With today’s depressed shipping market and the recession we are facing, buyers and sellers are focusing on seeking logistical improvements, as being the only area where efficiency developments and sustainable cost reduction could produce long lasting and significant improvements. Therefore, floating facilities are now being taken seriously as viable — high value; faster realization; low profile; lower investment — alternatives to the shore-based infrastructure. This paper deals with the latest offshore cargo handling equipment designed for efficiency, reliability and availability. This is demonstrated by way of two case studies.

Solutions for logistic supply chain are almost infinite, but all require a solid knowledge of the market, the material and how it is to be handled, local environmental conditions, economics and the technical expertise to combine all of these factors to produce a solution that delivers value to the client. The last decade has seen the evolution of various types of floating facilities. These have been deployed for various usages like loading, discharging, lightering etc. The most common ones are however used for offshore loading of dry bulk cargo, mainly coal.

The operating conditions of such floating facilities are more demanding, i.e. exposure to high winds and waves in open water conditions, therefore the relative cargo handling facilities require higher safety standards, since they are subjected to higher acceleration forces as compared to cranes operating on shore or in sheltered water conditions.

### PRINCESSE ABBY MAIN FEATURES

<table>
<thead>
<tr>
<th>Class</th>
<th>RINA/BKI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flag</td>
<td>Indonesia</td>
</tr>
<tr>
<td>Length</td>
<td>60 metres</td>
</tr>
<tr>
<td>Breadth</td>
<td>22.6 metres</td>
</tr>
<tr>
<td>Depth</td>
<td>5 metres</td>
</tr>
<tr>
<td>Operative draught</td>
<td>2.5–3.5 metres</td>
</tr>
<tr>
<td>Light ship weight</td>
<td>1,450 tonnes</td>
</tr>
<tr>
<td>Crane</td>
<td>CBG 35t swl x 35m Liebherr</td>
</tr>
<tr>
<td>Grabs</td>
<td>2 x 24.3 m³</td>
</tr>
<tr>
<td>Designed daily loading capacity</td>
<td>18,000 tonnes</td>
</tr>
</tbody>
</table>
This brings about a fundamental difference in the cargo handling design and selection, which have to be designed specifically for ‘heavy-duty operation, in open seas’.

**Princesse Abby**
The floating crane *Princesse Abby* is owned by PT MITRA/SWIRE CTM Indonesia, a JV between PT Mitra Bahtera Sagarajanti and SwireCTM Bulk Logistics. Floating crane *Princesse Abby* commenced coal transshipment operations on November 2008 at the Muara Pantai anchorage in the Sulawesi Sea (East Kalimantan) on behalf of PT Berau Coal; then, in August 2011, she moved to Bontang Anchorage after having signed a new coal transshipment contract with Banpu Minerals.

Since the beginning of operations, *Princesse Abby* has loaded 141 vessels of Panamax and Capesize, transshipping about over 9mt (million tonnes), starring a best performance rate of about 28,000 tonnes per day.

*Princesse Abby* was designed by Logmarin/Interprogetti, and built under Registro Italiano Navale (RINA) classification and Logmarin supervision. *Princesse Abby*’s hull structure is made by duly reinforced longitudinal frame with spoon bow, inclined stern and two skegs aft. Bilge keels are fitted on each side to the extent of about three quarters of the length of the pontoon; structural anti-rolling fins are also fitted in way of the stern skegs. It is equipped with movement damping devices and suitable dynamic factors to bear stress and fatigue resulting from continued heavy duty work in open seas have been developed and incorporated in the *Princesse Abby*’s design, making it less sensitive to adverse weather conditions as compared with standard floating cranes.

The crane is designed and supplied by Liebherr through mastering proven technologies in design and operation of offshore transshipment systems. It incorporates specific features for open water and heavy duty conditions such as: duly designed heavy duty hoisting winches, strengthened boom, the slew bearings conceived with triple roller and four equally distributed slewing motors (thus to minimize the risk of breakdown to one of the most critical component of the crane), four-rope grab configuration, heel and trim alarm systems, thus ensuring high turnover, efficient and effortless loading/unloading from most types of vessels up to modern Capesize, as well as smooth and wider life cycle time.

**Princesse Chloe**
*Princesse Chloe* was delivered in April 2011 from Keppel Subic Shipyard and started coal transshipment operations at the Muara Pantai anchorage in the Sulawesi Sea (East Kalimantan) for PT Berau Coal.

In 2011, *Princesse Chloe* loaded 41 vessels between Panamax and Capesize, handling about 3.6mt, with an average daily loading rate up to about 47,000 tonnes of coal, and achieving a best performance rate of about 56,000 tonnes daily. It has an annual capacity exceeding 9.5mt.

*Princesse Chloe* is equipped with two Liebherr cranes of heavy duty offshore four rope type, each with a capacity of 30 tonnes. They have been fitted with Peiner Smag grabs of 20.5m³ capacity. The cranes are strategically placed in such a way with respect to the hoppers so as to minimize the slewing movement, thereby increasing the cycle time and efficiency. These heavy duty cranes are specifically designed for offshore operations, which means they are more robust in construction and are able to perform even in adverse weather conditions. They are guaranteed to operate up to two metres of wave height and 25 knots wind speed. Thanks to their outreach of 28 metres, their operational area is considerably increased, so that they can handle up to modern Capesize vessels.

The cargo handling system supplied by Bedeschi consists of two duly designed hoppers and an array of conveyor systems leading to a telescopic/shuttle ship-loader. The hoppers are of...
50m³ volume with a top opening sufficient to accommodate the footprint of the large grabs in use. The trunk-pyramidal shaped hoppers have asymmetrical walls to ensure the smooth flow of coal through the hoppers into the transfer chute. The hoppers are fitted with vibrators to ensure free flow of sticky coal, in order to maintain the required flow rate. The top of the hoppers are fitted with mesh grill to eliminate any over size or undesirable material which may potentially damage or block the conveyor system. Moreover, two additional features are installed on the hoppers aimed to avoid pollution — which are hydraulically operated spill plates and a water sprinkler de-dusting system. The spill plates are installed on the sea side of the hoppers and are opened during cargo operations to cover with gap between the floating terminal and coal barge, thereby eliminating any chances of coal spillage. The water sprinkler system is installed on top of the hoppers to suppress the coal dust during grab delivery. The swivelling capability of the shiploader facilitates serving multiple holds of the oceangoing vessels without the need to shift the Princesse Chloe alongside. The luffing mechanism of the shiploader is used to cater to the difference in the air draught of the ocean going vessel at ballast to fully laden condition.

Coal from each of the hoppers is extracted by means of individual variable speed belt feeders. These frequency-controlled feeders extract coal from the hoppers and transfer it to the longitudinal conveyor. The belt width of the feeders is kept high and the speed is low to ensure uniform extraction of coal from the hoppers. Another conveyor then transports the
coal longitudinally through the length of the floating terminal to transfer point a transverse conveyor, which will help in crossing over the entire beam of the terminal and be led to the final conveyor leading to the shiploader. The inclinations of all the conveyors have been designed in accordance to the grade of coal to be handled in order to achieve smooth flow of cargo and avoid back flow. Special care is taken in the design of the transfer points to ensure no blockage occurs and the material flows smoothly. All the conveyors are enclosed to avoid airborne pollution.

The shiploader is of shuttle/telescopic boom type with a 19m air draught; the shiploader is capable of swirling by means of geared slew rings and luffing by means of hydraulic mechanism. The shuttle length movement in excess of 11 metres gives the flexibility to deliver the cargo uniformly into the holds of the ocean going vessels. At the shiploader’s end a movable banana chute is fitted, to ensure delivery of coal into all areas of the ocean going vessels’ holds. This is crucial while loading cargoes with large stowage factors like coal, when it becomes important to fill in all the areas of the holds, thus avoiding dead freight charges.

In addition, it must be highlighted that, thanks to Princesse Chloe’s double-bow shape, she is also able to moor and operate on both sides of the ocean going vessels.

Normally, in a standard floating terminal of belt shiploader type, it is not possible to transfer a pay-loader to the ocean going vessels to trim the holds; this is because the cranes are located on the other side of the barge and with their limited outreach it makes it impossible for them to deliver the pay-loaders into the ocean going vessels’ holds. A lifting winch has been incorporated on the delivery boom of the Princesse Chloe, which can easily transfer pay-loaders into the cargo holds. These, both the ‘banana chute’ and pay-loader lifting device that allow best possible trimming, will help in compacting the coal in the holds of the vessels, maximizing the vessel’s transport capacity.

Princesse Chloe has been equipped with double independent Caterpillar made electrical generator sets, one set for duty while the other on standby or maintenance to ensure 24 hours a day non-stop operations. This means a 100% redundancy on this critical service. An SGS automatic sampling device has been installed on the terminal to enable the shipper to take samples of cargo as delivered into the ocean going vessels’ holds. It is also equipped with a belt scale to monitor the cargo quantity loaded and a metal detection system to initiate an alarm, if any metal is detected on the conveyor system.

**About the company**

SWIRE CTM BULK LOGISTICS (SCBL) is a company 50% jointly owned by China Navigation Company Limited (CNCo) part of the Swire Group and 50% by C Transport Maritime (CTM) part of Ceres Shipping Group. It has been established to take advantage of opportunities in the fast developing offshore marine logistics market. Both companies bring many years of experience in shipping, technical innovation, expertise and management to the joint venture. This is reinforced by strong relationships with shipyards, dry bulk shippers/end users and engineering companies.

SCBL encapsulates the experience, know-how and networks of its parent companies in the dry bulk and logistics field, providing a full range of integrated services from the supplier to the end users, including specialized barge services, transshipment units (floating crane, floating terminals), river/coastal and ocean transportation by means of conventional bulk-carriers or self-unloading vessels utilizing the most advanced technology offered by one of the major suppliers in the bulk handling equipment market.

SCBL’s mission is to provide customized and cost-effective dry-bulk seaborne supply chain services aimed at bridging the gap between supplier and industry to reduce total freight costs.