

# The transshipment solution: overcoming constraints in port logistics in developing countries

Coeclerici transhippers are supporting Mozambique coal exports where conventional port facilities are insufficient

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In January this year Coeclerici Logistics successfully launched *Bulk Zambesi*, a 55,000 DWT transhipper vessel of last generation. The vessel, which is the first of two units, will start operations in Beira, Mozambique in July 2011. The second transhipper named *Bulk Limpopo* will be operative in the first half of 2012.

## Background

In December 2009 Coeclerici Logistics, the logistic division of Coeclerici Group, specializing in international offshore logistics for raw materials, acquired the biggest offshore coal transshipment project ever awarded, which foresees the handling of about 11 million metric tons of coal per year during a 20-year contract. The cargo involved is 80% coking coal and

20% steam coal. Coeclerici's project was selected among offers made by leading offshore logistic operators that participated to the international tender for the Moatize coal project in Mozambique issued by Vale, the Brazilian company world leader in metal and mining production.

## Mozambique mining

Mozambique is seen as one of the new and fast growing countries with the mining industry, and is expected to grow at a rate of 9.2% during 2010-2012. The major coal demand is expected to come from Asia, China, Europe and India. Mozambique is well positioned for exports to these countries and its coal is seen competitive with that originating from Australia, South Africa, Indonesia and Colombia.



The 55,000 DWT *Bulk Zambesi* transshipment vessel, the first of two such vessels to be deployed at Beira port, Mozambique.

## Moatize coal project

The Moatize Coal Project involves the development of a concession area in Moatize, located in the Tete Province of Mozambique, approximately 600 kilometers from the Port of Beira. The overall investment expected to be of about US\$1.2 billion, accounting for 12% of Mozambique's GDP in 2008. Tete Province has an estimated 2.4 billion tons of coal reserves.

The coal that will be railed to the Port of Beira can not be loaded into big Panamax or Capesize vessels due to limitations in the Port and draft restrictions in the approaching channel. Therefore, offshore transshipment is the only solution that can be implemented to take advantage of economies of scale in the sea transportation part of the logistics chain. The project, which envisages the employment of two tailor-made transshipment units, will thus help to overcome these infrastructural limitations.

Both transshipment units, fully designed and built by Coeclerici Logistics, will be loaded at berth in Beira and will transport their coal cargo to a suitable deep-water anchorage off the coast, where there are no draught constraints and where the coal will be transferred into ocean-going vessels (OGV) up to 180,000 DWT by means of a sophisticated loading system installed onboard.

*Bulk Zambesi* and *Bulk Limpopo* are each duly equipped with heavy duty cranes, grabs, a belt conveyor system capable to transship at 4,000 tons/hour, and state-of-the-art gears allowing a throughput of around 12 million tons of coal per year. The two vessels will fly the Italian flag, will be classed with RINA, and will be in compliance with the latest international code resolutions for ships' safety and security, protection of crew and of the environment.

## Transhipper operation cycle

### • Loading at berth

The coal mined in Tete Province will be railed up to Beira port



The *Bulk Zambesi* has two sets of bow thrusters, each with an output of 700kW.

using the Sena line, which was finished being upgraded a few months ago. Coeclerici transhippers will be loaded at berth no. 8 by means of shore facilities. The loading operation will be completed on the basis of available tide and each OGV's schedule.

The average tidal depth is about 11.3 meters (being spring tide plus 6.7 meters), which will permit the transhippers to load about 44,000 metric tons of coal.

It will be possible to load different grades of cargo, which will be segregated in the five holds existing onboard.

### • Sailing to the transshipment area

The transhippers will navigate through the Macuti channel, which has a depth of 8 meters on Chart Datum and is about 135 meters wide, to reach the OGV, which will be anchored in the transshipment deep-water area located about 25 nautical miles from the loading berth. The transhippers are equipped with special flap-rudder and heavy power double bow-thrusters to facilitate the navigation along the hairpin-bends of the Macuti channel.

### • Loading the OGV

*Bulk Zambesi* and *Bulk Limpopo* – equipped with a pitch-propeller, flap-rudder and double bow-thrusters for smooth maneuvers – will approach and will moor alongside the OGV. The two units, fitted with suitable Yokohama fenders, will safely start transshipment operations. The five cranes onboard (one for each hold) will start to grab the cargo and will discharge it into the five hoppers.

The hoppers are equipped with anti-spillage plates, and the grabs used are spillage-free to avoid coal pollution at sea. A pay-loader is also available into the holds to gather the cargo and maximize the loading operation.

A system of fully covered conveyor belts, which run under the hoppers, will transport the cargo to a gantry traveler conveyor. This conveyor will finally put the cargo into a 37-meter long loading boom for loading coal into OGV holds.

The loading boom will be able to rotate and incline, and will be equipped with a 9-meter swiveling chute, which can smoothly deliver the cargo into any part of the OGV holds while avoiding 'empty spaces'.

Both transhippers are able to guarantee great stability even with adverse weather conditions. A 'tank test' simulation has been duly carried out during the design phase at USP University of Sao Paolo, resulting in a high percentage of operational days.

TABLE 1: BULK ZAMBESI TECHNICAL SPECIFICATION

Criteria	Value
LOA	190m
Breadth	32.26m
Depth	18m
Draught (scantling)	12.80m
DWT	Approx. 54,400
Speed	Approx. 14Kn
Main Engine	kW 9480

- **Propeller:** One four-blade pitch-propeller
- **Rudder:** One rudder composed of a single main blade, plus additional flap permitting high manoeuvrability while turning.
- **Bow thruster:** Two sets of bow thrusters, each with an output of 700kW.

### Cargo handling system

The handling system has a peak loading rate of 5,500 tons/hour, guaranteeing an average loading rate in excess of 3,000 tons/hour in all conditions.

### Cranes

Five electro-hydraulic heavy duty high performance four-rope grab cranes, designed for high speed continuous operation in open sea, with a lifting capacity of 40 tons and an outreach of 26 meters, with the following characteristics:

- Horizontal load path (level luffing)
- Reinforced boom construction
- Components tested and proven for extreme conditions and performance
- Continuously variable speed control from zero to maximum speed
- Operation of all three motions simultaneously with maximum load
- Automatic power output regulator for all motions
- Wide rope field
- Low center of gravity
- Designed with focus on low maintenance and life-cycle costs
- Comfortable driver's cabin with all-round vision and ergonomically designed layout.

### Hoppers

Five hoppers positioned starboard side with upper opening of about 10 meters by 6 meters, with inner lining made by Hardox 400, each equipped with two electrical vibrators and fitted with anti-spillage plates operated by hydraulic pistons.

### Conveyors

- One belt feeder (one for each hopper)
- One longitudinal conveyor of approximately 162 meters on starboard side
- One astern cross conveyor of approximately 30 meters
- One tripper conveyor of approximately 161 meters on port side
- One travelling gantry on port side with a travelling length of approximately 79 meters, designed to accommodate the boom conveyor
- One boom loading conveyor of 37 meters length and 18 meters air-draft, with a maximum elevation of  $-10^{\circ}$  to  $18^{\circ}$  and a maximum slewing of about  $100^{\circ}$  at  $15^{\circ}$  luffing. The loading boom is also equipped with a 9-meter rotating chute to gently handle cargo in each part of the OGV holds.

## Environmental impact

Both transshipment units have been designed to meet the most stringent environmental protection standards set by all major international certification bodies: IMO, MARPOL, IOPP, and ISPP. The loading system has been tested to reduce pollution and spillage of coal in the sea, mainly thanks to devices such as:

- Hoppers with anti-spillage plates
- Covered conveyor belts
- Anti-spillage grabs.

Hence, we can classify *Bulk Zambesi* and *Bulk Limpopo* as 'environmentally friendly transhippers'.



The rudder of the *Bulk Zambesi* is fitted with additional flap, making the vessel highly manoeuvrable.

## Coeclerici Group

The agreement with Vale Group is another example of Coeclerici Group's ability to develop solutions that can overcome port logistics constraints in developing countries, based on Coeclerici's know-how and expertise gained over more than a century of professional experience in the shipping industry. In addition, owing to its 20-year duration, this project is perfectly in line with recently implemented policies that aim to ensure stable profitability for the Group through agreements with first-class international operators.

Projects where tailor-made solutions developed by Coeclerici Logistics are employed include:

- Lake Maracaibo, Venezuela where *Bulkwayuù* handles over 6 million tons of coal on behalf of Carbones del Guasare, the main exporter in the country
- Goa, India where *Bulk Prosperity* is employed in offshore logistic operations on behalf of Fomento Group
- Tanjung Bara, Indonesia where *Bulk Pioneer* serves Kaltim Prima Coal handling 5 million tons of coal every year;
- Piombino, Italy where *Bulk Irony* serves Lucchini, and
- *Bulk Kremi I*, through the recent joint venture with Transship Ltd (the major transshipper operator in the area) is now employed in the Black Sea.

### ABOUT THE COMPANY

**Coeclerici Logistics**, the logistics division of Coeclerici Group, is today a leading company in land-sea transport of raw materials, with transshipment, port logistics, and short-sea shipping operations.

Founded in Genoa in 1895, Coeclerici Group, with a turnover of about €500 million and 800 employees, is a leading international operator for the supply of integrated and innovative services for the power, iron and steel industries.

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