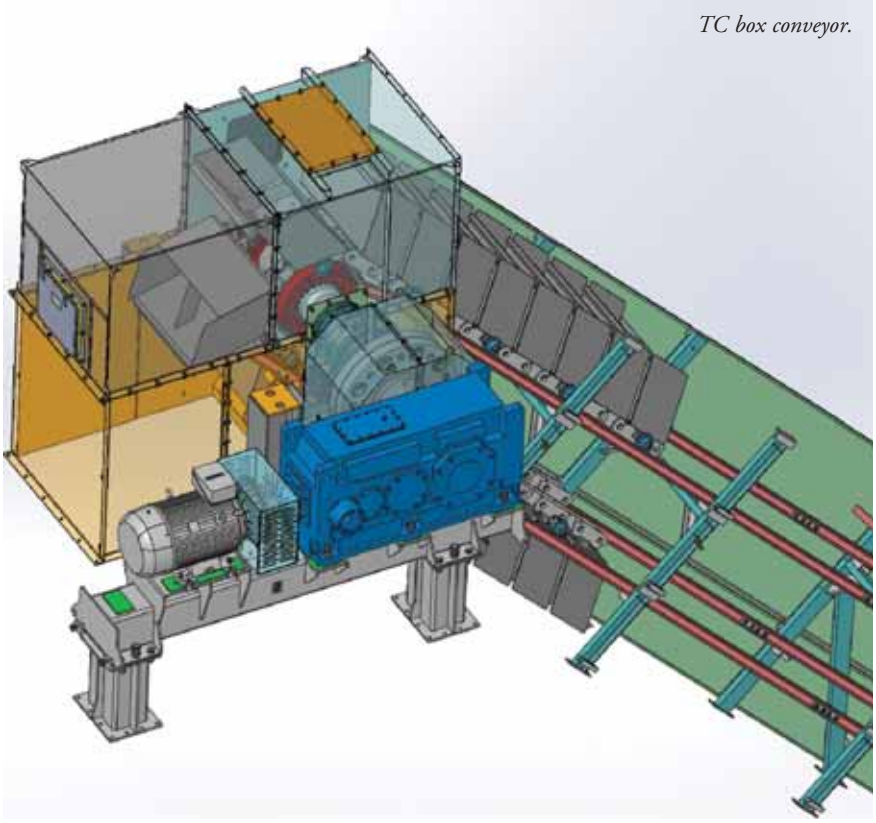
The flow rate of this type of conveyor depends on the maximum angle of inclination as well as other fundamental parameters such as width, height and speed. A reduction coefficient is applied to the flow rate of a TP standard conveyor depending on the maximum angle of inclination.



TC box conveyor.

TC box conveyors

An alternative to transport clinker at inclines over 45° are TC box conveyors. Similar in composition and specification to TP conveyors, TC box conveyors include a 'metal belt' that conveys the material and which is made up of a series of boxes placed at a distance corresponding with twice that of the chains that connect them underneath. The front wall of one box mounts onto the rear wall of the neighbouring box to avoid any loss when the material is loaded. The chains connect the boxes to each other and also provide the required articulation. The chains have an 'anti-rotation' feature, allowing the belt to be supported in an almost planar position even though the supports are placed four times further apart than the pins of the chains. One box in every two is equipped with a pair of rollers with bearings that guide and support the belt and rest on the tracks.

Material is conveyed on the upper branch only, where several loading points are allowed.

Specification of TC box conveyor

- possible inclination is up to 60';
- no powder leakage throughout the life of the conveyor; and
- minimum curve radii of 10m are permitted.

TTP deep bucket conveyors

The favourable position of the chains allows the conveyor to be used to transport incandescent material. The chains are positioned laterally and in the highest part of the buckets — the area least affected by hot material. This position reduces the vertical footprint of the equipment compared to TP and TC conveyors.

TTP deep bucket conveyors convey material on the upper branch only but hold material well within the confines of the conveyor. Throughout the conveyor's life, no flow-through of material is observed.

Moreover, this type allows for the occasional transport of incandescent material (900–1,000°C), which is particularly useful in instances of cooler or kiln malfunction.

Specifications of the TTP deep bucket conveyor

TTP deep bucket conveyors are produced according to the following specifications:

- each bucket is supported by a pair of rollers with roller bearings, inserted onto the chains;
- the maximum inclination is 60°; and
- minimum curve radii of 5m are possible.

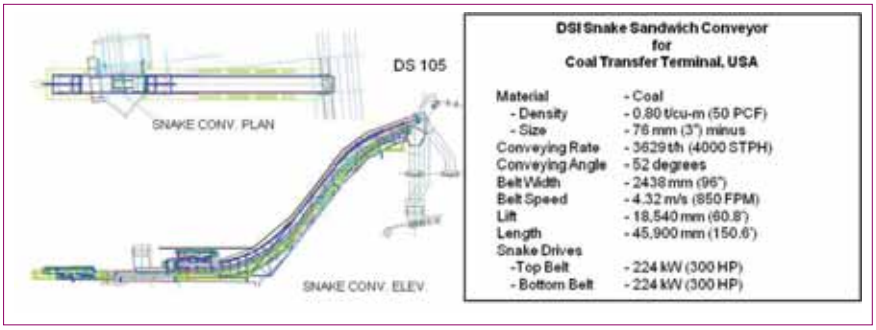
Gambarotta Gschwendt is thus in a position to supply reliable equipment, that is completely tested against the risk of explosion.

Among the products offered for the handling of coal are: surface feeders; pan conveyors; bucket elevators; drag chain conveyors; screw conveyors; rotary valves, flap valves; bulk material loading systems; spare parts; and weighing systems.

Largest DSI Sandwich conveyor links storage yards

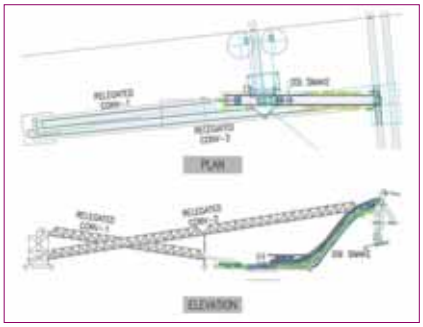
Dos Santos International was awarded a contract near the Gulf of Mexico, for engineering support and supply of a DSI Sandwich belt high angle conveyor — the widest belt width, highest volumetric rate DSI Sandwich conveyor to date.

Dos Santos International has long provided expert engineering support to this major transfer terminal on the Mississippi River delta, North American Gulf of Mexico. Barge tows of coal and coke from all over the USA travel south on the Mississippi River to the terminal where they are unloaded to storage. The stored material is later reclaimed and loaded into ships that deliver the coal and coke to power plants, steel mills and chemical plants, along the Gulf coast and all over the world. The terminal transfers 20 to 30 million tonnes annually.



Background

When built in 1965 the terminal consisted of a bucket ladder type continuous barge unloader (CBU), a storage yard, served by a reversing yard belt with a bucket wheel type stacker reclaimer (S/R), and a slewing, luffing and telescoping type loader for Gulf barges and small ships. The main market was the power plants along the North American Gulf coast. Additional down-river dock structure was later added along with clamshell type unloading equipment to handle specialty materials.



International coal trade increased dramatically through the 1970s. A major expansion of the terminal, in the early 1980s sought to capitalize on the increased coal trade. A second, parallel, but higher capacity system was added just up-river from the first. The new system included a double bucket ladder, pivoted arm type continuous barge unloader (CBU), a storage yard served by a reversing yard belt with a bigger, higher capacity stacker reclaimer (S/R) and a new travelling, luffing, telescoping shiploader on a new dock structure between the two storage yards. The new travelling shiploader could easily load large ships. Parallel tripped conveyors at the new dock, one running up-river, the other down-river, allowed the shiploading of the coal from either yard. Other than sharing the common shiploader, the two storage yards remained isolated from each other depending entirely on the availability of their local equipment. At each stock

Chief engineer, Peter Nevels, with the large pulleys.

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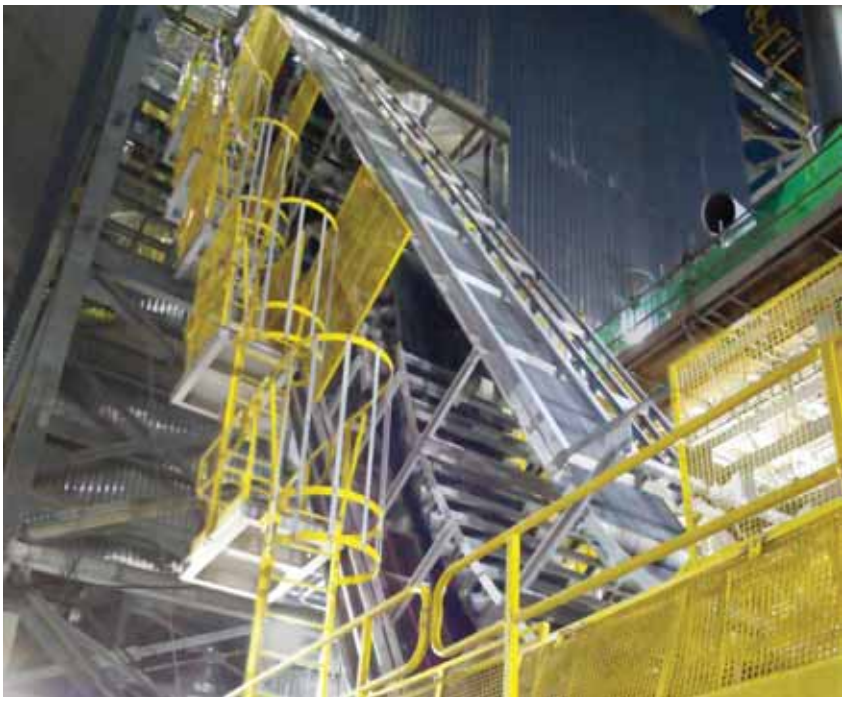

The DSI Sandwich Belt High Angle Conveyor is **PROVEN** in installations all over the world. It's **RELIABLE** for rugged mining conditions, yet gentle enough for friable materials. It is **ECONOMICAL**, fitting into tight spaces and small footprints. Elevating millions of tons of material using all conventional conveyor parts, users have agreed it's the most versatile, low cost and low maintenance high angle conveyor system available. **LET US PROVE IT TO YOU**!

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yard it was not possible to simultaneously stack and reclaim.

A major expansion would end the isolation. Ahead of the expansion, the original S/R of the down river yard was replaced with a new, modern S/R with the increased operating parameters of the upstream system. The current major expansion includes:

1. An additional parallel, reversing yard belt at each storage yard served by the yard's stacker reclaimer.

- Either yard belt tripper can feed the S/R to stack-out.
- In reclaim mode, the S/R can load either yard belt through a bifurcated chute with actuated flop gate.

2. Two additional stackers at each yard; one on either side of the S/R:

- Each stacker has a reversing boom conveyor that can stack to either side of the track.
- Each stacker is loaded by either of its two yard belt trippers.

3. Up river and down river conveyors to direct material flow from either CBU to either storage yard or from reclaiming at either yard to shiploading via either end of the main dock.

4. Three new slewing, telescoping shiploaders, located downriver of the main dock. These new shiploaders, though stationary are designed with the combined operating range to load large ships without repositioning.

The isolation would end with the new up-river and down-river conveyors that link the two storage yards. To preserve maximum stacking range along the yards the up/ down-river conveyors must hug the CBU dock line, locating them alternately over land and over water. The original yard belts are broken into two flights at the respective junctures with the up/ down-river conveyors. Thus, from either CBU, material flow can be alternately directed to either storage yard for stack out or directly to any of the shiploaders.

High-tech transfers

The new expansion maximizes flexibility allowing continuous stack-out at either or both yards with simultaneous continuous reclaim to shiploading from either or both storage yards. This flow path flexibility is facilitated through elaborate junctures of high-tech control flow chutes, particularly at the ends of the new up/down river conveyors. These transfers are contracted separately to the control flow specialists of Power Techniques of Alma, Illinois, USA and M & J Engineering of Germiston, South Africa. These control flow chutes are well known in the trade as Weba Chutes.

Environmental and operational improvements

The current expansion afforded the opportunity to establish better environmental controls and to better deal with nagging operational issues. These are related. Whereas conventional open troughed belt conveyors can ideally operate at inclines as high as 15° to 17°, practically, variations in material characteristics can greatly affect this, significantly lowering the incline angle.

Barged coal often arrives in very wet condition. The barges may have been loaded with wet coal and/ or the open barges may take on additional moisture from long exposure to downpours of rain. In transit, excess water tends to gravitate to the bottom of the barge. When unloaded by the bucket ladder type CBU, the first 'hogging' pass delivers a moist coal mix but the final pass drags the barge's bottom and bails the excess water. In many cases such a wet material/free water mix cannot be conveyed at any significant incline and tends to run back, spilling from the conveyor. Operational and design parameters for the terminal expansion were developed from such experience. As a result: 1) conveyor incline angles are limited to 9° throughout the terminal; 2) All new elevated conveyors are to have full length drip pans to catch any spillage so that wash-down can direct it to a strategic collection point. These two mandates promise to improve the environment at and around the terminal.

DSI Sandwich conveyor, optimal path from the down-river CBU

The new system layout required a new conveying path from the down river CBU to the new down-river transfer complex. The direct path to discharge over the down river yard belts subtends an incline angle that far exceeds the capability of any conventional open troughed belt conveyor. The reflexive solution was to use two conventional conveyor flights in a switch-back arrangement. The 9° maximum incline limitation and the location over water made this a costly proposition. The large (environmental) footprint was also a negative.

Because of the long relationship with Dos Santos International, terminal personnel knew there was a better solution: a DSI Sandwich High Angle

Inventor of the Sandwich belt high angle conveyor, Joe Dos Santos shows the enormity of the belt idlers for this installation.

Conveyor. At 3,629tph (tonnes per hour) (4,000 short tons per hour) of coal this would be the highest volumetric rate to date for a Dos Santos Sandwich Belt High Angle Conveyor. The Terminal management, in their due-diligence, sent key professionals to visit the operation of Dos Santos Sandwich units handling coal at high volumetric rates. These visits, and discussions with operating and maintenance personnel, confirmed that the DSI Sandwich conveyor was the best solution.

The new DSI Sandwich conveyor profile is depicted in Figure 1 along with the alternate conventional conveyor solution for contrast. Figure 2 shows the conveyor arrangement along with a summary of the design specifications and features. At 2,438mm (96") of belt width this is the widest Dos Santos Sandwich Belt unit.

The Sandwich belt high angle conveyor would be part of the coal flow path from the original down-river CBU to the top of the new down-river transfer tower. The bucket ladder type CBU unloads the coal from the barges and discharges it onto the gathering 'A' conveyor, which discharges to the connecting 'B' conveyor. The DSI Sandwich conveyor receives the coal load from the B-conveyor discharge and elevates it continuously up to the transfer tower, for distribution to the alternate terminal destinations. The CBU travels up and down the support tower as required; to clear the empty barge at the highest river level and to dig into the fully loaded barge at the lowest river level. Thus the tail of the connecting B-conveyor follows the CBU travel while the head end pivots to the resulting incline angle. The material discharge onto the DSI Snake unit will vary accordingly.

Special features of the Sandwich conveyor include galvanized steel structure, corrugated covers and wind guard, and a full length stainless steel drip pan to a strategic discharge point at the foot of the inclined structure. Naturally, at 52° incline the drip pan will be self-cleaning. Additionally the bottom belt tail end is extended back, behind the loading area, in order to facilitate belt splicing.

The lower end of the Sandwich conveyor would be largely supported on existing structure while the main incline structure would be supported on a new pile group at the bottom and on the new transfer tower at the top. A pair of smaller piles would support the bottom belt take-up area.

The DSI Sandwich Conveyor would be a substantial improvement over the switch-back conveyor arrangement originally conceived. Its use would eliminate a transfer, along with the substantial additional tower and foundations that would be required to support the switch-back transfer. Its shorter path and material containment will further limit the environmental impact of the material handling system. These, among other benefits of the DSI Sandwich conveyor, make this unit an ideal solution for this application.

Unfortunately, even after engineering and supply was completed, the terminal again went through major economic challenges and halted the installation of the DSI Sandwich conveyor. The equipment still remains at the site, with the hope that it will eventually be installed and greatly benefit the terminal's operations. This order is proof of the continued growth and confidence in the DSI Sandwich High Angle Conveyor technology and its many advantages.

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Scantech International: high-tech analysis of coal cargoes

Scantech International Pty Ltd designs, manufactures and supplies analysers for measurement of conveyed coal utilizing various technologies depending on the parameter to be measured. The COALSCAN range of ash, moisture and elemental analysers has been on the market for over 35 years and continues to expand.

Initially the company was focused on commercializing dual-energy transmission technology for ash measurement in the early 1980s. With hundreds of installations this was and still is a very robust design with some units installed in the 1980s still operating. The COALSCAN 2100 ash analyser typically achieves accuracies of better than 1% ash. Main applications are measuring raw coal feed to wash plants and washed coal quality. The COALSCAN 1500 uses natural gamma sensing to calculate the ash content of coal without the use of radioactive sources as in the COALSCAN 2100.

SizeScan analyser for PSD, volume and speed.

Moisture analysis is commonly used in conjunction with ash analysis to enable calculation of heating value of coal. TBM systems utilize microwave transmission technology to detect free moisture by measuring the attenuation and group delay of microwaves passing through the conveyed coal. A signal from a belt weigher is used for the total mass flow and the TBM determines the moisture content to accuracies better than 0.5% moisture. Moisture measurement can be used to monitor TML, assist with optimal filter or dryer operation, and for dust management.

In some cases more detailed information on coal quality, such as sulphur content and other ash components is also needed, particularly for thermal coal where power stations may require coal with strict composition requirements.

The COALSCAN 9500X has been used to provide accurate elemental analysis on full flows rather than sample streams which may not be representative. A chute-based version has also been supplied where opportunities to measure have been limited by high chlorine content in conveyor belts or space has been limited on existing belts. Measurement accuracy is typically close to 0.5% ash.

The latest models use a common interface and include remote access capability. All models measure through the full bed depth continuously and provide results second by second or minute by minute. Scantech analysers are considered a premium product due to high specification, robust design and comprehensive shielding particularly for the PGNAA based COALSCAN 9500X which requires no additional isolation area around the unit.

Recent comparisons to other products on the market by a customer indicated the COALSCAN 9500X had one quarter the radiation levels of a newer competitor product claiming to be the latest and most advanced system in the market with a smaller source, but evidently also much less shielding. No two products in the market are the same so a thorough due diligence process involving reference checks should be considered in all purchasing decisions.

Scantech's latest addition to its range is the SizeScan PSD (particle size distribution) analyser developed by COREM in Canada and commercialized by Scantech. It is a next-generation PSD system using a 3D infrared camera and advanced algorithms that overcome known problems in particle recognition using segmentation software. The 3D IR camera is unaffected by dust and lighting controls required for traditional 2D digital camera systems which add significantly to installation and operating cost and maintenance of those systems. SizeScan has the added advantage of reporting every five seconds the conveyed volume and belt speed with the PSD data. Where bulk density is consistent the SizeScan becomes a reliable mass flow measurement device comparable to a nucleonic weigh scale in performance. SizeScan does not require ongoing calibration or support, unlike other measurement systems.

Scantech offers various installation services. Installation manuals are available to clients wishing to install equipment themselves. Installation supervision, engineering, fabrication, or full turnkey options are also available. This limits risk of cost or schedule blowouts and ensures analysers are installed correctly the first time, every time. Clients have analysers operating sooner and providing benefits in the shortest possible timeframe after purchase.

Ongoing service and support for analysers is handled by qualified service engineers based near concentrations of analyser installations in Europe, Africa, Asia, Australia, North America and Latin America. A central pool of engineers provides support as needed for commissioning and calibrating analysers as well as R&D.

Vortex Global: providing coal handling solutions for over 40 years

Bituminous coal will be handled in this mega slide gate engineered by Vortex Global.

For more than 40 years, Vortex Global has provided quality slide gates, diverters, iris valves and loading spouts designed specifically for handling dry bulk solids in gravity, vacuum, dilute, or dense phase applications. Vortex valves and spouts are engineered for dependability, durability, ease of maintenance, and offer proven solutions to material handling and process efficiency problems. With an in-house team of engineers, Vortex products can be completely customized for individual applications or special installations.

Vortex manufactures many different products that address dry material handling in the coal industry. The Vortex Titan line of gates and diverters is specifically designed for applications that require larger sizes or are placed in abrasive-duty situations.

Slide gates

One such application involved a slide gate with a 0.86 metre x 2.6 metre opening handling 50mm 'minus' bituminous coal. The gate was to be pneumatically actuated. One of the major requirements was that the gate had the ability to close through a standing column of product if an upset condition occurred.

Since Vortex manufactures pneumatic air cylinders, calculating the thrust requirements and providing additional cylinders to provide the added thrust was not an issue. For this application, six 203mm x 0.9 metre cylinders provided the necessary 24,000 pounds of thrust.

The open area between the cylinders allowed the gate to be installed around an existing material feed chute.

Diverter valves

Another application involved a large flapper-style diverter (0.9 metre x 1.4 metre). A US-based coal-fired energy plant utilized a diverter of this size to handle 203mm 'minus' coal.

Over the years, the plant operators discovered that replaceable polymer liners worked well in addressing interior abrasion from the material handled. The major issue they faced was that the liners needed to be replaced approximately every 18 months.

Replacing the liners was a long, tedious, and expensive proposition. Due to the fact that access to the interior of the diverter was limited, production was shut down and a crane had to be sourced and rented to remove the 1,900Kg diverter from place. Once removed, maintenance personnel had better access that allowed replacement of the liners. Then the diverter was hoisted back into place and re-installed.

Another issue was that the leading edge of the flapper blade rested against the diverter's interior housing and was exposed to the material flow stream. Over time material would gradually wear away the tip of the blade, affecting the blade's ability to seal product.

Two features that are standard with any Vortex diverter solved the customer's issues:

- **Access Panel:** Vortex diverter valves are manufactured with a removable, side access panel. This feature allows for in-line inspection and maintenance. In most cases, replacement of interior parts can be accomplished without having to remove the diverter from place. For this application, Vortex added additional access areas to permit easy replacement of the polymer liners. Production loss was minimized major savings in maintenance costs were realized. The customer commented that "after two interior liner replacements, the diverter was paid for."
- **Recessed Blade Compartment:** Vortex flapper-style diverters are designed to shield the leading edge of the blade. Whether in the open or the divert position, the blade over strokes into an

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Vortex Global fabricates a large diverter valve with removable access panels and replaceable liners.

area where flowing material does not come in contact with the leading edge. Properly shutting off material flow prior to changing the position of the blade ensures that there is never an issue with leading edge blade wear.

Telescoping Loading Spouts

Vortex Telescoping Loading Spouts are utilized in lorry, rail, barge, and ship loading operations. Vortex's four-cable hoist drive offers enhanced stability and improved cable service as opposed to traditional two and three cable drives. Additionally, the use of three-piece, CNC machined pulleys with rounded edges and precision cable grooves drastically limits the cable wear experienced with traditional spouts.

Fly ash, the byproduct from burning pulverized coal in electric power generating plants, is utilized by many industries and especially by concrete manufacturers. Fly ash improves the workability, durability, and strength of concrete. As such, it is in great demand by the cement industry.

The Vortex telescoping loading spouts are used to load fly ash into lorries and rail cars.

Independent companies throughout the US operate numerous terminal locations where concrete and ready-mix operations have a local source supply of fly ash. Contracts are established with fly ash producers and that material is transported to the terminals.

Vortex telescoping loading spouts are utilized at many of the producer and terminal locations to load fly ash into lorry and rail car vessels for transport. The standard features of the Vortex spouts offer a smooth, maintenance-friendly operation. Additionally, Vortex offers filters and positioners to complement its spout line.

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Flexible, reliable and up-to-date: coal handling equipment from Latvia's TTS

Latvian company TTS has been serving the world's material handling equipment market for more than 25 years. During that time, numerous unique machines have been designed and built. Although TTS supplies equipment for a wide range of materials — from grain and raw sugar to aggregates and fertilizers — a large proportion of its products are specifically designed for coal handling. Below are a few of TTS's coal handling projects.

Port of Vysotsk, Russia

In order to carry out coal stacking operations, two mobile 25m-long stackers with tramp metal magnetic cleaning were supplied to replace old existing ones. The port authorities were delighted with the performance of the new machines, resulting in a further order for an additional six units. Today, a total of eight machines operate at full capacity in the port.

Riga Central Terminal, Latvia

TTS was approached and asked to design and deliver a versatile mobile coal handling system, with minimal investment and a short production period. Six months after signing the contract, TTS delivered: two receiving hoppers with feeders; a stationary collecting conveyor equipped with magnetic separator; and one 14m-long and two 40m-long stackers. Today the terminal operates at its full capacity of 1,000tph (tonnes per hour) in the port of Riga.

Multifunctional transshipment complex, Ust-Luga, Russia

One of the customer's primary objectives was mobility of the complex, so TTS designed, produced and installed a mobile system for coal handling. The system comprised: five mobile 40m-long link conveyors; two radial 40m-long mobile stackers; and one radial self-propelled mobile stacker/shiploader with telescopic boom, ranging from 30 to 50m. Equipment ensures magnetic cleaning of coal and performs at capacity of 1,200tph.

Coal port, Murmansk district, Russia

In order to ensure flawless functioning of the technologically highly advanced terminal, TTS created a conveyor system, connecting all material handling units into one net, capable of handling coal at 4,500tph. The total length of belt conveyors reached 9.5km.

Conclusion

The experience gained through numerous completed projects means that TTS is able to solve the most complex tasks, and is able to develop solutions that meet its customers' needs 100%. All equipment is versatile, technologically up-to-date, and cost-effective.

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RBL-REI selected as main contractor for 23km coal conveyor line for Russia's EMCO mine in Sakhalin

The France-based company RBL-REI, renowned worldwide for the design, manufacturing and construction of overland belt conveyors with technical complexities, is still proving its skills and capabilities for such challenging works.

The company's next project will be in Russia, in Sakhalin. This island is the country's largest island and is located in the Far East. Sakhalin ranks ninth in Russia for coal extraction*. The Eastern Mining Company (EMCO) is in charge of the production and export of coal. Most of the coal produced is exported, mainly to Korea, China, Japan, and the Philippines.

According to the results of the competition, EMCO has chosen RBL-REI, as the contractor for the construction of the 23km main conveyor's line for coal extraction. The contract for manufacturing, delivery and construction supervision of the corresponding equipment was signed in Moscow in February 2019.

The coal conveyor line in the Uglegorsky district in the Sakhalin region will be the longest in Russia. It will connect the key mining asset of EMCO's Solntsevsky coal mine with the coal seaport Shakhtersk. According to the company's global development strategy, the construction of the conveyor is one of the key measures to further increase the production and export shipment of coal from the current 7.5mt (million tonnes) at the end of 2018 to 20mt after 2022.

The achieved flowrate will be 4,200tph (tonnes per hour), with a 2,000mm-wide belt running at 5.5m/s powered by 8,000kW for each of the two main segments.

Currently, RBL-REI is starting to

A similar project, carried out previously by RBL-REI.

* *Source: Metal Expert*

manufacture equipment. Meanwhile, the customer has already started preparatory and general construction works, namely the vertical layout of the conveyor route and earthworks. The installation of foundations will soon begin. It is planned to complete the construction of the facility in 2021. The total cost of the project is tentatively estimated at 7.8 billion rubles.

The project is supported by federal and regional authorities and is being implemented in the freeport of Vladivostok. "The main coal conveyor in the Uglegorsky district will become one of the most modern not only in Russia, but also in the world. The launch of the facility will significantly reduce the load on the district's roads and have a positive impact on the environment, since the conveyor will be covered throughout its entire length. The project will create additional high-tech jobs and significantly increase tax deductions to the regional and municipal budgets." said Oleg Misevra, Chairman of the Board of Directors of EMCO.

Misevra added,: "Implementing this project, we put the economy and the environment at the forefront. Road transport of coal is really quite expensive. We pay $4–5 per tonne transported. The conveyor will reduce the cost below $1 per tonne. It turns out that we win $3–4 per tonne. Based on the volume of traffic even at 10mt per year, the conveyor will save at least $30 million per year."

The conveyor is a complex and very responsible engineering structure. It consists of three segments, two of which have numerous horizontal and vertical radii. The longest segment is about 13km long. The conveyor route crosses numerous roads, water barriers, and power lines. All intersections are co-ordinated with local supervisory authorities and must meet not only international, but also Russian-specific, norms and standards. Thus, about 10km are raised above the ground and pass by trestles, bridges or conveyor gallery with special load-bearing trusses. The longest spans are 82m (crossing the road) and 64m (crossing the river), respectively.

It should be noted that Sakhalin Island is a zone with a seismicity of up to 9 points (MSK-64 scale). Construction in such areas requires special calculations and strengthening of all structures taking into account seismic loads.

In addition, the climatic conditions at the construction site of the conveyor are quite severe: in winter, intense precipitation and snowstorms are typical, and the equipment is designed to operate at temperatures from –40° to +40° Celsius. The maximum wind speed can reach up to 40m/sec. During the year, 1,100–1,700mm of precipitation falls. A third of precipitation falls during the cold period, sometimes in the form of heavy snowfalls and sleet. Characterized by frequent and long-lasting snowstorm with strong drifts. Due to the difficult climatic conditions, it was decided to cover not only the belt, but also transfer towers and the rooms of the drive groups.

Before a construction permit is obtained, the project must pass a state examination and receive a positive conclusion. The equipment shall be certified and subject to declaration of compliance with the regulations on safety of machinery and equipment of the customs Union of the member States of the Eurasian economic Union (EEU).

In total, it is expected to ship more than 1,000 40ft sea containers with equipment from Europe and China in 2020–2021.

For RBL-REI, the project is a priority. Its implementation involves the most experienced employees of its own design office and all technical services in France, its own metalwork plant in China, as well as the company's own office in Russia (Moscow).

Coal handling: improving efficiency, production and safety

Standard Industrie International brings its expertise in the resolution of plant issues in the material handling arena. Rich in this field of expertise, the company has designed and improved different types of equipment, usually used in all parts of the coal handling process:

Air cannons to avoid production stoppages due to accumulations of coal

The AIRCHOC® air cannon acts directly on the material, thus avoiding any damage to the structure:

- a volume of compressed air of between 4 and 400 litres is released instantly through an adapted outlet port (from 25 to 300mm) to achieve a deflagration.
- 93% of clogging or build-up in silos and hoppers cause a complete stoppage of production. AIRCHOC® prevents 100% of manual intervention accidents on clogging problems in storage units.

Since the patent for STANDARD INDUSTRIE's air cannon system was filed in 1978, more than 50,000 AIRCHOC® have been sold in 90 countries.

Safe cleaning

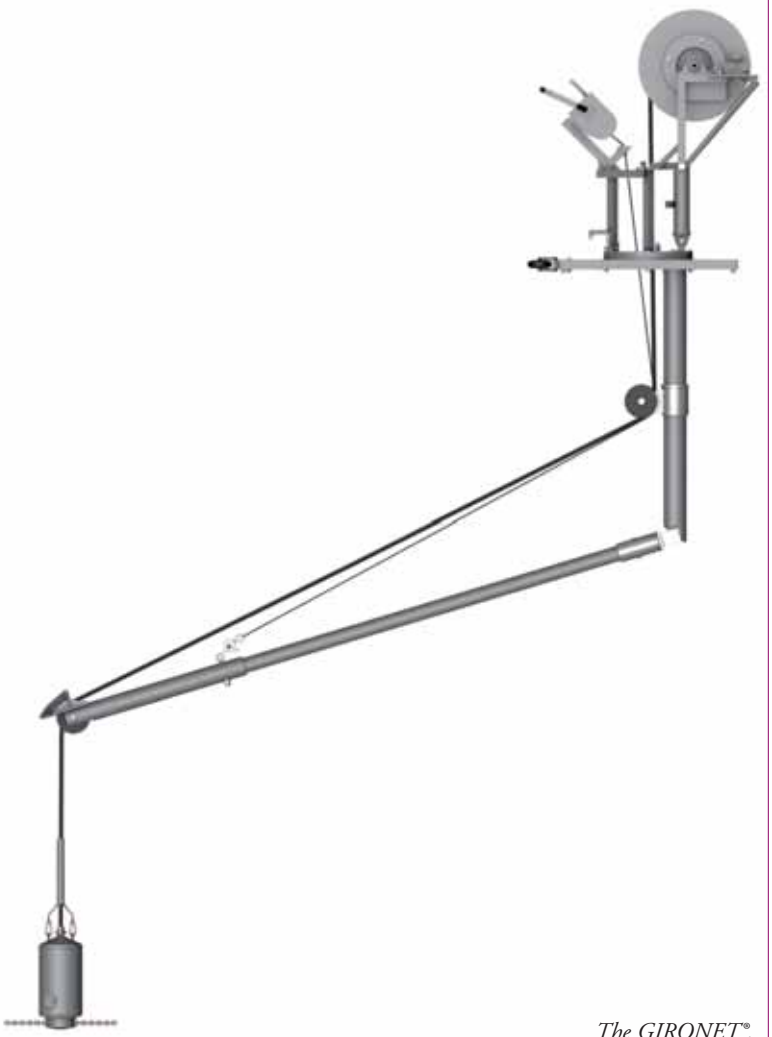
The development of wireless air cannons and silo cleaning solutions that can be used without manual intervention at the location where issues occur, has improved safety as well as reduced operational costs. Moreover, preventative action with such tools enables efficient material flow throughout the plant, thereby reducing or eliminating costly shutdowns of key equipment and improving plant productivity.

The Powernet.

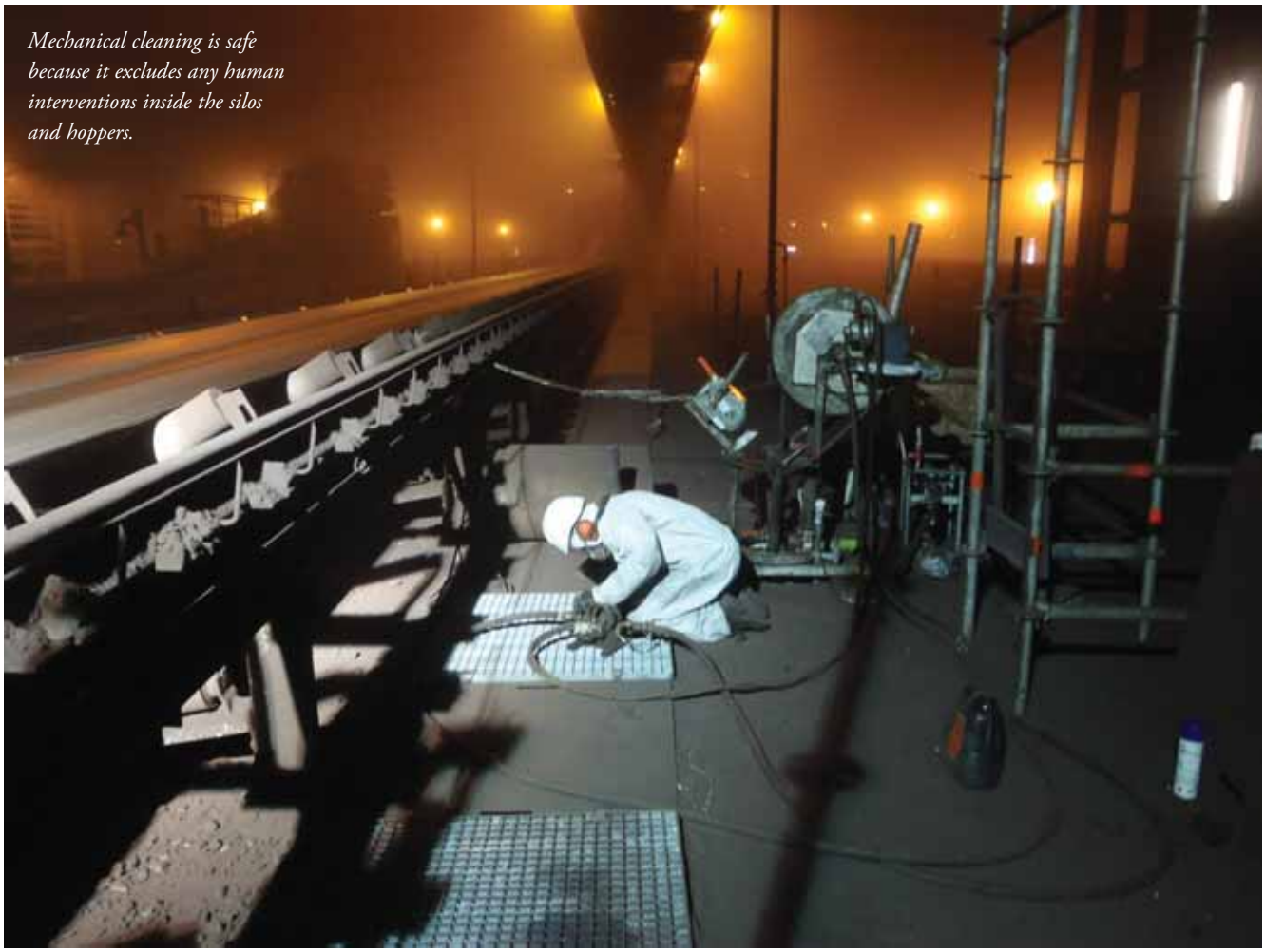
The AIRCHOC® air cannon can be installed on crushers, feed hopper chutes, storage silos or hoppers (raw meal, flour), tunnel reclaimer, crushers, dust collector filters, preheating tower (cyclones, flour chute, smoke box, gas duct, kiln inlet, by-pass, tertiary duct), fan blades, kiln burner, cooler (clinker fall).

EXAMPLE:

A power station in France encountered problems with clogging inside the coal mill feeding hoppers. the customer therefore installed two AIRCHOC air cannons on each of its 12 hoppers to optimize productivity. These AIRCHOC cannons have been programmed with a regular shots rate of two per hour.



The GIRONET®.



Mechanical cleaning is safe because it excludes any human interventions inside the silos and hoppers.

RopeCon®
Efficient Solutions for Bulk Material Handling

Wherever bulk material needs to go – across impassable terrain, rivers, highways and buildings – RopeCon® delivers without a hitch!

Long distances, capacities of up to 25,000 tonnes/hour, minimal environmental footprint, quiet operation plus low operating and maintenance costs: These are the features that convinced leading mining businesses.

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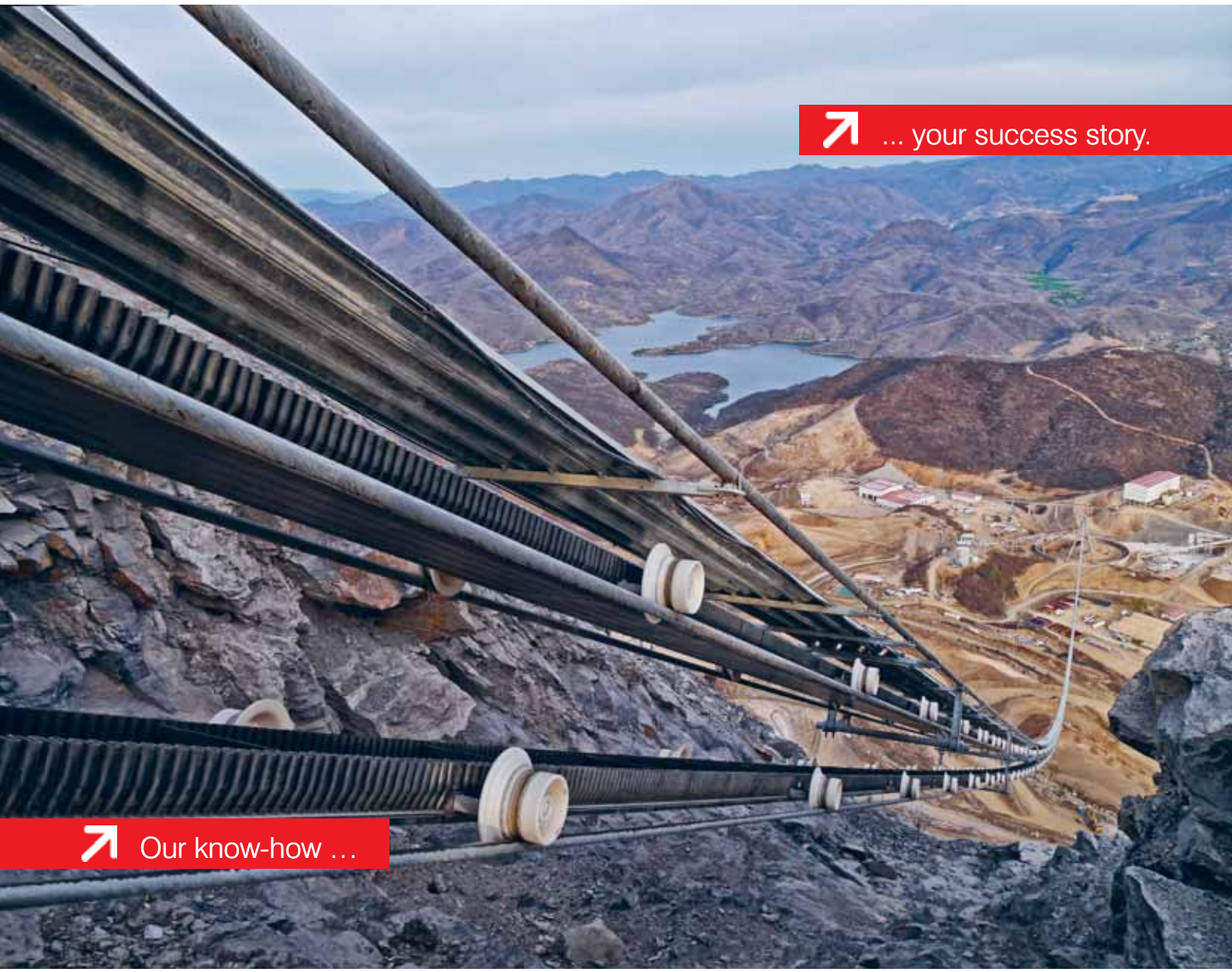
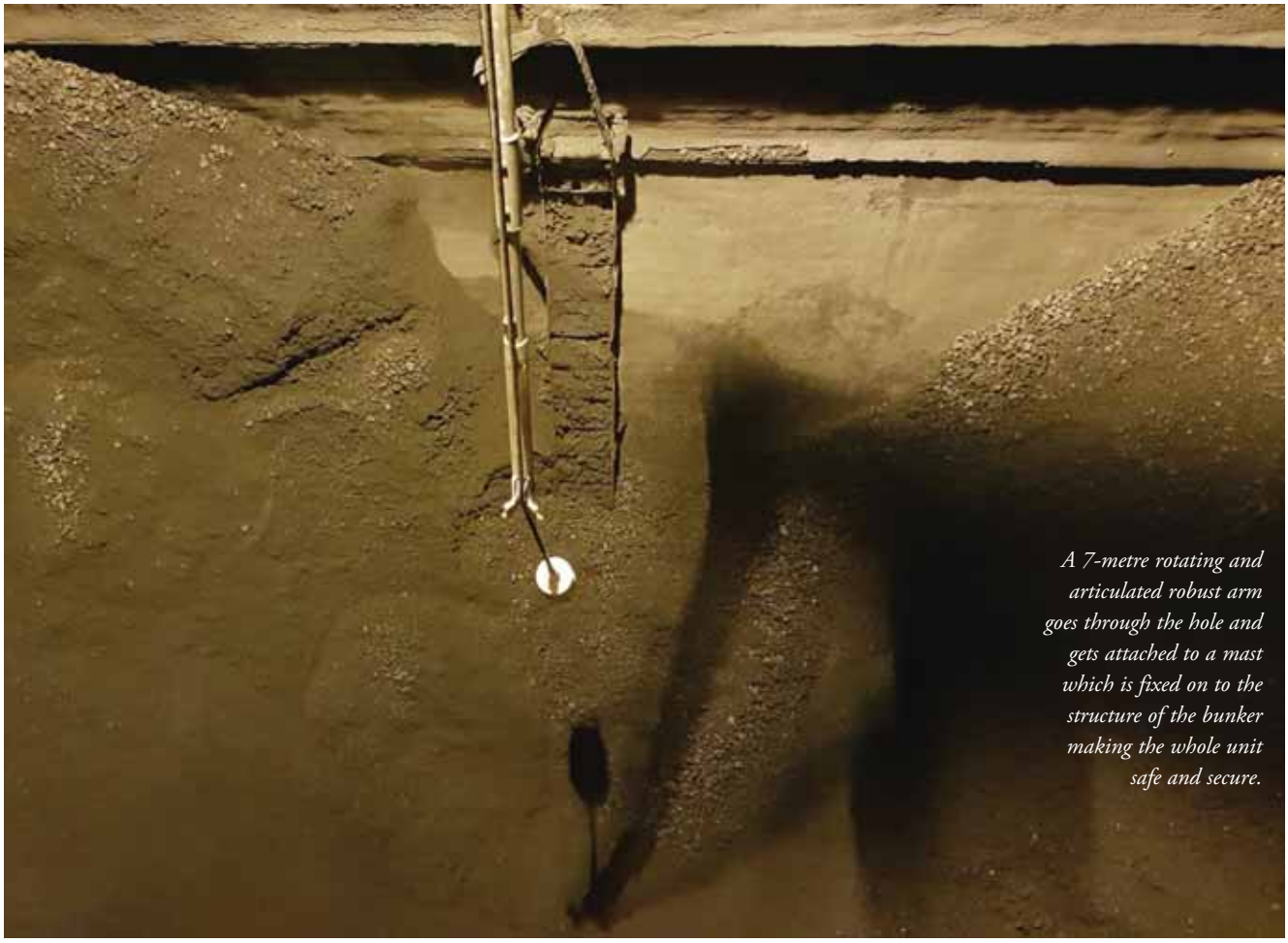


Doppelmayr Transport Technology GmbH, Konrad-Doppelmayr-Strasse 1, 6922 Wolfurt / Austria, T +43 5574 604 1800, dtt@doppelmayr.com



A 7-metre rotating and articulated robust arm goes through the hole and gets attached to a mast which is fixed on to the structure of the bunker making the whole unit safe and secure.

Study the best installation for the best efficiency

As each installation of air cannons is different, a complete range of accessories is available. These include:

- **Deflectors:** direct the air flow (straight, inclined or 90°) towards the sensitive clogging points. Steel or refractory stainless-steel version.
- **Stainless steel bevelling pistons:** increase the service life and resist aggressive atmospheres (chemistry, incineration, cement works)
- **Blowpipes:** allow air to be channelled during firing, available in steel, stainless steel, refractory stainless steel, ceramic...
- **Isolators:** secure maintenance operations: high temperature, aggressive product, risk of material return.

This regular compressed air blasting from the AIRCHOC® into the different points of the plant allows the material to remain in motion and maintain its flow in the production process.

This is a preventative solution. Standard Industrie International also proposes a curative solution, which results in the cleaning and unclogging of storage units, guaranteeing the safety of the operators.

Silo and hopper cleaning services

After a complete analysis of the clogged storage area, the breakdown teams place their equipment outside, respecting all safety standards:

The POWERNET

This deep drilling equipment is a solution for bridging problems.

- diameter for piercing storage units from the top or bottom: 65 to 300mm;
- intervention depth: up to 45 metres;
- controlled from outside;
- cleaning without pollution of the product; and
- to be used before GIRONET®.

The GIRONET®

This 360° rotating hinged arm is an answer for ratholing blockage and dead stocks.

- intervention depth: up to 45 metres; and
- controlled from outside.

These two products, available in pneumatic version (friable products) or in hydraulic version (hard products) and in ATEX version for the GIRONET®, are effective on any type of blockage, product or storage unit. They can be used without stopping production.

This mechanical cleaning method is safe because it excludes any human interventions inside the silos and hoppers.

In addition, using compressed air and aluminium housing around the engine, all risk of explosion is avoided. Therefore, the customer can quickly recover its full storage capacity while ensuring optimum safety for its operators.

Example:

In a power station in south Africa, The GIRONET serves to clean the coal that builds up all around the extraction.

A 7-metre rotating and articulated robust arm goes through the hole and gets attached to a mast which is fixed on to the structure of the bunker making the whole unit safe and secure (see above).

The results:

No one inside the bunker = no risk of fatal accidents.

All sections of the 36 coal bunkers can be cleaned to maintain the delivery of coal to the boilers.

This solution benefits the performance of the power station globally.

Furthermore, for recovering or reclaiming material down from storage units, a vacuum cleaning operation can be carried out by the Standard Industrie International's intervention team.

Konecranes: coal handling down to a fine art

Coal handling grab crane provided to Magnitogorsk Metallurgitseskiy Kombinat in Russia.

Konecranes is renowned in the bulk handling world for its lifting equipment and services, and serves a broad range of customers, including manufacturing and process industries, shipyards, ports and terminals. For more information on the company's cranes on barge, please see 'Konecranes Gottwald cranes on barge to be operated off the coast of Guinea' on p36 of this issue.

Among the many commodities handled by Konecranes' equipment are coal and coke. Below follows details on just a few of the company's offerings to the coal handling market, including some recent orders.

Mobile harbour cranes

Konecranes' mobile harbour cranes (MHCs) remain extremely popular in the bulk handling market, as they are so flexible not only in their operation, but in terms of the different commodities they handle. Containers are containers, but bulk material is far from standard. They have different consistencies, densities and flow rates. They range from: agricultural products such as grain, soya, flour, sugar, rice, maize, seed, animal feed and fertilizer; to power generation products such as coal, iron ore, copper, zinc concentrate and scrap; to construction industry materials including cement, sand, gravel, clinker and limestone.

Bulk terminals are like the vessels that visit them — each can have very different properties. Terminals can range from having virtually no infrastructure, to being equipped with a complex infrastructure including hoppers, conveyor belts and

At a coal import terminal, with no handling equipment on the quay, a Konecranes' crane bridges the gap between the quay and ship in shell-draught berth.

Portal harbour crane on barge at a coal import terminal.

stacker reclaimers. Equally vessels come in a range of sizes, from single-hold mini-bulkers to mammoth ships carrying 400,000dwt of cargo.

For this reason, Konecranes has an extensive portfolio of MHCs. It has a well-graduated product range, including:

- seven models, maximum 200-tonne capacity and 64m radius;
- two-rope variants;
- four-rope variants for bulk handling with maximum 63-tonne grab curb.

The company's MHCs have also inspired its other cranes, which have taken many of the MHC principles and applied these to the other models, which include portal harbour cranes; rubber-tyred portal harbour cranes; pedestal-mounted harbour cranes; MHCs on barge; portal harbour cranes on barge; and pedestal-mounted cranes on barge.

Handling rates for Konecranes' MHCs typically range of 750tph (tonnes per hour) to 2,000tph.

MHCs with two hoists for four-rope grabs enable operation with simple and robust mechanical grabs, and offer high working speeds and acceleration. They achieve very high handling rates of up to 2,000tph.

Coker cranes

The coke pit is the production heart of a petrochemical plant, a harsh environment full of moisture, corrosive fumes and abrasive dust. Work is fast and continuous, and downtime is crippling to production. Konecranes can provide lifting equipment and service that can meet these challenges safely and efficiently. It offers a variety of crane types that can be adapted to the structure of the facility and customized to exact specifications — bridge cranes; semi-gantry cranes; portal semi-gantry cranes and custom cranes with fixed hoppers to conveyor.

Load control technologies reduce stress on people and machines

Konecranes' proprietary load control technologies are software programmes that operate in the background of its coker cranes, making the operator's job safer, easier, and less fatiguing. They also reduce stress on controls and machinery. Technologies including DynAGrab, DynaTrack and DynAPilot offer such vital

GOLFETTO SANGATI
GRAIN MILLING AND HANDLING

Mechanical and Pneumatic Systems for grain handling and port facilities

Designed, engineered and built in italy with 90 years of experience and evolution

Golfetto Sangati, part of GEA Group, designs, builds and installs turnkey equipment for grain handling and milling. The company fulfills the market demand in a competitive way and with state-of-the art technologies based on research, experience and in-depth technical knowledge. The company designed and built more than 60 port systems all over the world and plays a primary role in technological advancement from the first pneumatic ship unloader to the more advanced mechanical loaders and unloaders. The company supplies a large range of handling, processing and storage, loading and unloading systems on tires or rail

GEA engineering for a better world

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services as synchronizations, skew control and the reduction of load sway.

In addition, Konecranes CMS Monitoring software provides equipment status and alarms and can archive that information for use in maintenance planning and trouble-shooting. And TRUCONNECT® Remote Support provides 24/7 access to a global network of crane experts and specialists, offering problem solving and troubleshooting.

Supporting the entire process

Petrochemical production cranes have to be especially durable to withstand the constant wear and stress of coke-handling environments. Konecranes' service experts can provide guidance on the right inspections and maintenance. By working closely with customers, Konecranes has developed a body of experience in petrochemical industry processes and material handling applications.

Konecranes awarded order for three large mobile harbor cranes from Ras Al Khaimah, UAE

In the fourth quarter of 2018, Saqr Port, part of the RAK PORTS GROUP, ordered three Model 8 mobile harbour cranes; two Konecranes Gottwald cranes were delivered in April 2019, a third one followed in July 2019.

Situated in Ras Al Khaimah, Saqr Port is the major bulk terminal in the Middle East and an essential pillar of the Emirate's economy. The two new eco-efficient diesel-electric cranes, additions to the existing fleet of eleven Konecranes Gottwald mobile harbor cranes, will handle inbound and outbound bulk material including coal, limestone and clinker.

David Owen, Port Engineering Manager, Saqr Port: "Ras Al Khaimah is one of the most rapidly growing Emirates. Our port not only plays a key role in the long-term strategy of our Emirate, but also as a logistic backbone of the entire Arabian Peninsula. To fulfill this dual role, we have operated mobile harbour cranes from Konecranes for many years which have proven themselves to be very efficient. The new Model 8 cranes form both the next step in our partnership with Konecranes and our terminal's performance. These large cranes will help us to sustainably boost productivity in Saqr Port."

Dirk Stoll, Regional Sales Director of Konecranes' Business Unit Mobile Harbor Cranes: "The United Arab Emirates are situated in the center of an extremely dynamic world region. Reliable handling of bulk materials is thus crucial. We are proud that this important customer continues to trust in our technology for its bulk operations. Saqr Port's decision once again in favour of Konecranes Gottwald mobile harbor crane technology confirms that our large cranes perfectly meet the needs of terminal operators who are faced with the challenges of rapid growth."

The three Model 8 mobile harbor cranes for Saqr Port are four-rope G HMK 8410 B cranes with a powerful 63-t grab curve in combination with the highest operating speed on the market, resulting in the highest handling rates. For particularly eco-efficient use, the cranes will be prepared to be hooked up to the terminal's grid.

Konecranes Gottwald Model 8 mobile harbor cranes are in high demand around the globe.

Konecranes delivers portal harbour crane to Spain

In October 2017, the Spanish bulk terminal operator European Bulk Handling Installation (EBHI) in the port of Gijón put a Konecranes Gottwald Model 8 portal harbour crane into service.

The crane, originally ordered in October 2016, is being used mainly to unload coal and iron ore. This is the first portal harbour crane delivered by Konecranes to Spain.

The new machine is the first Konecranes Gottwald portal harbour crane purchased by EBHI. It is helping the terminal to continue increasing its handling volumes.

Jose Manuel del Arco, Managing Director, EBHI said: "Our handling rates have increased sustainably in the past few years. To serve this increasing demand over the long-term, we are now opting for bulk handling technology from Konecranes. We were particularly impressed by the short delivery lead-time for the crane, the high handling rates and the very eco-efficient electric drive system, which uses power from our terminal's mains supply."

Giuseppe Di Lisa, Sales and Marketing Director, Mobile Harbor Cranes, Konecranes: "Our business in Spain is developing very well these days. We are proud that EBHI , another leading terminal, has decided to adopt our portal harbour crane technology. Around 50 examples of this technology are working around the world in large bulk terminals that supply raw materials to power stations and feedstock to industrial plants."

Konecranes Gottwald portal harbour cranes bring together field-proven mobile harbour crane technology and portal designs. The machines are particularly suitable for integration in the complex infrastructures of bulk terminals. The new Konecranes Gottwald portal harbour crane for EBHI, a Model 8 crane in a four-rope-grab variant, offers a maximum lifting capacity of 100 tonnes with a powerful 63-tonne grab curve and an operating radius of up to 50m. The portal has a track gauge of 22m and a clearance height of 6.125m.

Model 8 portal harbour crane delivered to EBHI in the Port of Gijón in Spain.

TMSA designs and implements major coal transport system in Brazil

Founded in 1966, TMSA has consolidated in recent years to become one of the major equipment suppliers for port terminals and for the high-capacity handling of bulk solids over long distances.

Given the expertise of its specialized team, the company has developed a range of different solutions to provide quality equipment and to provide high-quality solutions in different markets.

Among its many coal handling projects, TMSA has designed and implemented the newest and most innovative mineral coal transport handling system in Brazil at the Pampa Sul Thermoelectric Power Plant, in the city of Candiota/RS.

It is considered to be one of the largest tubular belt conveyors in Brazil, extending to a length of 4.17km in a single bid, with transport capacity of 550tph (tonnes per hour) of mineral coal.

This large greenfield project, carried out as a turnkey contract, included basic and detailed projects, civil and infrastructure works, manufacturing, implementation, testing and commissioning, as well as assisted operation. TMSA also took charge of all environmental management, and the company implemented the environmental recovery plans necessary for the operational licensing of the system by IBAMA.

A striking feature of the project is its drive system through state-of-the-art medium voltage inverters with automated load sharing load distribution control.

In addition, the project has a lighting system that uses autonomous LED lamps powered by built-in photovoltaic solar panels. This ensures a non-polluting, silent energy, from a renewable source, which is easy to install, and has minimal maintenance needs. It also has a modern monitoring system that uses high-definition cameras. These are linked to implanted telemetry, and allow operators to verify the behaviour of the equipment in real time in the control centre.

The mining market is increasingly competitive, where the pressure to reduce costs and increase productivity is ever-increasing. TMSA's team has the expertise to seek and create innovative solutions that offer a better economical choice to the customer.

Having reached its fifty-fourth anniversary, TMSA has gained the experience and strategic will necessary to focus its efforts on increasing the profitability of its customers. This is because, in addition to green field projects, it now offers solutions for the support and modernization of its customers' existing industrial facilities (the so-called 'brown field'), through the allocation of its highly specialized engineering team.

CRS's Coaltainer: designed to cope with the rigours of coal handling

In 2009, Container Rotation Systems (CRS) introduced Australia's first 360° container rotator, trademarked Rotainer®, which was commissioned for D.P. World, Port Adelaide, Australia.

Initially, its primary role was loading parcels of approximately 70,000 tonnes of DSO iron ore for IMX Resources. Automated lid lifting following not long after, for copper concentrate applications.

Since then, CRS has continued to enhanced its systems and has built a client

base which sees its products successfully operating in ten countries around the world, from the extreme temperatures of Central Africa to the arduous conditions of Northern Canada.

CRS is a one-stop solution for rotational, containerized bulk handling equipment.

The year 2020 will showcase the launch of the Rotainer® 2020 programme, which encompasses several new products. These include the Rotainer® Eurospec MH range, Ezzelid™, Tiltainer®, and the Skiptainer® Load and Dump.

The Rotainer® MH container Rotainers are purpose designed for large materials handlers, mobile harbour cranes and ships' cranes. Furthermore, CRS is adding to its container range the Ezzelid™ self-opening lid system, a new concept for cost effective, simplified lid opening together with its Skiptainer® Load and Dump system which allows for loading in the ship's hold as well as discharge.

At the coal face

CRS has developed a special, 2900mm heavy duty container system for coal and other light materials such as woodchip and grains, for when higher-than-normal volumes need to be transported and loaded.

This system is well suited for applications where the product is moved from a shore-based stockpile to the shiploading facility via an internal road network. This innovative and patented container design is best suited to the newly developed Rotainer Eurospec 38 with rotating head frame which allows for larger lifting capacities whilst keeping the simple design criteria.

The Rotainer Eurospec 38, released in 2018, is designed for containers from 1,450mm to 2,900mm in height with or without optional lid lifting.

With a tare weight of 9,500kg and a gross lifting capacity of 38,000kg, it gives maximum advantage to reachstackers and ships' gear cranes.

Being self powered via diesel/hydraulic or electric/hydraulic makes this a simple, low-maintenance drive system with no need for a complex interface with the main machine.

The Rotainer Eurospec 38 is designed to suit reachstackers, ship-to-shore (STS) cranes, mobile harbour cranes, large material handlers or bridge cranes.

To optimize STS crane operations, CRS has developed as an option a specialized, high capacity rotating head frame that allows 360° rotation in the horizonal plane.

Simply put, N-S-E-W discharging position means more efficient shiploading and trimming.

Recent company activity

CRS has been very busy recently. Among its most notable contracts include the commissioning, ten months ago, of two units for Ust-Luga Port in Russia. They are connected to a high capacity Kone STS crane. CRS designed and manufactured a special 360° rotating head frame to better trimming with less long travel of the crane. The contract was so successful that a further two units have been ordered to run on the four cranes.

In terms of capacity, they offer an average of 35 cycles per hour; using two cranes, they can operate at 2,200tph (tonnes per hour), with the potential of 4,400tph if all four cranes are operating.

Each unit has completed 16,300 cycles in ten months — they were set up to operate at a rate of approximately 20,000 cycles per year.

The units run perfectly in temperatures ranging from–10° to + 35°. The system is managed on site by Severmek from St Petersburg.

A special high duty cycle Rotorcon 2,900mm container was designed especially for this project. A third unit was commissioned and loaded on ship in January this year, and the four unit is in the water and is expected land in Ust Luga this month.

Telestack's rapid deployment solution enables Oxxean to use existing infrastructure and minimize on capital expenditure

Telestack recently installed a TB58 Export Radial Telescopic Shiploader to Oxxean in Chile, which is proving a critical part of the logistics chain in Chincui Port, located in the developing industrial zone of Puerto Montt. The unit is currently fed directly from a woodchip stockyard and is used to load woodchips onto Panamax vessels in Chincui Port at loading rates of 600tph @ 0.3 tonnes m³, destined for China where they will be used to feed power stations.

Oxxean Puerto Chincui was formed to maximize the unloading and loading of solid bulks in the region. At the start of this project, Oxxean's primary objective was to achieve an efficient woodchip export business. Telestack's solution, which was custom-designed specifically to the parameters of their existing jetty, meant that Oxxean could utilize the current infrastructure without major capital investment, planning approval or civil construction. The immediate savings achieved by selecting the Telestack solution, compared to a fixed infrastructure or mobile harbour crane, meant that Oxxean could redeploy its capital investment in other areas of its operation. The lower cost per tonne also ensured that Oxxean maximized on efficiency. The flexibility of the Telestack unit also future-proofed the equipment, meaning that the quay is now more flexible when handling any dry bulk and can be adapted quickly and efficiently to load different commodities. Furthermore, the flexibility to use the unit in any type of shiploading, unloading or stacking means that the TB58 unit can be maximized along any part of the logistics chain. The investment in the TB58 Telescopic Shiploader also reduced the timeframe of the project significantly with the system fully operational in 6–7 months from order.

A key requirement for Oxxean when considering its shiploading solution, was to minimize the capital investment and to utilize the existing jetty as much as possible. The existing finger jetty was limited in size so it was important that the TB58 Telescopic Shiploader was capable of operating within these restricted parameters. The capabilities of the equipment allows the operator to have ultimate flexibility whilst shiploading and when in storage position, compared to fixed length shiploaders, as minimal space is needed for storage. The site is used as a multicargo jetty for shiploading, ship-unloading and breakbulk so the mobility of the shiploader was a key consideration as it was an important that the shiploader could be moved easily off the jetty when required.

International Sales Manager for Telestack, Carl Donnelly explains "Telestack have been providing solutions for over 35 years and we are experienced in working within the parameters of existing infrastructures. Mobile equipment often helps reduce initial CAPEX as they are typically significantly cheaper to purchase and operate than mobile harbour cranes and stationary conveyor systems without the civil construction requirement. The mobile equipment also means there are typically significantly lower civil engineering and infrastructure costs, and can easily link into existing material handling systems. The customer can very quickly be generating revenue streams with this mobile 'rapid deployment solution' which was critical to the Oxxean Project in Chile. Typically designed to not require any onsite welding, a standard shiploading unit can be transported in several 40ft containers and operational within a very short space of time — all with limited/no planning requirements or restrictions as found with stationary solutions. Moreover, the operating costs are significantly less than traditional systems as mobile solutions are continuously loading as opposed to grabs/wheel loaders/trucks coming back empty in the cycle. The ease of use means that all machines are simple to operate, maintain and troubleshoot as there are no complicated electrics/electronics to manage, and hydraulics can be kept to a minimum. Overall, this has been a very successful project both for Telestack and the customer Oxxean and we look forward to developing this relationship further in Chile and South America."

The radial and telescopic features of the mobile Telestack solution allowed the operator to easily and safely work within the constraints of the site. Fitted with a Telestack telescopic Telechute with 360° trimmer, the radial telescopic features allows for trimming of the hold. Each Telestack unit is custom-designed and as part of the design brief, will take into consideration the maximum free-board heights, beam and quayside widths, production rates, relevant vessel characteristics as well as commodity composition. The design in this case also had to consider the flow-ability of the product and Telestack's direct loading solution ensured that the material could be transferred from stockyard to vessel as efficiently as possible, eliminating the double handling of material and maximising the integrity of the product.

The TB58 Telescopic Shiploader has an extended 58m length conveyor and 8m telescopic discharge chute.

The TB58 Telescopic Shiploader has an extended 58m (190ft) length conveyor which allows the unit to reach the centre of each of the holds easily. The integration of an 8m (27ft) telescopic discharge chute with 360° trimmer increases flexibility during the trimming process. The dust covers on the outer and inner conveyors also controls any dust and contributes to the environmental benefits.

This system is fully supported by Telestack's long term dealer Komatsu Chile. Komatsu Chile (KCH) is the local unit of Japanese mining and construction equipment manufacturer Komatsu Limited. The company provides equipment, services and parts for the construction, mining and forestry industries. Komatsu Chile is an established long term partner of Telestack's which provides excellent pre-sale and ongoing aftersales support of all Telestack systems in Chile.

Invisible dust: measuring particulates and controlling emissions

When air quality changes, people with chronic breathing problems know immediately, *writes Mike Lewis / Vice President of Sales, BossTek*. They monitor pollen and dust levels regularly, because normal daily activities depend on it. When their ability to breathe is unexpectedly disrupted, they may search for causes inside the home or workplace, visit online air quality monitoring resources, or — out of desperation — personally investigate the potential sources in their local area.

Dust emissions that cause respiratory symptoms are frequently invisible and could be travelling from locations that are miles away. When a state's Department of Environmental Quality (DEQ) receives a complaint from the public regarding air quality, inspectors generally inform the alleged violator. If complaints persist, they can trigger an inspection. For example, during the recent construction of an elementary school in Lake Travis, TX, as few as four complaints sparked a full investigation and testing.[1]

Companies that engage in coal handling, aggregate processing, open-pit mining and other dust-emitting activities are typically well aware of issues with particulate emissions. However, many still employ antiquated methods of dust control using tanker trucks with spray bars, water hoses for suppression of airborne and ground-level particles, and natural wind barriers in an attempt to stop particulates from leaving the site line. These have proven inadequate against microscopic respirable dust and do little to help operators comply with modern testing and regulations. As a result, a number of facilities across a wide range of industries are turning to more innovative methods such as atomized mist technology to manage this invisible threat.

Air quality testing equipment contains sensors that measure microscopic particulates (source – Environmental Protection Agency).

Invisible hazards

"The science behind industrial particulate emissions has become so precise that measurements are taken at the microscopic level," said Jason Lesch, Senior Engineer at BossTek. "In most cases, visible particles are big enough to be stopped by the body's natural defences: mucous membranes, cilia, etc. However, microscopic invisible emissions tend to bypass these controls and penetrate into the lungs. Long-term exposure can cause chronic breathing issues and serious problems for people with weakened immune systems."

Particulate matter (PM) is measured in micrometers or microns (µm). Depending on the mass of the substance, particles are generally light enough to become airborne at <200µm in size and become invisible to the naked eye at around <100µm (approximately the width of a human hair). Generally, the particle size required to penetrate the body's natural defences is µ10[2]. Referred to as "respirable dust," PM of this size can travel long distances on natural air currents without visible detection. Once inhaled, these tiny particles reach deep into the bronchial system, becoming a primary factor in

[1] Dadamo, Amy Ray, "TCEQ investigating residents' dust complaints against Lake Travis ISD school under construction", Community Impact Newspaper. Aug, 2019. https://communityimpact.com/austin/lake-travis-westlake/development-construction/2019/08/15/tceq-investigating-residents-dust-complaints-against-lake-travis-isd-school-under-construction/

[2] "Particulate Matter (PM) Basics". Environmental Protection Agency. Washington, DC. Aug. 2019. https://www.epa.gov/pm-pollution/particulate-matter-pm-basics

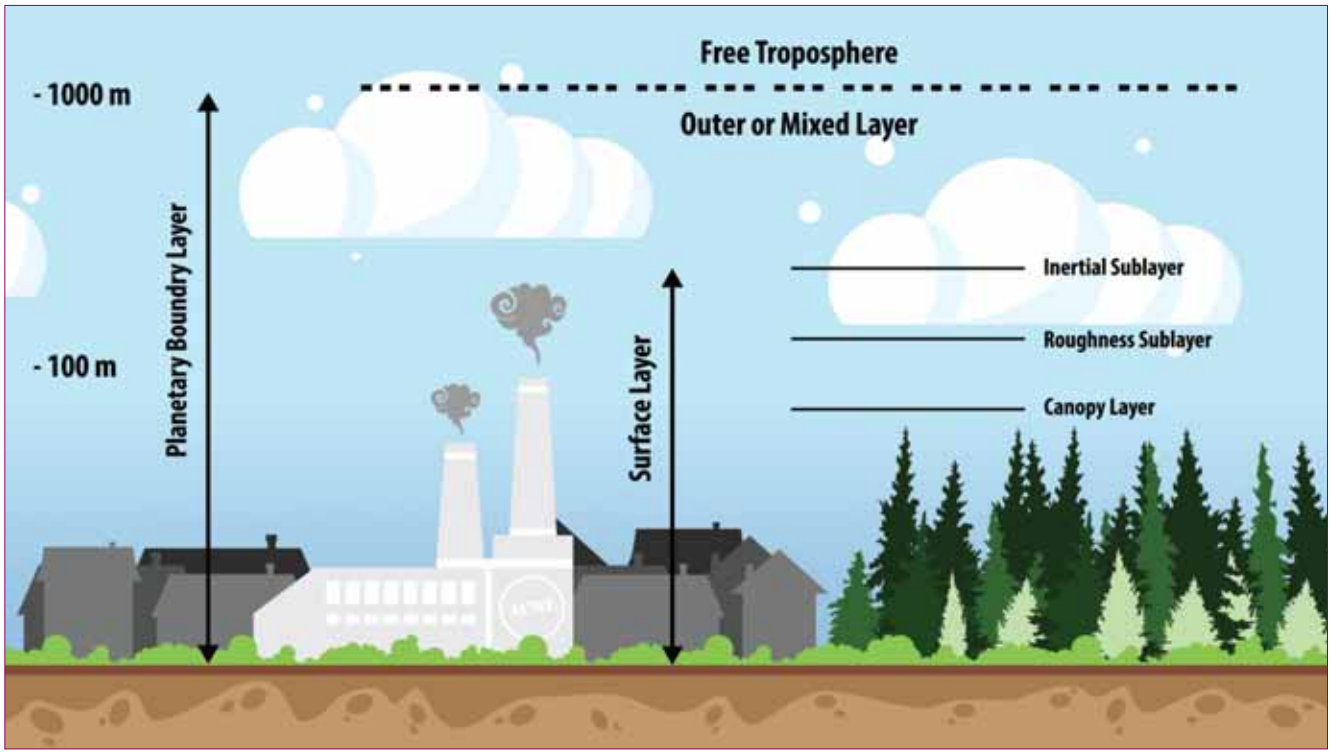


Figure 1- Airflow layers can carry dust long distances, raising the chances of complaints.

chronic conditions such as silicosis or pneumoconiosis (black lung).

What are DEQ inspectors looking for?

In response to complaints, inspectors need to confirm the complaints and make a causal connection to industrial operations. To do this, they often strategically position sensitive dust detection equipment a mile or more outside of the site. After studying the prevailing wind patterns, gravimetric meters are placed upwind and downwind from the alleged violator. Gravimetric meters extract air samples and use a filter to separate out the particulates in the range of PM10 to PM2.5 over a specified period. The amount of dust is determined by weighing the filters, and those values are then used to calculate the concentration of dust with a high degree of accuracy. If the downwind meter detects a significant increase in particulates, that tends to confirm the claims made by the community.

Personal Dust Monitors (PDM) can be requested for workers to wear during work shifts to determine which operations cause dust, as well as when and where on the site. Typically, either an active photometer or nephelometer employs a pulsed, high output, near-infrared light-emitting diode source to detect the density of particulates in the size range of 0.1 to 10µm. The unit has a concentration measurement range of 0.001 to 400mg/m^3 (milligrams per cubic metre).[3] Gathered data can be cross-referenced with results tabulated by gravimetric meters. This then informs inspectors as to next steps, generally involving warnings, fines, action items, operational restrictions (time, days, etc.), or possible shutdown.

If potentially toxic emissions such as lead particulates or carcinogens are detected, further testing by the Centers for Disease Control (CDC) is conducted using even more sensitive equipment. Violations for exceeding allowable toxic emissions could result in stiffer fines, closures, and/or litigation. Unfortunately, it's not uncommon for violators to be initially unaware they were even emitting these substances.

Democratization of testing

"Some local communities aren't waiting for the government to come to their aid," Lesch explained. "Innovative technology that is relatively cheap to manufacture is changing how individuals monitor air quality for their own health."

The EPA releases data collected by the National Air Toxics Assessment (NATA) to the public but restricts the usage of the data by individuals for litigation or policy purposes.[4] Individuals, communities and environmental organizations can now turn to new technologies set up in their own back yards that collect data and automatically feed a centralized database.[5]

Although not as reliable as professional-grade devices, several active devices may be concentrated in sample areas, in order to compensate for the potential margin of error. Monitored and aggregated by environmental organizations, this data can be used to put political pressure on local legislators or spark legal action against specific polluters.

Controlling airborne particulates

From front loaders digging into storage piles to truck wheels rolling over unpaved roads, field testing has shown that disruption of material is the major cause of airborne dust in outdoor operations. Surface spraying helps but cannot fully prevent emissions and does not control particulates once they've become airborne.

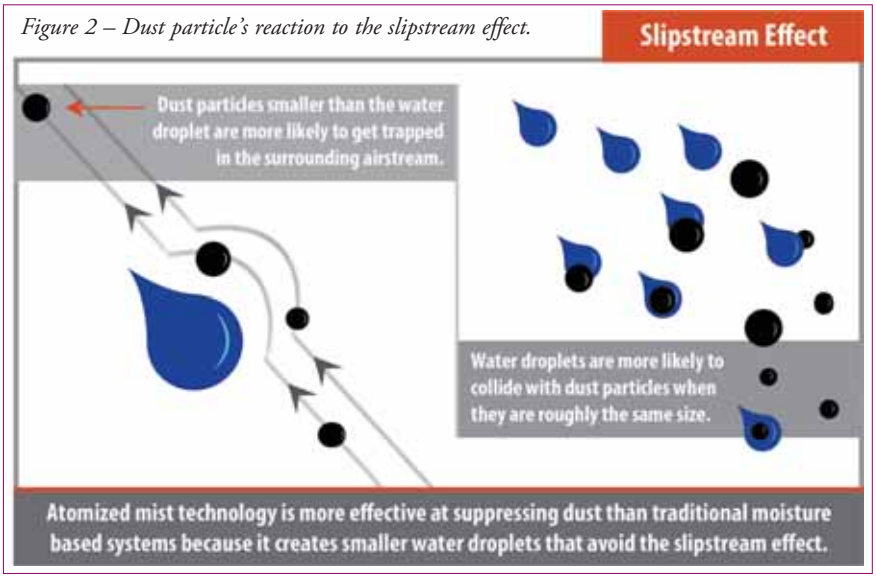
When disrupted, airborne dust particles can linger and travel long distances, even in moderate breezes. The higher the storage pile or less contained an area is, the greater the chance of an emission being carried above the canopy layer, greatly reducing the effectiveness of natural or man-made wind barriers (see Figure 1 on p95).

The U.S. National Institute for Occupational Safety and Health (NIOSH) published an extensive study in 2018 on the most effective method to address airborne particulates, specifically explosive coal dust in longwall mining operations.[6] Researchers concluded that pressurized and widely distributed atomized mist droplets presented the highest capture rate of particulates <75µm.

For water to effectively suppress airborne dust, the droplets must be roughly equal in size to the particles. The reason for this is the 'slipstream effect'. Hoses create water droplets 200–10,000µm in size. These particles are too large to linger in the air and collide with dust particles, so air currents form around the droplets as they fall. Like wind travelling around an aircraft's wing and giving it lift, large droplets cause a similar effect. When the tiny dust particles encounter the larger droplets, they get caught in the slipstream, which diverts them away from the droplet rather than being absorbed (Figure 2, above).

"Atomized mist droplets for dust management usually range in size between 50µm and 200µm, which means they are light enough to travel with the dust," Lesch said. "That range can be extended upward or downward using different nozzles sizes and shapes to deliver the optimum droplets

Figure 2 – Dust particle's reaction to the slipstream effect.

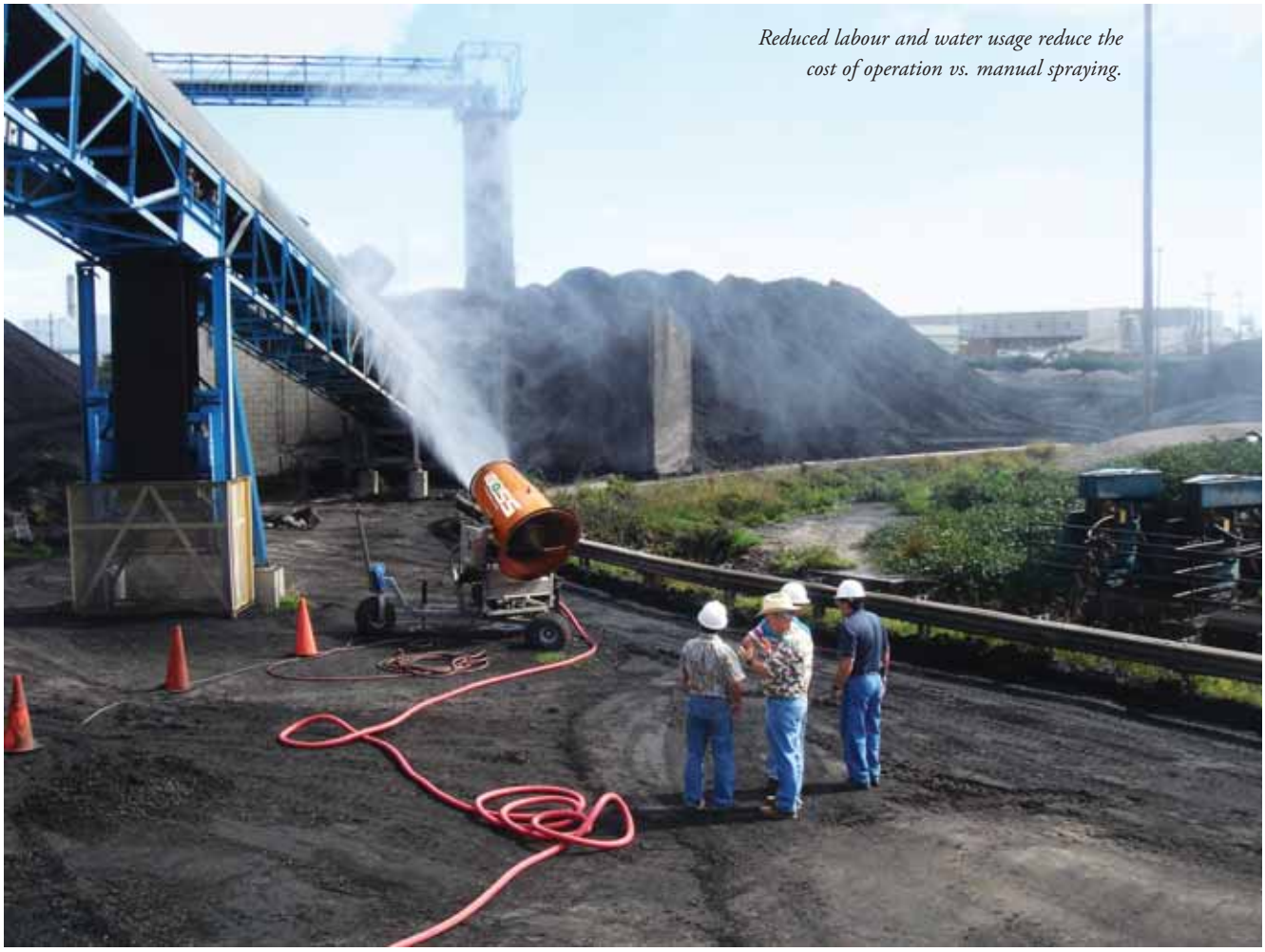


[3] Listak, Jeffrey; et al. "Performance Of A Light Scattering Dust Monitor At Variousair Velocities: Results Of Sampling In The Active Versus The Passive Mode". Centers for Disease Control. Washington, DC. Jan-Mar, 2007. https://www.cdc.gov/niosh/mining/UserFiles/works/pdfs/poalsd.pdf

[4] "How to Use NATA Results". National Air Toxics Assessment, Environmental Protection Agency. Washington, DC. Aug. 2019. https://www.epa.gov/national-air-toxics-assessment/nata-overview

[5] Plautz, Jason. "Cheap Air Sensors Are Democratizing Air-Quality Data". City Lab. July, 2019. https://www.citylab.com/environment/2018/07/cheap-sensors-are-democratizing-air-quality-data/563990/

[6] Beck, T.W.; Seaman, C.E.; Shahan, M.R.; Mischler, S.E. "Open-Air Sprays For Capturing And Controlling Airborne Float Coal Dust On Longwall Faces". U.S. National Institute for Occupational Safety and Health and Mining Engineering, Vol. 70, No. 1, pp. 42-48. Jan 2018. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5769954.



Reduced labour and water usage reduce the cost of operation vs. manual spraying.

for specific applications."

Atomized mist technology introduces billions of droplets over a wide area, and because they can remain airborne for long periods, the technology is far more effective than conventional labour-intensive methods. It also uses far less water, helping to reduce costs and potential runoff.

Caveman technology vs. modern innovation

Hand-held fire hoses are a common dust management approach on many worksites. Hoses fitted with a 1.5-inch nozzle that draw water from municipal hydrants use about 100 gallons per minute (gpm) (378 lpm). They often require one or more workers to focus the spray on problem areas, and they can create excessive runoff and mud. While the equipment cost is low, hoses require ongoing labour and waste large volumes of water.

Using spray bars, tanker trucks have the benefit of mobility using a single driver, but the suppression range is limited to a few yards, with droplet sizes typically around 200–500µm. The trucks only offer surface suppression in relatively flat areas and need to be filled periodically throughout the day. Moreover, they require a large amount of fuel to operate continuously.

With a water usage range of 1.4gpm (5.2 lpm) at 25 psi up to a maximum of only 39gpm (147 lpm) at 100psi for the largest models, atomizing equipment fractures the water into a fine mist, with droplets in the optimum range between 50–200µm in size. Users of atomized mist technology can choose from a variety of different designs, including low-turbulence models for applications in which a large airflow would be undesirable — indoor operations, tunnels, conveyor transfer points, etc. — and they can be customized according to the application.

Fan-driven units employ a cone-shaped barrel with atomizing nozzles in front, a powerful industrial fan in the rear and can be mounted on a mobile trailer, skid, or

fixed tower. This fine atomized mist can be projected as far as 100 metres (328 feet) in calm conditions, able to cover as much as 280,000ft² (26,013m²) with a single oscillating unit. These fan-driven machines are typically manufactured in a standard 480V configuration for the US market, and users can specify voltages to suit their region. They can be direct-wired or powered by a generator set. Self-contained, transportable units can be mounted on a road-worthy trailer, with a generator and highly durable electric motor.

Modern atomized mist cannons are engineered to deliver portable one-touch operation, with workers able to manage the settings for specific conditions via touch keypad or remote control. They can run unattended for extended periods when connected to a suitable water source, reducing labor and the overall cost of operation vs. manual suppression methods.

Conclusion

The regulations for air quality reach farther than merely protecting local communities. On the surface, they may seem 'anti-industry', but with volumes of studies tying low air quality to respiratory diseases, cancers, and heart disease, dust exposure can impact residents and healthcare systems both locally and nationally.

Capital investments in new dust control technology can seem expensive, but the costs pale in comparison to lost labour, inspections, fines, settlements, and downtime. Well-constructed, field-tested equipment can deliver a low cost of operation and proven track record of success, paying for itself over the long run and mitigating the potential consequences of fugitive dust.

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The underside of efficiency: protecting a conveyor belt's return side

In October of 2012, a maintenance employee was cleaning a belt conveyor support roller with a claw hammer, *writes Dan Marshall/Process Engineer, Martin Engineering*. Intending to clean sediment from the roller shell, he reached in through a 6in. (152mm) wide by 20in. (508mm) long triangular-shaped opening between two framed, expanded metal guards to strike an inclined support roller. When removing his hand from the opening, the claw hammer and his hand were drawn into the pinch point between the belt, the support roller and a metal feed chute faster than he was able to let go of the tool, resulting in amputation of a finger. In addition to that tragedy, inspectors issued an $18,000 fine to the employer.[1]

The return side of the conveyor may be the most deceptively hazardous part of a conveyor system. With long gaps between rollers and carrying no cargo, the return side of the conveyor lulls workers into a false sense of security. However, there is an extensive list of injuries inflicted on workers from the return side of conveyors in the Occupational Safety and Health Administration (OSHA) database.[2]. Injuries — caused by nip/shear points, belt contact and reach-in hazards from working around a running conveyor — stem not only from a lack of satisfactory protection of both the worker and system, but also inadequate training.[3]

Many experts will attest to the fact that efficiency and safety are inextricably linked. Thus, an emphasis on safety translates to a reduced cost of operation and increased production. Clean return systems using modern equipment mean less spillage and clean-up under and around the belt, which mitigates labor costs, downtime and exposure to work hazards. A well-maintained belt return also yields less dust, fewer fouled rolling components and a centred belt entry from the tail pulley into the loading zone.

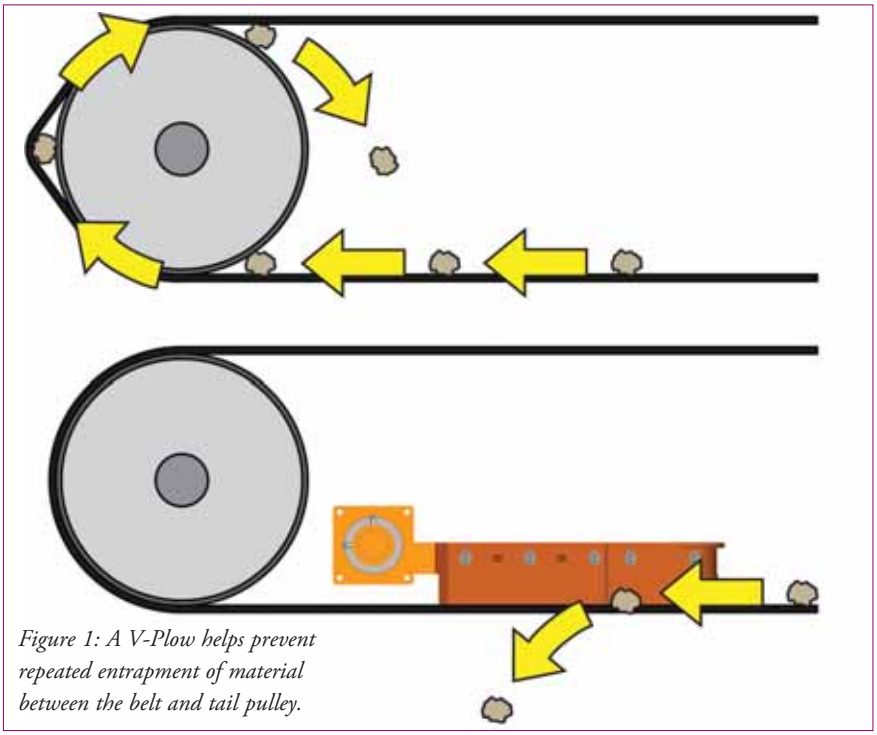

Figure 1: A V-Plow helps prevent repeated entrapment of material between the belt and tail pulley.

Belt return hazards

Beginning from the head pulley over the snub pulley, around the take-up and bend pulleys and extending to the tail pulley, the myriad of hazards presented to workers along the entire return belt path can result in friction burns, loss of a limb or even death. Understanding the hazards brings into focus the need for solutions.

Nip points are created where a moving element of the conveyor machinery meets another rotating or moving component. It is possible to entrap objects coming in contact with either of the two parts. Commonly this involves something being caught between the belt and pulley where the belt tension will draw in anything that comes into contact with the components. Gears, idlers and rollers also pose a hazard, as they can be placed close enough together to entrap and crush anything that gets caught between them.

Based upon common belt speeds and average human reaction times, a shovel or other tool in an entrapment situation will pull the worker using the tool in with it before the person can even let go. The same is true of loose-fitting clothing or long hair when working beside or under a running belt. Rather than merely losing an extremity, in-running nip points will pull the worker through the rotation, with potentially lethal results.

Shear points occur when the edges of two machine parts move across or close enough to each other to cut a relatively soft material. An example of this is where the belt quickly passes a stationary beam or component, which can trap a limb, abrading or even severing it.

Fugitive material

The fugitive material hazards posed around the belt return begin with the discharge at the head pulley. An inadequately cleaned belt can cause carryback to drop along the entire belt path and spill into walkways or on the return belt. This produces a trip hazard and a possible OSHA violation. In addition, dust can get into cracks and divots in the belt, release along the belt path, and foul gears and bearings of rolling components, causing them to seize and creating a possible fire hazard.

Inadequate cleaning technology and tensioning systems allow carryback to collect directly beneath the discharge zone. If not addressed, material accumulates quickly until the belt runs along the top of the pile, creating carryback across the entire profile while abrasion degrades the belt face and frays the edges. In extreme cases, encapsulation can move carryback to the inside of the belt, fouling pulley faces and causing them to slip, leading to mistracking and component wear. If the material is flammable or explosive, the hazard from carryback increases exponentially.

Spillage such as debris on the return side of the belt can rapidly reach the tail pulley. Once caught between the belt and the pulley, these material chunks can recycle through over and over again, each

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[1] "Accident Report Inspection: 314451170," Occupational Safety and Health Administration. Sacramento, CA. 2012. https://www.osha.gov/pls/imis/establishment.inspection_detail?id=314451170

[2] "Accident Reports: Conveyor Roller," Occupational Safety and Health Administration. Washington, DC. 2018. https://www.osha.gov/pls/imis/AccidentSearch.search?acc_keyword=%22Roller%20Conveyor%22&keyword_list=on

[3] Swinderman, Todd; Marti, Andrew D.; Marshall, Daniel: Foundations for Conveyor Safety, Martin Engineering, Section 1, pp. 8-26. Worzalla Publishing Company, Stevens Point, Wisconsin; 2016. https://www.martin-eng.com/content/product/690/safety-book

time putting a new divot in the belt, as well as gouging and fouling the pulley face. This material can become ground into fine dust or ejected from the pulley. Plows are often used to clean the inside of the belt and protect the tail pulley and belt from damage (see Figure 1 on p100).

Other equipment hazards

Many operators focus on cargo side issues and neglect the return side, where belt tracking should be of pivotal concern. When left unchecked, the belt can drift into the structure, causing fraying and the potential for a fire hazard. Moreover, if the belt is off-centre on the tail pulley, then it will likely enter the loading zone unevenly and cause the cargo to be loaded off-center, exacerbating cargo-side belt tracking issues.

Normal long-term wear and tear is also a hazard, which can contribute to equipment separating from the system and falling to the ground. Operators are encouraged to be especially aware of the weight at the take-up pulley, which uses downward force to control the belt tension, and if it works itself loose, can crush anything beneath it.

While issues from fugitive material to belt tracking can cause a number of mechanical problems, each one also represents a safety hazard. If components are not functioning at 100%, there is an increased likelihood of a situation that may put a worker in danger while trying to fix the problem. An operation's interests are best served by taking actions intended to prevent the mechanical problems and the accompanying potential for injury, rather than just protecting the worker from hazards that will likely be present with guarding.

Figure 2: Proper signage should be displayed wherever a hazard presents itself.

Minimizing return belt hazards

According to OSHA,[4] operators should adhere to the standards set by the American National Standards Institute (ANSI), which recommends detailed inspections of the entire conveyor mechanism.[5] The first step is identifying potential problems before they occur (see Figure 2, above). The second step should be putting an emphasis on training and enforcing strict lockout-tagout procedures for any activities on or around the conveyor system.

The third step is for operators to choose the proper equipment to minimize accidents. New equipment designs dispel the myth that conveyors are inherently dirty and in need of constant maintenance. The equipment being offered today is safer and easier to maintain, engineered to improve production and efficiency, and designed to reduce the cost of operation.

Safe and efficient cleaning

In the past, belt cleaners were rigid, linear pieces of hardware made out of various materials from brick to plastic that earned the name 'scrapers' or 'wipers' because that's what they did. They had a low operational life, broke or cracked often and significantly contributed to belt wear. Modern primary cleaners are usually mounted at the head pulley, made from engineered polyurethane, which is forgiving to the belt and splice, but still highly effective for dislodging cargo. Typically supported by mechanical or pneumatic tensioners designed to meet the needs of the application, the designs require significantly less monitoring and maintenance of blade tension. At least one modern primary cleaner design requires no tensioning at all after initial installation. Featuring a matrix of tungsten carbide scrapers installed diagonally to form a 3-dimensional curve around the head pulley, it typically delivers up to 4x the service life of urethane cleaners without needing re-tensioning.

As conveyor speeds and cargo volumes increase to meet production demands, secondary belt scrapers are often installed immediately after the belt leaves the head pulley to address dust and fines that escape the primary cleaner. Generally equipped with spring or air tensioners that easily adjust to fluctuations in the belt, secondary cleaners are particularly efficient for applications that produce wet, tacky or dusty carryback.

In most applications, normal belt wear can yield valleys and depressions in the belt. Dust and fines that get into these blemishes often remain even after passing under primary and secondary belt cleaning blades, becoming dislodged by the impact of any return idler the belt meets (Figure 3, left). This causes dust and spillage in areas away from the head pulley.

In such cases, operations may choose to install a Washbox Cleaning System, which combines secondary cleaners with water spray bars enclosed in a self-contained unit that captures residue and drains wastewater safely away from the work area (see Figure 4 on p102).

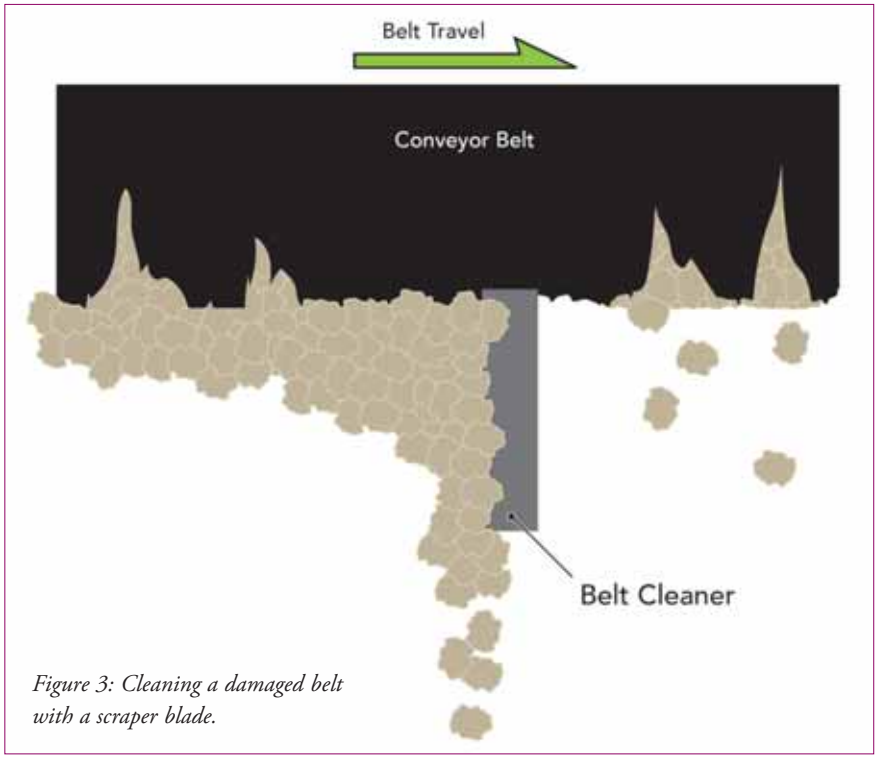

Figure 3: Cleaning a damaged belt with a scraper blade.

[4] "Conveyors," Occupational Health and Safety Administration 1926.555(a)(8), Washington, DC; 2018. https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_id=10765&p_table=STANDARDS

[5] Webb, J.C. "Safety Code for Conveyors, Cableways, and Related Equipment," American National Standards Institute ANSI B20.1-1957; The American Society of Mechanical Engineers.

Even on a clean belt, mistracking is another concern, especially for operators of long conveyors. Previous belt tracking systems were reactionary pieces of equipment designed to help prevent belt contact with the mainframe, however these designs have historically experienced problems with friction heat, edge degradation and belt curling. To avoid these expensive and hazardous consequences, operators can now specify modern tracking equipment designed for the belt return. Shorter single-direction or reversing conveyor systems may only require a crowned roller that uses a ribbed lagging made of durable polyurethane. The moment the belt wanders off-centre, the assembly tilts to the opposing side and steers it back toward the centre.

Some longer systems may require a series of modern upper and lower trackers hung from the mainframe every 70 to 150 feet (21 to 50m) and on the return run directly prior to the tail pulley. These designs utilize innovative multiple-pivot, torque-multiplying technology with a sensing arm assembly that detects slight variations in the belt path and immediately adjusts a single flat rubber idler to bring the belt back into alignment.

Tail pulley protection from build-up riding on the return side of the belt using a V-Plow or diagonal plow can extend the life of the entire system by minimizing fouling of the pulley face that can lead to mistracking. Attached with dual steel crossbars bolted to the conveyor frame ahead of the tail pulley, the units employ a unique torsion arm suspension system, which adjusts to fluctuations in belt tension to maintain consistent pressure for effective cleaning in all stages of wear. Lightly riding on the belt, the diagonal design deflects debris away in a specific direction, while the V-plow design deflects debris to either side. Where large lumps or broken idlers are getting on the return side of the belt, a tail protection plow designed for high impact is used, often in addition to or in combination with a return belt cleaning plow.

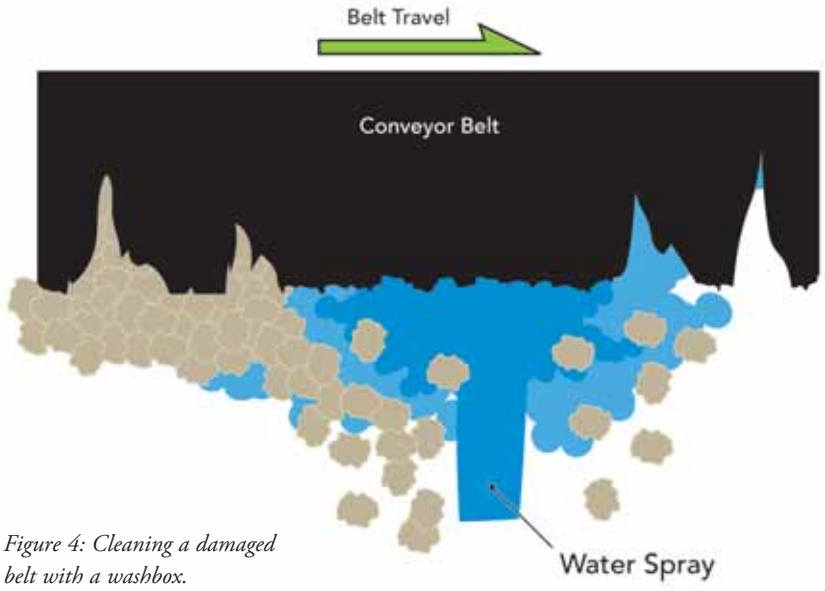

Figure 4: Cleaning a damaged belt with a washbox.

Installing adequate guarding that encloses the system and has the correct mesh size and mounting distance from the hazard also helps protect workers from fugitive material and reach-in injuries. For systems that are considered "guarded by location" (too high to reach), gates may not be required, although most countries have standards that require guarding against falling bulk materials.[6]

[6] Swinderman, Todd; Marti, Andrew D.; Marshall, Daniel: Foundations for Conveyor Safety; Martin Engineering, Ch. 1, pg. 13. Worzalla Publishing Company, Stevens Point, Wisconsin, 2016. https://www.martin-eng.com/content/product/690/safety-book

Build-up can quickly form and engulf both the mainframe and the return side belt.

Return roller guards — though seldom seen except over roads and walkways — improve safety and meet the growing demands of government regulations. Build-up under the conveyor or on work platforms can negate the guarded by location "too high to reach" criteria, so the best practice is to guard all known hazards or eliminate the hazard by design.

Long returns that rise over activities can be prone to spillage hazards, mistracking and falling cargo.

Conclusion

From head pulley to tail pulley, return side belt care is essential to maintaining an efficient and productive conveyor system. By installing modern equipment that helps remedy common return side problems, operators reduce the time workers spend near the system servicing and cleaning it. This mitigates hazards, reduces downtime and improves compliance.

In addition to resolving many mechanical problems, these improvements will help prevent injuries caused by incidental contact with a moving belt that can pull a worker into pinch and shear points, some of the most prevalent workplace hazards in bulk handling operations. Over hundreds of projects that directly address return side issues using modern equipment, operators have reported a quantifiable return on investment. Decreased man-hours for system cleaning and reduced downtime for maintenance enable a lower cost of operation, translating into a return on investment in as little as 12–24 months. If an injury is prevented, the payback is instantaneous, but even without considering the cost of an injury, the improvements actually pay for themselves over time.

Return side inspections should take a holistic view of the return belt's effect on the entire system.

The primary belt cleaner's curved design ensures consistent contact throughout the blade's life.

Return side trackers minimize belt drift and can be fitted on reversing belts.

About Martin Engineering

Martin Engineering is a global innovator in the bulk material handling industry, developing new solutions to common problems and participating in industry organizations to improve safety and productivity. The company's series of *Foundations* books is an internationally-recognized resource for safety, maintenance and operations training — with more than 20,000 print copies in circulation around the world. The volumes can also be downloaded free from the Martin website. Martin Engineering products, sales, service and training are available from 19 factory-owned facilities worldwide, with wholly-owned business units in Australia, Brazil, Chile, China, Colombia, France, Germany, India, Indonesia, Italy, Japan, Mexico, Peru, Russia, Spain, South Africa, Turkey, the USA and UK. It employs over 1,000 people, approximately 400 of whom hold advanced degrees.

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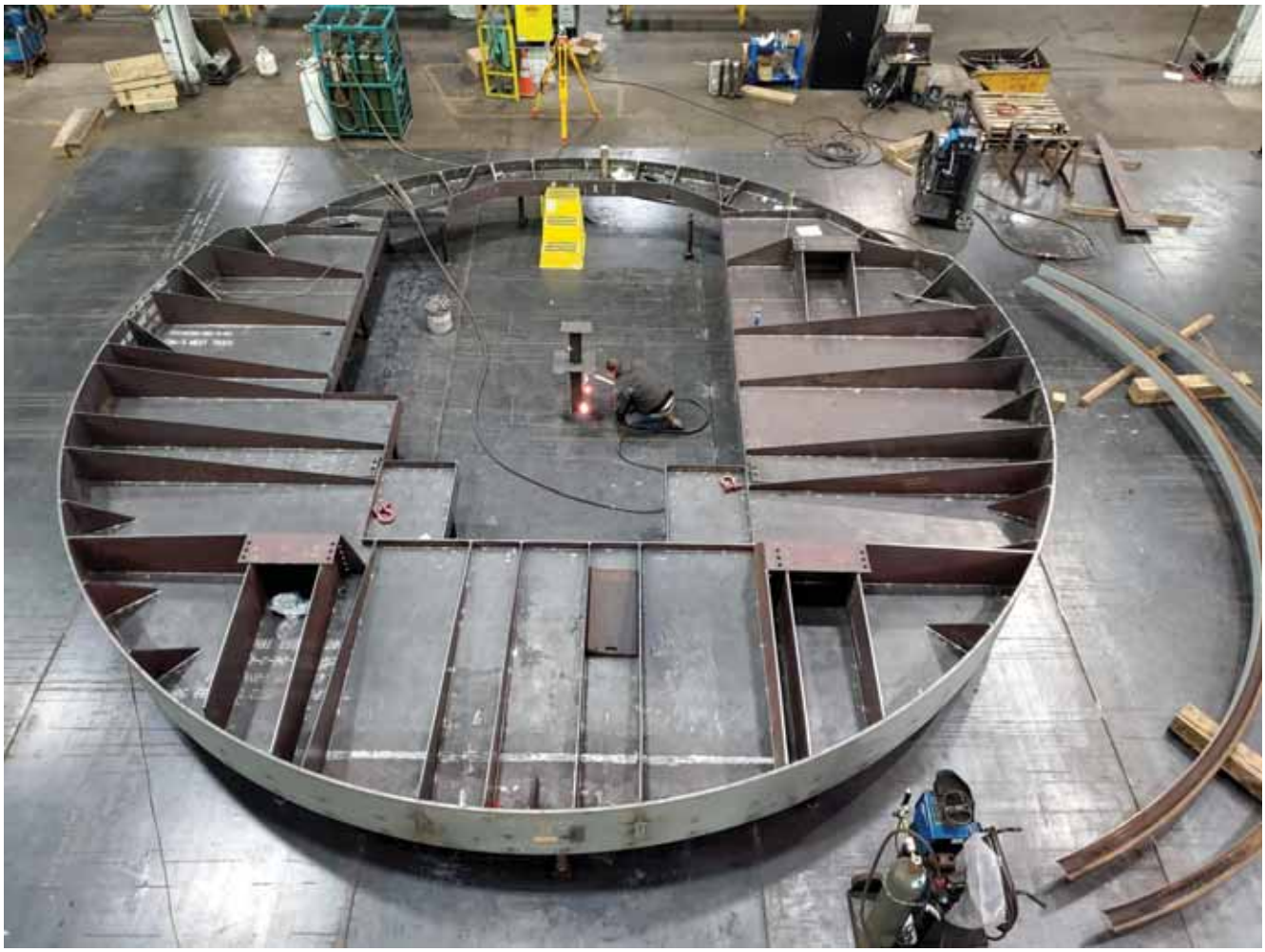


Rail

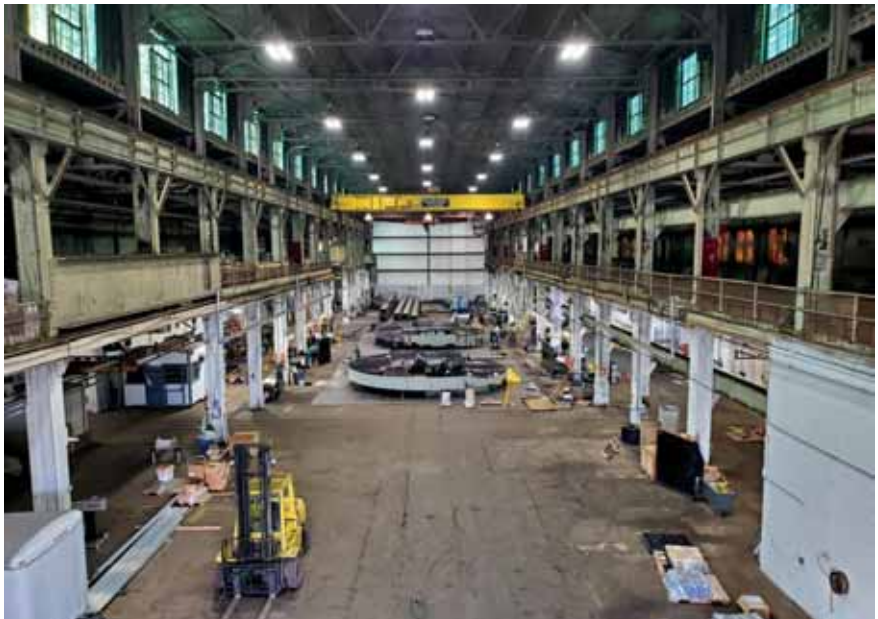
Export terminals looking to increase throughput and improve efficiency are trusting Heyl & Patterson to assist them in their bulk material handling expansions and upgrades.

One of the largest terminals on the US Gulf Coast recently pursued an expansion project to upgrade its facility. The existing Louisiana-based facility utilized a bottom dump-only railcar unloading system. The bottom dump system could unload 150 cars in roughly a four-hour span. Heyl & Patterson has been contracted to install a rotary railcar dumper to augment the bottom dump system, giving the customer the ability to unload trains by either rotary or bottom dump. The rotary railcar dumper will have the ability to dump a railcar in 45 seconds.

The new unloading system will utilize a hydraulic clamping system and offer remote troubleshooting of the dumper control system via internet connection. In the event of a problem or the need for a system adjustment, H&P personnel, in conjunction with plant technicians, will be able to access, modify, and troubleshoot the program parameters from the H&P home office with the ease of a single phone call, thus saving considerable time and expense.

Across North America, Heyl & Patterson is currently working with an export terminal in Vancouver, British Columbia which handles several bulk commodities. This exporter is looking to make improvements to the terminal, that will increase capacity, allowing them to transfer 30 million tonnes — all while maintaining the same footprint. Heyl & Patterson will be engineering a rotary railcar dumper that will allow for a dump cycle time of 38 seconds. The design will include a mechanical car clamp system, originally patented by H&P engineers in 1953.

This terminal faces unique challenges in terms of product conditions. Often inbound rail shipments contain various grades of coal, with a moisture content ranging from 8–17%. In frigid temperatures this level of moisture leads to frozen clumps of coal that are difficult to manage. To counteract the frozen coal, the rotary railcar dumper is equipped with a vibrator



system. In this instance the dumper will be furnished with two new car vibrators. Each car vibrator is a hinged hammer which is supported from brackets located on the rear truss of the dumper. The vibrator hinge pin will be fitted for lubrication. When needed, the hammer is manually unlocked via a safety lock out pin. The hammer is then allowed to swing during a dump cycle and contact the bottom railcar sill. When activated the hammer vibrates against the sill of the car, dislodging wet or frozen material.

The electro-mechanical vibrator mounted on the rear of the hammer is activated via a limit switch. Each system includes the bracket, lockout pin, hammer, and safety chain. The vibrator will aid in removing material that is sticking in hopper pockets, along supports and to the railcar sides, easing the flow of coal.

For further support in tackling frozen coal in cold weather climates H&P will often implement a hammermill. Frozen coal can be a hassle and dealing with oversized lumps of coal can greatly affect the speed on the unloading process. To accommodate coal handling in extreme cold, Heyl & Patterson's 'hammermill' breaks up frozen coal with a series of steel hammers on a rotating shaft, crushing frozen chunks of coal down to more easily transportable size that can easily fit within the grid of grizzly.

Waterway

For coal transportation on inland waterways, continuous bucket unloaders (CBU) can unload coal at a free digging rate greater than 5,000tph (tonnes per hour). The CBU features a continuous bucket elevator traversing the barge's cargo hold from one end to the other while reclaiming in the longitudinal direction of the barge. Once lifted by the bucket, the bulk material is transferred to a gathering belt conveyor, which in turn feeds a takeaway conveyor. To accommodate smaller scale operations stationary or travelling grab bucket unloaders can be designed to empty barges at rates exceeding 1,500tph, with a cycle time of 36 seconds.

Heyl and Patterson has recently rebuilt a cantilevered continuous barge unloader, originally installed by HP in 1970. Designed to accommodate volatile changes in water level, exceeding 40ft, this unit unloads coal barges for an electric utility plant on the Ohio River. Transporting coal by barge has its own set of challenges as water levels can be unpredictable. To combat the changing water levels HP has engineered a continuous barge unloader where water elevation adjustments are made by hoisting the counterweighted cantilever section, which supports the takeaway conveyor and fixed bucket boom. The project scope included new drives and operating systems, a new boom structure and an equalized trolley assembly, to extend the life of the machine for another 48 years. DCi

From cover to cover

enclosed storage solutions for the bulk market

Kuwait domes nearing completion.

Louise Dodds-Ely

Triodetic undertakes two major dome projects

For the past 60 years, Triodetic, a Canadian company has been designing and building storage facilities for a wide variety of applications all over the world. Triodetic recently completed, among others, two interesting projects, one in Kuwait and one in Chile. The project in Kuwait involves two 86m-diameter domes for the new Al Zour refinery. The project in Chile involves a cover for a rectangular shaped fine ore stock pile facility with overall dimensions of 60m by 80m as well as a 110m diameter coarse ore stock pile dome.

Kuwait Al Zour refinery

The Al Zour refinery is a complex managed by KIPIC, a subsidiary of the Kuwait Petroleum Corporation. When completed, it will be one of the largest refineries in the world. It is designed to process 615,000 BPD of ultra-low sulphur diesel fuels as well as jet fuel. The domes cover the stock pile and conveying mechanisms of the granulated sulphur, a byproduct of the refining process.

Structure specifics

The 86m-diameter domes sit on a 14m-high concrete wall which acts as a retaining wall to hold materials against in order to increase the storage capacity of the facility. The domes and cladding are entirely constructed of aluminium to resist corrosion due to the sulphur materials inside, as well as the salty marine environment of the facility located some 800 meters from shore.

Dome shape

Client requirements were such that the dome shape had to have a high curving side-wall to accommodate the swing arm of the central pivoting rotating conveyor. In addition, height restrictions at the site required the dome curvature to be flattened at the top. This resulted in the dome shape having two radii of curvature. The side wall radius of curvature, in elevation, is 44m. The top of the dome has a radius of curvature of 54m to keep the

Kuwait framework and decking installation.

overall building height down to 48m.

Installation

The structural system making up the dome shape consists of a fully triangulated network of tubes. These tubes, some 12,000 pieces, are mechanically inter-connected using the Triodetic proprietary hub. The individual tubular components are field assembled using manpower on top of high reach lifts. The entire structure is covered with 2,000 pre-curved aluminium panels.

Access stairs

An added complexity to the design of the structure was the requirement of a stair to access the dome apex. In order to follow the curvature of the dome, the configuration of such a stair has to have a combination of ramps, landings and stair sections. A series of triangulated struts are reaching out from external dome points to support the underside of the stair sections.

Chile Spence mine

As part of BHP's $2.46 billion US expansion of the Spence Growth Option (SGO) copper mine in the Atacama Desert of

Spence mock-up.

Spence project nearing completion.

northern Chile, Triodetic was contracted to build two stockpile covers. A rectangular shaped dome cover with major dimensions of 60m by 80m for copper concentrate and molybdenum and a coarse ore dome stock pile cover with a diameter of 110m. First production of 185ktpa (kilo tonnes per annum) of copper concentrate and 4ktpa of molybdenum will be in 2021. As of January 2020 the rectangular dome is completed and the spherical dome is under construction.

Structure specifics

The rectangular dome sits on a 5.6m-high wall and has several protrusions to allow conveyor galleries to access the dome. "This pillow shaped dome had enough complexities for Triodetic to do a trial assembly of one of the corners" says Bill Vangool Chief Engineer of Triodetic. "We ship projects worldwide and rarely have an opportunity to do a trial assembly. It proved to be an educational exercise for our in house engineers and installers as well as our quality control personnel."

Mock-up

Even though the mock-up on the facing page represents only 3% of the overall plan area of the building, it incorporates a number of technical challenges for the tubular framework, decking and flashing.

The corners of the building are the most challenging from a geometric point of view as two curved surfaces come together to form a ridge line or spine. The ridge line incorporates a triangular truss for overall rigidity of the corners of the building where load stresses tend to accumulate.

Assembling the short tubes in this corner was a useful experience in establishing an installation sequence which best suites the tubular configuration of the ridge lines.

With the truss elements at the ridge line assembled, the adjacent components are then sequentially added in either direction.

Certain tubular components have metal break sections attached to permit the fixing of corrugated decking by means of self-drilling screws. The mock-up served very well as a demonstration structure and is now a permanently installed decorative sculptural frame at Triodetic's head office in Canada.

Installation

A critical element of the installation was the sequence of lifting pre-assembled sections into place without extensive scaffolding. A series of towers were positioned within the space onto which the sections were positioned during installation. Individual components were then "knitted" between sections to ensure continuity over the entire roof profile.

Conclusion

It is interesting to note that both the Kuwait and Chile structures are buildings with fairly large spans constructed without the use of heavy structural steel truss elements. These structures rely on the benefit of double curvature where stresses are directed by means of shell action within the curvature of the dome surface toward the perimeter base supports.

Tenova TAKRAF storage solutions for solid fertilizer products

TAKRAF portal reclaimer for phosphates in Saudi Arabia (source: TAKRAF).

Dry bulk fertilizer products, whether they be within fertilizer factories or at shipping or receiving points, are mainly stored in stockpiles, *writes Ralf Katzke, Scraper Reclaimer Technologies, Tenova TAKRAF.*. Employing a pile instead of a high silo is an economical solution for large volumes. In most circumstances, the stockpiles are covered in order to protect both the environment, as the product is prevented from being blown around, and the product itself as it is shielded from being affected by adverse weather conditions.

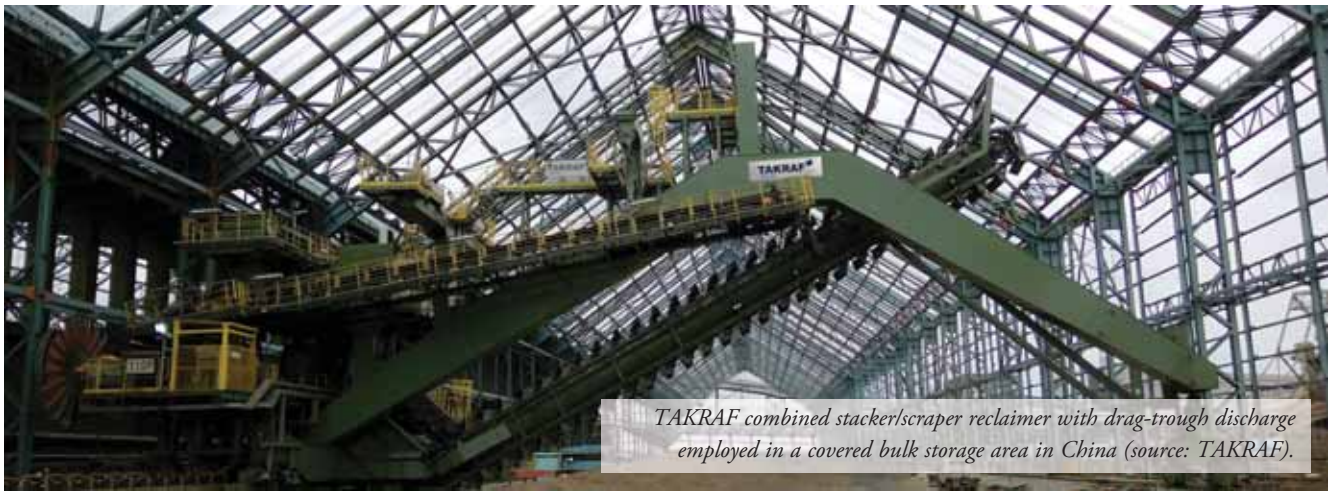
In most instances where a fertilizer product boasts both a consistent composition and quality from an upstream chemical process, the piles also often function as buffer storage. The piles are thus employed to balance time and volume between production and shipping or to balance reception during interim storage and onward transport to users.

In other instances where there is very little or no consistency — specifically when mined ores of varying qualities and/or characteristics arrive at a chemical plant and require homogenization prior to a chemical process — piles can also be employed as a blending bed. This is often the case for large fertilizer storages, especially those with high throughputs for either stacking, reclaiming or both, and are usually equipped with fully automated stockyard machines.

Leveraging more than 50 years of fertilizer industry stockyard machine expertise

Tenova TAKRAF is a global OEM for mining and bulk handling equipment with a history dating back almost 300 years. The company boasts a successful 50-year plus track record of supplying stockyard machines to the global fertilizer industry, with its first scraper reclaimer (for a potash factory) being supplied in 1966. Since then, the company has designed, manufactured, supplied and successfully commissioned around 400 scraper reclaimers across various commodities with a large majority being employed in the effective handling of potash, urea, phosphates and sulphur.

Tenova TAKRAF's approach to this vast array of global projects is 'flexibility'. This means that it treats the specific requirements of each project in a unique manner, ranging from the supply of a single machine to various machine packages and/or delivery of a complete bulk conveyor system including storage bin machines, conveyor belts and loading & unloading equipment. Such complete handling systems leverage an extended and well established material handling portfolio covering stockyard/disposal facilities, loading/unloading equipment, conveying,



TAKRAF combined stacker/scraper reclaimer with drag-trough discharge employed in a covered bulk storage area in China (source: TAKRAF).

TAKRAF stacker and bridge-type reclaimer in circular blending bed in India (source: TAKRAF).

port facilities and in-plant handling equipment.

Stacking and reclaiming

In most instances, a storage facility is fed material through a network of conveyors that efficiently carry the product to be stored. In order to achieve an optimal pile width within the storage area, the stacking of material is carried out via overhead tripper cars. Having supplied machines with capacities of up to 4,000tph (tonnes per hour), Tenova TAKRAF boasts significant experience in the supply of these under-roof tripper cars.

For the recovery of product from a pile, scraper reclaimers are the preferred (and dominant) equipment of choice for operators and planners alike. Some of the advantages of these machines include:

- proven robustness and reliability;
- high efficiency and low operating costs;
- simple and steady working movements allowing for full automation; and
- gentle treatment of material and almost dust-free handling of fertilizer products.

Maximum storage space in indoor areas

As a result of general market developments and increasing fertilizer logistic requirements, the global demand for storage volumes and handling capacities is increasing. This growing demand has resulted in large pile widths, sometimes even exceeding 60m. For such indoor applications, the portal reclaimer, which boasts separate main and auxiliary reclaiming booms, is the preferred solution, as it requires a minimum amount of space due to its shape. This results in the maximum covered storage space for the product stack.

Depending on bulk products' densities, Tenova TAKRAF is able to supply portal reclaimers with handling capacities of up to 6,000tph and with rail-spans that can exceed 60m.

Special features of stockyard machines that handle fertilizer

As previously mentioned, scraper reclaimers are, due to their method of operation, very gentle in their treatment of material and thus operate with minimal dust creation. This makes them ideally suited to fertilizer material that often comes in granulated form.

This gentle treatment of a material, together with the minimization of dust, also applies in principle to all equipment within the fertilizer handling value chain including boom stackers and/or overhead tripper cars. These machines, which generally employ cone shell stacking for the minimization of dust, can also be equipped with lowering booms or special chutes in order to further improve handling and dust minimization.

Nevertheless, depending on the characteristics of the fertilizer product and our customers' unique requirements, Tenova TAKRAF is able to equip its scraper reclaimers and stockyard machines with special features such as:

- stainless steel design for blades and chutes;
- 'de-lumpers' arranged within the discharge chutes for the breaking up ('de-lumping') of caked bulk material;
- hoses on hose reels for fresh air supply to operator cabins;
- life-time lubricated outboard roller chains; and
- ATEX-certified components in case of

Circular buffer storage for 360° endless slewing operations with TAKRAF lowering stacker and cantilever reclaimer in India (source: TAKRAF).

inflammable/explosive bulk material such as sulphur.

Criteria that may influence the chosen bulk storage arrangement

In addition to the globally popular solution of employing portal reclaimers in combination with overhead tripper cars for indoor fertilizer storage facilities, other alternative solutions can potentially also be employed or be even better suited in certain specific instances.

Spending the time to properly evaluate all options and making an informed decision based on all factors including the overall space situation, storage shed design and structure and/or on individual mass flows, may mean that the following machine solutions might be an even more suitable choice:

- a stacker with tripper-car travelling on ground along the pile;
- a combined stacker/reclaimer; or
- a circular storage arrangement.

In addition, the requirement for homogenization may also bear significant influence on equipment selection.

Nowadays, very light building structures even for large shed dimension are available and quite commonplace. Often, these light building structures do not allow for any under-roof installation of incoming conveyors with a travelling tripper car. In such cases, an alternative approach in combination with such a light building structure might employ an on-ground travelling stacker. In such instances where all equipment is installed at a ground level, access to equipment for maintenance is significantly safer and more efficient as an additional benefit.

If space at the site is limited, then a circular buffer storage facility may turn out to be the most effective space-saving solution. Bulk material is stored against a retention wall, with both stacker and reclaimer mounted on a central column.

In circular buffer storage solutions, the feeding of the pile is conducted via a boom stacker employing the cone shell stacking method. Reclaiming is accomplished via a cantilever reclaimer, which conveys material into a central chute located below the central column. From this central column, material is then fed, via a feeder, to the outgoing conveyor.

In operations where material logistics can be managed in such a manner so as to avoid simultaneous stacking and reclaiming operations, a combined stacker/scraper reclaimer can also be an effective cost-saving solution. In this instance, stacker and scraper booms are mounted on the same chassis resulting in substantial cost savings not only for the equipment itself but also in reduced rail lengths and fewer conveyors being required.

Product consistency through homogenization/blending

In instances where fertilizer originates from mined ores and/or where variations exceeding the acceptable product range can be expected, material consistency can then be at risk. In order to protect against such consistency issues, the stockpile may, in addition to its buffer function, also be given the additional task of homogenization/blending.

Blending beds generally operate in an adjusted combination of chevron-stacking and front-reclaiming. The stockpile is built up according to the so-called 'chevron method' in a longitudinal stockpile, or the so-called 'chevcone method' in a circular stockpile. In both methods however, stacking is required to achieve a sufficient number of material layers. Reclaiming is then conducted via a bridge-type reclaimer, which takes material from the front side of the stockpile. In this manner, reclaiming achieves a perfect mixture of material, depending on the number of layers and the incoming deviation and/or distribution.

About TAKRAF

TAKRAF, a Tenova Group company, is an integrated solutions provider to the global mining, bulk material handling, minerals processing and beneficiation industries, offering innovative technological solutions as well as process and commodity knowledge along the industry value chains. With the integration of the well-known DELKOR and Tenova Advanced Technologies (formerly Bateman Advanced Technologies) brand of products into TAKRAF as specialized product lines, our portfolio for the minerals processing and beneficiation sectors has been considerably enhanced.

TAKRAF overhead tripper car for a urea storage facility in USA (source: TAKRAF).

Four key benefits of dome storage

For bulk storage to be a lucrative business, companies have to find ways to get the biggest bang for their buck, *writes Rebecca Long Pyper for Dome Technology*. And when it comes to property, that means using every square foot of real estate efficiently.

This is especially true for waterfront property. Often, companies with portside property have limited land availability, requiring them to make decisions on how to get the storage they need on a smaller parcel of land.

"If a port does not have height restrictions, which some do, the most efficient thing is to go vertical instead of horizontal, so domes or silos fit that," Dome Technology sales manager Lane Roberts said, adding that these types of storage can store up to three times the product as a warehouse with the same footprint.

Because of its strength and height, a DomeSilo allows companies to stack product deeper, taking up less property at the site. In this taller version of a dome, the vertical DomeSilo wall lends itself to the ability to build up, rather than out, and the dome's double curvature and construction materials provide strength at all points of the structure, even at the apex. The entire interior of a dome, then, can be used to contain product — something silos can't do.

Here are a few other advantages customers realize with dome storage and contracting with Dome Technology:

Robust storage

The double curvature and structural engineering of the DomeSilo render it stronger than traditional structures. Dome Technology's steel-reinforced concrete domes are the most durable bulk-storage structures on the market and have withstood earthquakes, hurricanes and the test of time with a remarkable success rate.

A dome provides ideal conditions for stored materials requiring a controlled environment. A fabric membrane surrounding the entire dome exterior prevents water and moisture entrance, blocking the introduction of outside water into the stored product. The dome's insulated nature reduces heating and cooling of the walls and air inside, preventing condensation from forming on the interior. Foam and concrete provide humidity control and moderate externally generated temperature fluctuations.

A dome's concrete monolithic construction also provides a tolerance for some differential settlement. These qualities combined with geotechnical engineering and site analysis ensure proper foundation selection and performance.

Design build

A straightforward design-build project is one of the benefits of hiring Dome Technology as general contractor and begins from the ground up. The team provides geotechnical analysis to determine foundation options, and thanks to the company's dome models, deep foundations aren't the only option. In addition to the storage structure itself, Dome Technology can provide structural-steel fabrication, manufactured in its shop located on the corporate campus.

Dome Technology is also knowledgeable in stored-product considerations, optimal design for product integrity and subcontractor management. Various types of enclosed reclaim systems work well with domes, protecting product from arrival to storage to shipment. Dome Technology's team designs domes with reclaim requests in mind. With options like mechanical stacker reclaimer, mechanical rotary plow, gravity, fluidized floor systems, airslides, mechanical horizontal screw reclaimer and front-end loader, customers are able to access their products quickly with specific needs in mind.

Even when the stored material is the same, every project in every locale is unique and receives individual attention. Dome Technology meets with customers to determine the details for a dome's proposed function . Need to fill and empty a dome once a year? Once a month? The team will conceive the optimal plan for a custom dome and material-handling systems within and around it.

Versatility in stored products

Even after determining the type of product to be stored in a dome, transitioning from one bulk material to another might not be as complicated as expected, especially when a company anticipates potential shifts from the get-go.

Dome Technology clients have made storage changes in the past — it's a smart way to maximize on existing infrastructure and to ensure multiple options are available no matter what the market does, Roberts said. "In case (an industry) fell through, a company would still have the capability to reach out to other things," he said.

Companies with dome storage benefit from more storage in a smaller footprint — ideal for portside locations.

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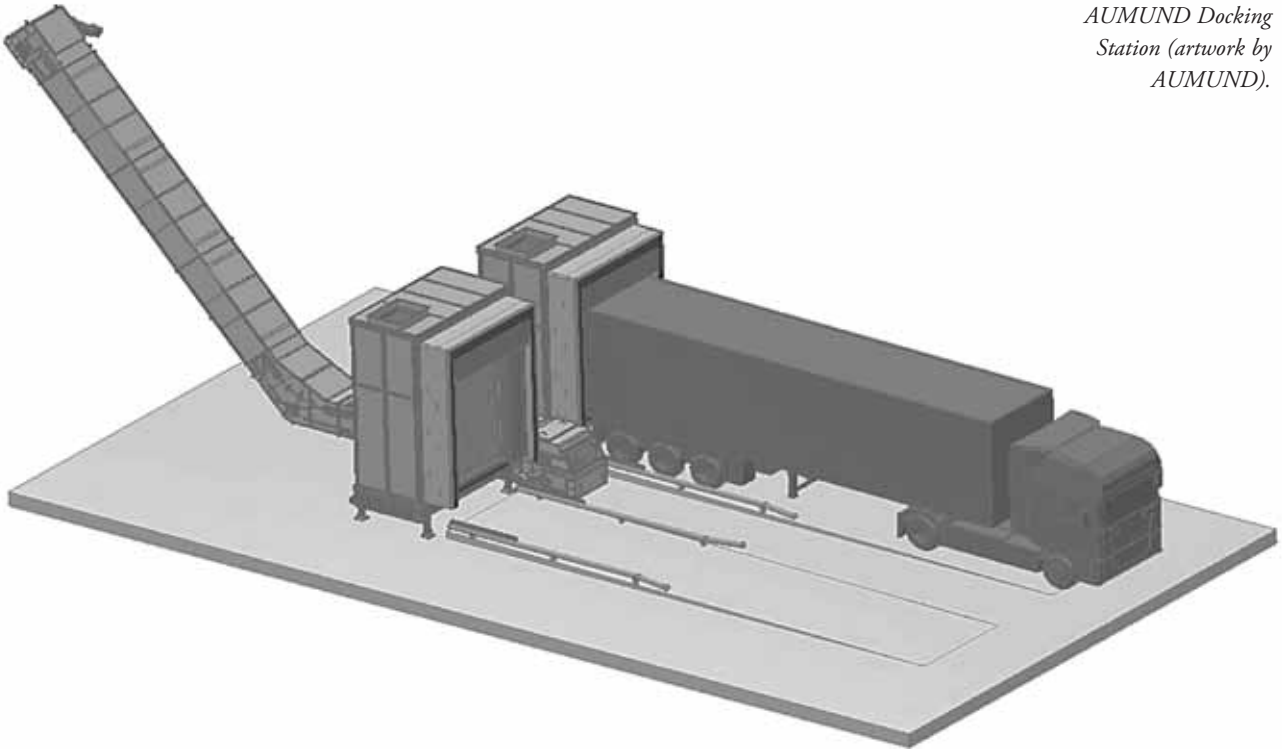
AUMUND offers new conveying and transportation solutions for alternative fuels



AUMUND Docking Station (artwork by AUMUND).

Back in July 2019 AUMUND Fördertechnik GmbH began increasing capacity in its engineering team; this signalled the start of new product design in conveying and transportation of alternative fuels. The engineering team has now started the new year with its full complement.

In the early 90s AUMUND made news by taking over Maschinenfabrik LOUISE in Cologne. In 2006 AUMUND also acquired WTW Engineering in Cologne. Both companies have engineering, patents, production and sales relating to rotary discharge machines and drag chain conveyors. The purchase of these companies and their products gave AUMUND the edge in bringing to market discharge systems such as CENTREX® or LOUISE Rotary Discharge Machines and Rotating Rotary Discharge Machines, and in driving the development of these products. The acquisition of the spare parts business of Maschinenfabrik Besta & Meyer in 2014 rounded off the product portfolio at that time.

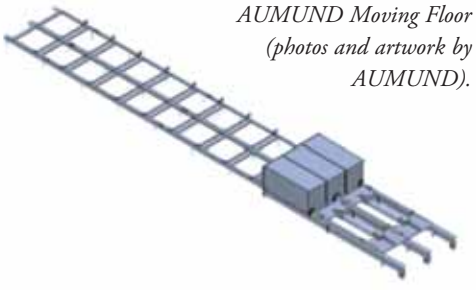
As AUMUND continues to pursue this strategic path it is now capable of offering an extended range of products for the alternative fuels sector: the offering includes the AUMUND Trailer Docking Station, the AUMUND Moving Floor, and the AUMUND Rotating Screw Discharger for the conveying and transportation of alternative fuels such as wood chips, wood pellets, RDF, sewage sludge, shredded paper and many more.

AUMUND Trailer Docking Station

The AUMUND Docking Station is particularly suited to truck unloading with autonomous discharge systems such as walking floors and active or moving bottoms. A separate hydraulic aggregate powers these moving floors so that the unloading of the truck is independent of its traction unit. With the aid of dedusting systems on the Station and a curtain, the discharge effected is largely dust-free. Screw conveyors on the floor of the Docking Station transport the material sideways to an ongoing conveyor. The AUMUND Docking Station impresses with its compact, modular and flexible design. Extensive structural requirements are not necessary. Discharge capacities of 200m³/h with two Docking Stations have already been achieved.

AUMUND Moving Floor

The AUMUND Moving Floor is a reliable unloading system for easy flowing and sticky materials. The Moving Floor consists of a special grating which is individually adapted to the characteristics of the material to be conveyed. The Moving Floor slats are each powered by a hydraulic cylinder, with individual slats retracting below the material in turn, enabling the complete Moving Floor to bring the material forward in the conveying direction. The Moving Floor can be installed either on a concrete slab or on steel. Classical applications for the Moving Floor are pre- and interim hoppers for wood chips and bark, sawdust, rubber waste, plastic rubbish, sludge, coal-tar

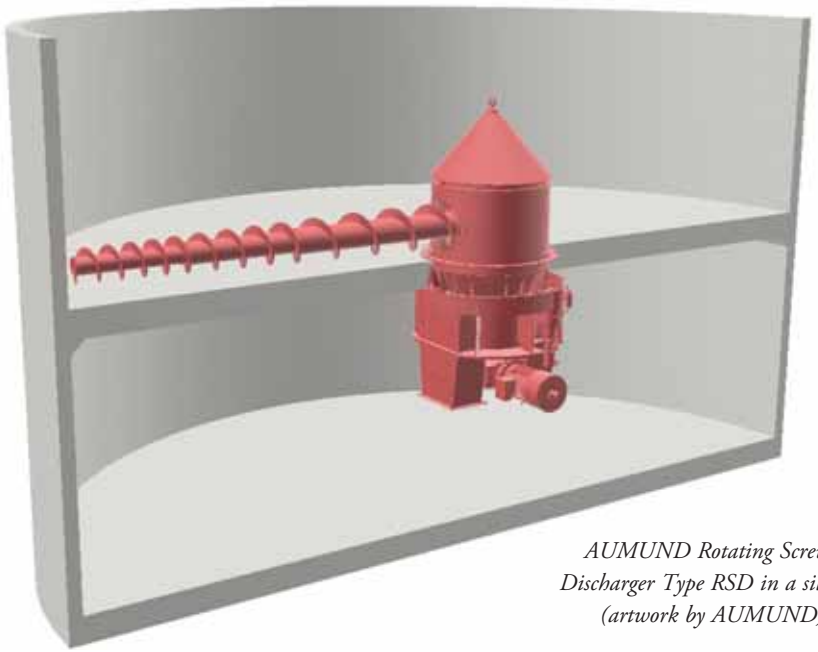


AUMUND Moving Floor (photos and artwork by AUMUND).

mixtures, refuse from the paper industry and many more. Discharge capacities of 40 to 300m³/h have already been achieved.

AUMUND Rotating Screw Discharger Type RSD

The Rotating Screw Discharger type RSD is a discharge system for dry or damp bulk materials which do not flow easily. The Screw Discharger travels over the silo floor by rotating around the vertical axis of the cone, and conveys the material into the chute beneath the cone. The Screw Discharger can be adapted to the individual bulk material by variations in the design of features such as the cladding, the teeth, or the pitch of the screw. Screw Dischargers can be installed in steel or concrete silos. Depending on the material properties and the diameter of the silo, conveying capacities of up to 450m³/h can be achieved. The maximum silo diameter is currently around 25 metres.



AUMUND Rotating Screw Discharger Type RSD in a silo (artwork by AUMUND).

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 Group Field Service GmbH and AUMUND Logistic GmbH (Rheinberg, Germany) are consolidated under the umbrella of the AUMUND Group. The global conveying and storage technology business is spearheaded through a total of 19 locations in Asia, Europe, North and South America and a total of five warehouses in Germany, USA, Brazil, Hong Kong and Saudi Arabia.

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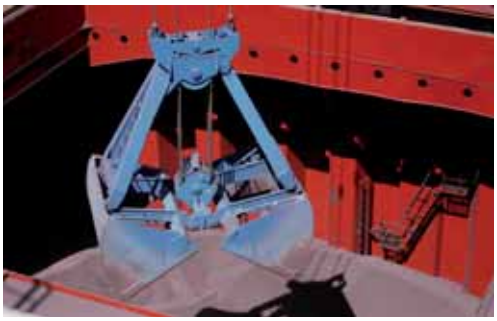

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Extensive silo protection project benefits from Hycontrol's expertise

Many industries handle and transport millions of tonnes of powdered or particulate products every year, including cement, lime, sugar, flour and others. These products are mainly transported by road tanker and deposited in storage silos by fluidizing the powders and blowing them in at pressure. This pneumatic conveying operation uses pressurized air to carry the product into the silo, creating an extremely serious over-pressurization risk if the airflow is not controlled or if the air is not vented efficiently through a filter. Most silos are not pressure vessels, and it may take only a small increase in internal pressure (as little as 1 psi) to either rupture the silo or blow the filter unit off the roof. With award-winning systems to protect silos from over-pressurization risks, Hycontrol is the only SPS manufacturer whose systems both meet and exceed safety guidelines from the Mineral Products Association.

Ensuring comprehensive safety with testable silo protection

A SHE (Safety, Health and Environment) review at UK company Marshalls — a major manufacturer of hard landscaping materials for over 120 years — recognized a concern about the number of times staff were working at height on the tops of silos. It was estimated that there were over 300 manual inspections at the top of silos every week, and circa 1,000 silo fills per week. It also revealed high levels of environmental discharges from the silos and, in one serious incident, a filter unit had been blown off a silo.

These findings led Marshalls to undertake a detailed survey of its 150 cement and PFA silos which are located across 24 sites. The survey identified that 50% of the silos had either below standard or under-capacity pressure relief valves (PRVs), faulty safety sensors or showed signs of a contents discharge. There was virtually no standardization of safety equipment across the estate and the silos were assessed as being a high risk to the environment. Marshall's staff were climbing the silos on a regular basis to inspect and work on the silo tops.

In partnership with Hycontrol, modifications were undertaken over a year with an investment of £1.1 million. Hycontrol undertook remedial engineering work to reduce the potential for silo discharge during deliveries. Hycontrol designed an engineering solution that was standardized, systemized, was legally compliant and would work across the entire Marshalls network. In addition, the silo protection system is fail-safe, enable tanker drivers to check spare capacity prior to discharge and would integrate with the factory's Allen Bradley PLCs – so data could be recorded for root cause analysis.

Marshalls is now in the process of informing local councils about the new systems and anticipates that the number of compulsory checks on the top of silos will be reduced.

Benefits of Hycontrol SPS installation project

- 90% reduction in operators checking top of silo and working at height;
- complete pressure monitoring and control safety during filling;
- exceeding current PPC permit requirements;
- full integration with site PLCs;
- automatic stop on fills if a high level or high-pressure event occurs;
- sensors check functionality of PRV and silo-top equipment;
- safer and cleaner environment; easier to maintain and manage;
- since installation the modifications have: detected and prevented 338 over-pressure events; detected and prevented 163 high level alarms; and detected and prevented 11 PRV alarms (preventing discharge).

Bulk developments in the US Gulf

Louise Dodds-Ely

Approval granted for new disposal service for non-compliant wood cargoes

AUTHORIZATION FOR THE USE OF AN ACI INCINERATION FOR THE APPROVED DISPOSAL OF LOOSE NON-COMPLIANT WOOD DUNNAGE — FIRST IN THE US GULF THROUGH INNOVATIVE PRIVATE COLLABORATION – STEVEDORE & CARRIER

Richardson's Companies has announced that in addition to stevedoring, storage, trucking and other marine terminal services currently provided by Richardson Stevedoring & Logistics Services, Inc. (part of Richardson Companies), it is now offering a new service for the approved disposal of non-compliant wood dunnage. This service can be accessed by vessels calling at Richardson Steel Terminals/PHA Woodhouse Terminal (RST) and Port of Houston, PHA Turning Basin Terminal and City Docks North (City Docks) facilities.

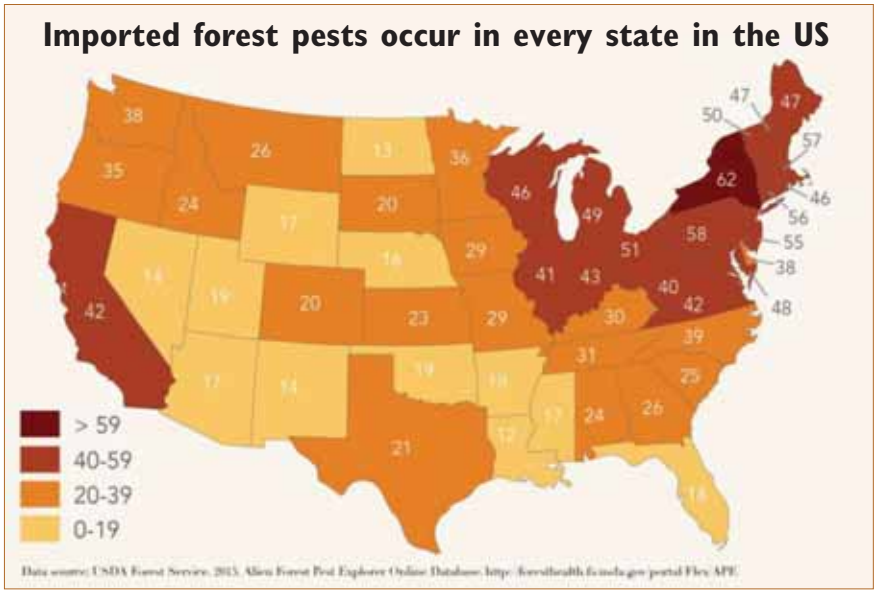
R Warehousing and Port Services, Inc. (RWPS) has been granted final approval by both USDA (APHIS) and US Customs and Border Protection to operate an approved air curtain incinerator for the disposal of clean loose 'non-compliant' wood dunnage.

RWPS has been further authorized to transport the non-compliant wood dunnage from the RST and City Docks facilities to the approved incinerator site off Clinton Drive in Galena Park using dedicated equipment.

Responding to its customer's most pressing needs, and following an extensive review, RWPS sought out a partner interested in advancing a solution to alleviate the huge challenges and financial exposures faced by carriers/charterers found with non-compliant loose wood dunnage.

A collaboration agreement was reached with Oldendorff Carriers GmbH, with both parties recognizing the value in such a venture through the synergies and pooling of resources.

Both parties were determined to



introduce a fast track solution to solve the logistics problems and financial exposures associated with non-compliant dunnage.

For shipping, it allows a more economic solution at Houston that previously was limited to placing the dunnage back on board against considerable cost.

This new option affords greater flexibility to the carrier and charterer, especially when the ship is to load back out of the US Gulf Region or redeliver back to owners. It now offers them a choice, against the uncertainty of leaving non-compliant dunnage on board; especially for ships loading back dry bulk cargoes for export.

Richardson and Oldendorff selected a project path that offered the fastest and most cost-effective solution to get up-and-running, as permitted by State and Federal agencies.

Invasive insects and pathogens, found within imported wood dunnage, results in damages that are calculated at US$40 billion annually in the US alone, as it relates to destruction of crops and forests (Smithsonian).

RWPS will work closely with USDA and CBP to help safeguard agriculture and natural resources against the entry, establishment, and spread of economically and environmentally sensitive pests (invasive species).

The USDA/CBP requirements for handling non-compliant loose wood dunnage has been adopted into RWPS's policy and operating procedures. RWPS takes this responsibility seriously and is committed to ensuring the highest level of care.

RWPS is confident that its approved project and processes will afford carriers a commercial solution to one of today's major challenges faced by steel carriers/charterers.

NOTE:

- The permit allows for the incineration of clean, loose, non-compliant wood dunnage not affixed to the cargo.
- The permit allows RWPS to handle infested dunnage at RST & City Docks only — under certain conditions.
- RWPS's incineration permit requires non-compliant dunnage to be removed from vessels by either Richardson Stevedoring & Logistics Services, Inc. or

its subsidiary Platinum Stevedoring, Inc.

About Richardson Stevedoring

Richardson Companies provides integrated transport and logistics services at the Port of Houston. A family-run business established in 1969, the group of companies continues to create new services and has expanded to other locations along the Gulf Coast. The goal is to keep up with current demands and create a complete door to door solution for customers.

The company grew to incorporate a large stevedoring service at Houston and Mobile. Along with barging and container services, and the occasional specialized bulk cargoes, Richardson handles steel products from its large leased port properties and storage facilities. The company offers both direct-to-truck and convential ship-to-yard services.

Richardson offers its own in-house trucking logistic services as well as having rail and barge loading facilities.

Richardson Companies is an asset based integrated cargo handling logistics company servicing the Port of Houston and the Port of Mobile (Alabama State Docks).

Richardson's service components and activities include the following:

Operator of the Port of Houston's Woodhouse Terminal — under the name of Richardson Steel Terminals (RST). This Terminal features Port of Houston's deepest draught berths with vessel stevedoring services being performed by Richardson Stevedoring & Logistics (RS&L) and Platinum Stevedoring, both affiliates of the Richardson Companies with the first being union and the second non-union.

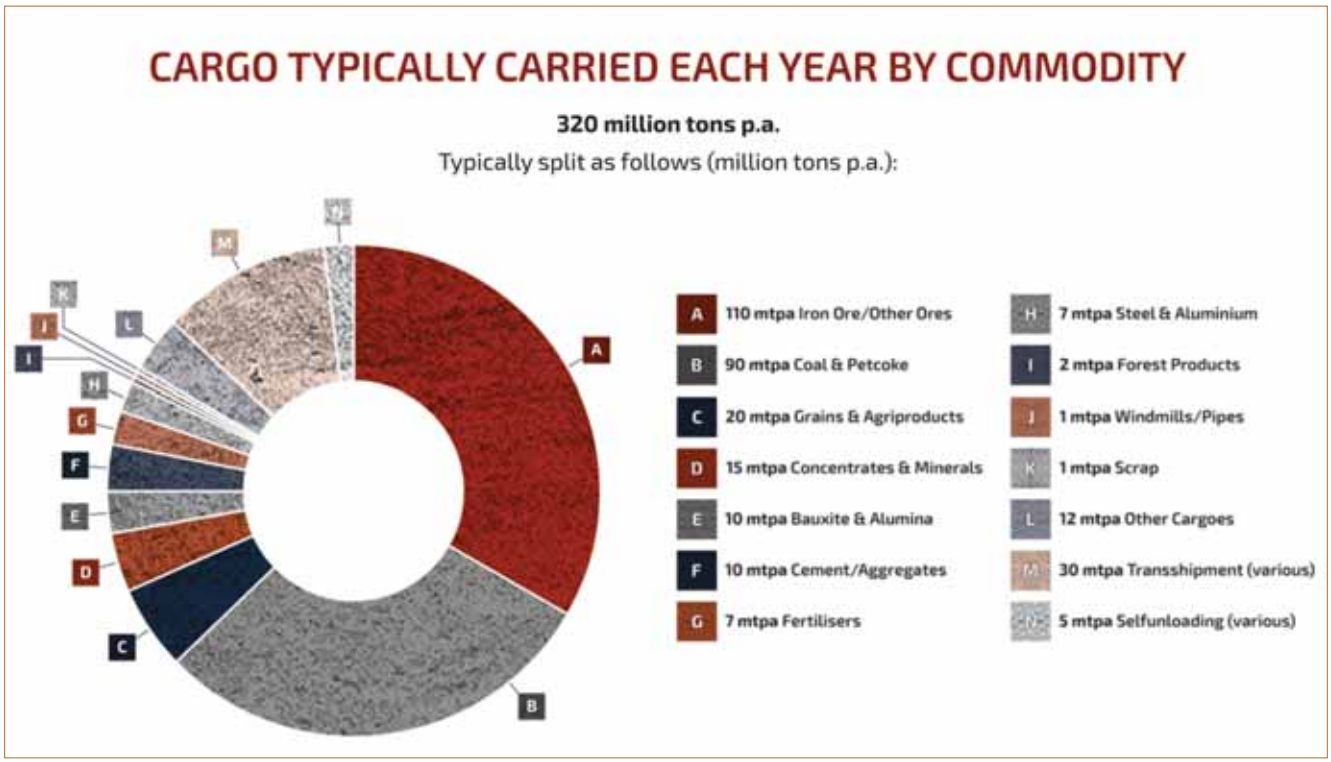
RS&L also performs vessel stevedoring services at Port of Houston's City Docks/Turning Basin Terminals. It offers ample lay-down areas at both locations along with inside covered storage including FTZ designated areas and warehousing. Steel loading and discharge from railcars is also a featured service.

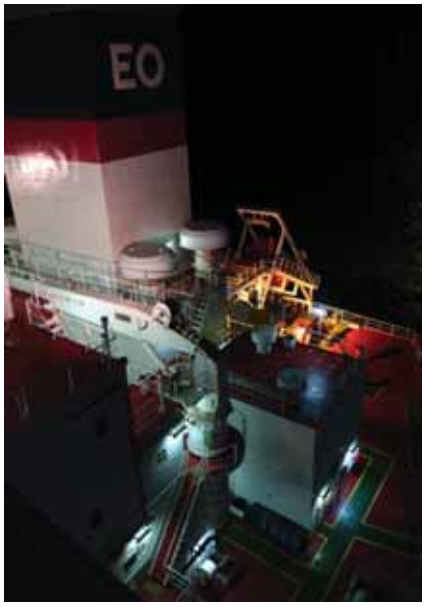
Richway Transportation (a Richardson Companies) provides trucking services for steel customers, and for steel product transfers from shipping terminals to the Richardson Reload Center (RRC), an off-site steel and wood products storage facility which also features additional inside storage/warehousing capabilities and operated by affiliate, R Warehousing & Port Services.

Richardson operates a local region intra-terminal barge service for steel products as well as a COB (container-on-barge) service. It currently owns and operates three push boats and six hopper barges to support customer requirements in this service category.

Container lightening and intermodal-trucking services are performed by the group under its affiliate — Robin International Transport.

At the Port of Mobile, Alabama, Richardson has a Public Private Partnership together with Alabama State Port Authority, at the 'Alabama Steel Terminals', completed in January 2015 and featuring





ECO NEW BUILDINGS

174,000ft² covered storage with 4 x 50-tonne overhead cranes, and terminal handling access via vessel, barge, rail and truck.

The company first introduced the concept of direct discharge for steel products at the Port of Houston and offers both direct discharge and ship-to-yard services.

Richardson Stevedoring with project support from Oldendorff Carriers now introduces CBP/USDA-APHIS approved incineration for disposal of non-compliant loose wood dunnage arriving on ships handled by Richardson Stevedoring at the Port of Houston City Docks/Turning Basin and Richardson Steel Terminals (Woodhouse).

Richardsons' remains focused and committed to its customers — this new value-added-service is anticipated to help with logistics and financial exposures faced by steel customers.

About Oldendorff Carriers:

Oldendorff remains committed to responsible environmental stewardship, proactively being at the forefront of evolving environmental regulations and actively searching for solutions that impact shipping.

The owned-fleet capacity comprises 95% 'eco' type ships; with most of its long-term chartered ships being 'eco' types as well.

Oldendorff operates a fleet of 700 vessels with 14,000 annual port calls, carrying on average 320 million tonnes per year, in both dry-bulk and break-bulk trades.

Oldendorff prides itself on commercially driven managers and seagoing personnel, who support each other and share knowledge and resources.

The company is highly focused with a bottom-up management philosophy, where people are empowered to make their own decisions, learn from their mistakes and assume 'ownership' of their business. Within Oldendorff's business model, authority is delegated to an extraordinary extent.

Oldendorff has a highly motivated and structured team who remain responsive to each client organization; extending their team's capabilities to form an effective partnership. Decisions are made quickly by the highly experienced, empowered professionals working within the 18 global offices, on board the ships, and within their engaged port operations department who assist with port logistics and operations.

Oldendorff personnel are hands-on decision makers — making them more accountable, responsive and flexible; with the goal of delivering cost-effective solutions, optimal service, and customer value.

The company benefits from having an exemplary work force with employees often being with the company for many years. Employees enjoy a positive work environment that fosters experience sharing and dedication to their jobs.

Associated Terminals acquires New Orleans Bulk Terminal

Associated Terminals has announced the acquisition of New Orleans Bulk Terminal. Located on the Michoud Slip, just off the Intracoastal Waterway, New Orleans Bulk Terminal is a privately owned 50-acre facility.

The terminal offers customers various transfer options for their cargo, including barge to rail, rail to barge, barge to truck or barge to storage. The facility is located on the CSX and is capable of handling unit trains. "We are excited about the acquisition of this facility," said Todd Fuller, President of Associated Terminals. "This facility will come with a new client base and will offer unique opportunities to handle cargo for existing clients."

In conjunction with this acquisition, Larry Arnold joins the Associated Terminals team and will continue to manage the facility. Arnold founded New Orleans Bulk Terminal in 2008 where he served as Managing Partner. "We are pleased that Larry has joined the Associated family," said Fuller, "With over 32 years of experience, Larry brings a wealth of knowledge in material handling, terminal design and terminal operations."

Founded in 1990, Associated Terminals is a cargo handling and logistical solutions company headquartered in Convent, LA. Servicing the US Gulf and beyond, the company provides high quality, customized services, including agricultural commodity exports, in-plant services, midstream operations and terminal port operations, for both the import and export of commodities.

Let the experts
HANDLE IT.

There is a reason excellence is Associated with us.

When it comes to the movement of your bulk, breakbulk and project cargo along the Lower Mississippi River, turn to the experts. Associated Terminals has assembled a highly skilled workforce and we have invested in modern facilities, equipment and related assets to best service your cargo shipping needs. Couple that with our total commitment to safety and it is easy to see that Associated Terminals is the best choice for all of your cargo handling and logistical solutions.

www.associatedterminals.com

ASSOCIATED TERMINALS

Millard Maritime: important link in North America's bulk handling chain

Millard Maritime is strategically located on the United States Gulf coast, and is a key link in the North American transportation network. The company is privately owned, and it operates a deep water port facility on Mobile Bay in Alabama. Millard Maritime has over 300 acres of land available that is ideally suited for industrial development, manufacturing or distribution.

Millard Maritime is a deep water 40ft draught port facility with a 1,600ft dock. It is served by CSX railroad with over 100 cars spots with plans for rail expansion this year. In addition, it is located on the inland waterway system with barge loading and unloading capabilities.

Millard Maritime has a barge harbour capable of the fleeting and storage of barges. The terminal is approximately 12 miles from open Gulf. Its location also provides quick highway access to both interstate 65 and 10.

Millard specializes in handling a variety dry and liquid bulk materials. Cross dock, transload, and value-added operations such as bagging, and palletizing are available. It has the ability to design, develop, and execute build to suit projects for anyone interested in locating on the United States Gulf Coast. DCi

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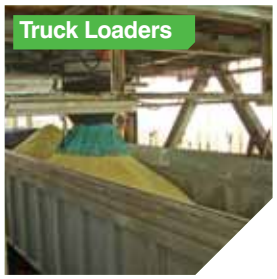
Cleveland Cascades Ltd

Global leader in bespoke dry bulk loading chutes



Cleveland Cascades are Specialists in the design and manufacture of bespoke dry bulk loading chutes.

Our bespoke solutions are designed to meet each customer's specific requirements from a tool kit of proven components, utilising the expertise of a team of specialist in house design engineers.

We lead the loading chute industry & set the standard for dust emissions and environmental pollution control in dry bulk handling.

Our worldwide reputation is built on high quality, well-engineered, robust, high performance chutes, backed up by excellent customer service and global lifetime product support.

Contact Cleveland Cascades Ltd

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