

Boom in Indonesian coal spawns handling innovations



The Gottwald 'Generation 5' unit (G HPK 8200 B), ordered by PT Puteri Borneo Company for coal handling in Kalimantan operates 35km off the coast transshipping coal from barges to ocean-going Capesize vessels at rates up to 1,500tph in winds up to force Beaufort Scale 6

Michael King

Rising demand for Indonesian coal has prompted an explosion of handling innovations from shipping and equipment suppliers eager to help miners overcome the draught and logistical difficulties associated with extracting supplies from key producing areas.

Indonesia is now the world's leading thermal coal exporter and second only to Australia in terms of total coal exports. Last year exports from Indonesia's patchwork of coal-producing islands topped 198mt (million tonnes) of thermal coal last year, up from 183mt in 2006 and just 73mt in 2002, according to figures from SSI.

However, much of the country's coal is located in rugged inland regions accessible only by shallow river networks. This has prompted the development of some of the world's most sophisticated supply chain systems incorporating innovative handling operations. In particular, while the rise of the floating crane can be traced in the west to post-World War II rebuilding, its surge to prominence in Asia is closely linked to the urgency with which coal demand has risen in the last decade.

Canada Steamship Lines (CSL), through its Singaporean subsidiary, CSL Asia Shipping, has been active in Indonesia for a decade, drawing on its knowledge of self-unloading technology to provide offshore coal transshipment services.

In 1999 CSL signed a long-term contract to operate the revolutionary Sea Spider Transshipper (SST) for miner PT Berau Coal. Located in East Kalimantan, Indonesia, the SST transships in excess of 4mt of coal annually at loading rates of up to

1,200tph (metric tonnes per hour).

The semi-submersible platform, which draws heavily on offshore oil industry designs, was developed to load Berau's coal, which is mined and crushed inland before being shipped to the coast by barge.

Stationed some 20 kilometres off the coast in the Sulawesi Sea, the SST design employs the SWATH (Small Waterplane Area, Twin Hull) concept which, said CSL vice president of projects and planning, Jim Murphy, provides several advantages over traditional barges.

Being semi-submersed, it is less vulnerable to waves, which is

*Jim Murphy,
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critical due to the length of the loading boom, as the motion of the barge or platform is magnified significantly at the end of the boom.

“Another major benefit of the SST is that it allows barge unloading from the centre of the barge outward. Most coal is loaded in the centre of the barge and it keeps barges stable throughout unloading,” he said. “Additionally, a semi-submersible design offers less resistance when being towed and is therefore faster and more manoeuvrable than a barge.”

Building on the success of the SST project, CSL has now been commissioned to deliver a second transshipper for Berau, due for delivery in April next year and also due to be deployed off Kalimantan. The new transshipment platform incorporates two 30-tonne cranes mounted on a flat top barge and is designed to transship in excess of 6mt per annum. “The cranes feed a central receiving hopper, which feeds a bucket lift elevator, which in turn feeds a ship loading boom with a 35-metre outreach and will be capable of loading Capesize bulk carriers,” said Murphy.

China Communications Construction Company, which constructed the original SST and another transshipment system for CSL for its Australian operations, has been contracted to build the new unit, while Nantong Yahau has been chosen as the shipyard.

“For our transshipment platforms that incorporate cranes we purchase them from various crane manufacturers such as Tsuji Heavy Industries of Japan,” said Murphy. “Because transshipment operations are typically located in remote locations, a considerable amount of time is spent on ensuring that the design is simple and robust and that the equipment can be operated reliably and safely by our crew members.”

“Our transshipment system designs reflect our over 80 years of experience designing, building, owning and operating self-unloading vessels. Basic design work is done in-house with final design work and production drawings undertaken collaboratively with naval architecture design firms, equipment manufacturers, shipyards and classification societies.”

Also to the fore has been Mario Terenzio, the former stalwart of Coeclerici Logistics, who now plies his bulk logistics expertise as chief executive of Logmarin Advisors. The Genoa-based company, in partnership with its associated marine engineering



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company Interprogetti and crane specialist Liebherr, plans to deliver its first innovative new ‘floating terminal’ to an unnamed client in Kalimantan, Indonesia, later this year.

The *Ibu Francesca* is currently under construction and will start operations in south Kalimantan by June. Two additional units are at the construction stage and will be ready in early 2009. “Those units have been conceived to handle dry bulk cargos as primary cargo,” said Terenzio. “Vessels up to the largest capesize type can be loaded at an average daily loading rate exceeding 18,000 tonnes per day.”

The floating terminal concept, which uses Liebherr craneage and can be custom-designed, has been developed for open sea operations but is also adaptable to suit inland waterways and harbour stevedoring requirements.

In order to maximize the transloading operation, the design incorporates wing tanks and high power pumps to keep the pontoon and the crane within the acceptable heeling operational limit. Side bulkheads are also envisaged on deck for dry bulk containment.

“The basic floating crane design can be further tuned to meet specific requirements of the client i.e. it can be self-propelled, with a sheltered area for steel products storage, a RoRo ramp, western accommodation, a helipad, etc.,” added Terenzio.

One of the main advantages of the new design over standard floating cranes is the availability of buffer storage totalling around 5,000 tonnes capacity — more capacity than most feeder river barges. This minimizes waiting times because of the discontinuity in the availability of barges alongside.

“The buffer storage requires the construction of a larger pontoon which, together with the designed anti-rolling damping device, guarantees greater platform stability so that the Logmarin floating crane is less sensitive to the adverse weather conditions, as compared with standard floating cranes, and provides better berthing places for the feeder barge or coastal vessel,” said Terenzio. “By having buffer storage, the utilization rate of this new concept can be maximized by way of using the spare idle time to transport the goods, thus resulting in additional benefits.”

Terenzio said the behaviour of the floating terminal pontoon at sea had to be considered at the design stage. “It has been estimated that the floating unit can move as much as over 10,000 times a day, thus causing fatigue to the mechanical component of the crane, the mooring lines, disruption of



Mario Terenzio.

operation, and discomfort to the crew. Therefore it is vital to adopt some movement dumping devices and to design the cargo handling facility with a suitable dynamic factor to bear such a stress and fatigue.

“The above measurements are effective not only to reduce the floating terminal down time due to bad weather, but also to extend the lifetime of the equipment mechanical component, thus resulting in an increase of the terminal availability and lower maintenance and repair costs and downtime.”

Gottwald, which has now secured 12 orders for its own floating crane design since its launch in 2004, supplied its first unit to Indonesia in 2006. The unit was also the German company's first floating unit designed for use on the open sea.

The Gottwald 'Generation 5' unit (G HPK 8200 B), ordered by PT Puteri Borneo Company for coal handling in Kalimantan (see picture on p89), operates 35km off the coast transshipping coal from barges to ocean-going Capesize vessels at rates up to 1,500tph in winds up to force Beaufort Scale 6 and waves up to 1.5 metres high.

The extra demands entailed in open sea operations had to be accounted for at the design stage by Gottwald. Additional forces acting on the steel structure — list and trim (5° and 2°), wave action (significant wave height $H1/3$), sidelead and offlead — required a modified crane geometry. The wind pressure and swell also gave rise to additional heeling moments along with increased motion of the crane.

Gottwald surmounted design challenges by modifying the design of critical components to withstand greater stresses, coupled with a reduction of the lifting capacity chart. Modifications included, amongst others, a reinforced boom design (heavy-duty boom) to effectively counter heeling and an

increased number of slewing gear drive units. Gottwald also decided to reduce the boom length by 7 metres and tower height by 2.2 metres, to compensate the increased weight and maintain the geometry between the rope pulleys at the tower head and the boom head.

“Even after modification the crane offers capesize capacity with a maximum 63-tonne grab capacity and a 50 tonnes grab-curve up to a radius of 43 metres (instead of 50 metres with the corresponding mobile harbour crane variant),” said a spokesman. “Due to these adaptations of the steel structure and crane geometry, Gottwald could still make use of many proven standard components, such as luffing cylinder, hoists and slewing gear units.”

Lloyd's Register classification was also demanded by the client, which created a problem for Gottwald because standard crane design codes do not deal with offshore conditions, while maritime codes issued by classification societies do not cover high service life demands.

Winning approval from LR required a complete check of the crane design, components structure as well as surveys during manufacturing and commissioning, including special non-destructive material tests. The entire crane construction was then assessed by Lloyd's Register and assigned the special feature class notation 'LA', which verified its compliance with Lloyd's Register 'Code for Lifting Appliances in a Marine Environment'.

“This certificate approval is portable for cranes of the same design on future open-sea projects related to Gottwald's new Generation 5 cranes,” a spokesman told *DCI*. “Only manufacturing and commissioning will be subject to reviewing and approving. Engineering and construction plans will not be affected.”