

Krupp Canada Designs the US Caribbean Refinery Shiploader to Protect the Environment

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ABSTRACT

As we recognize the fragile nature of the world we live in, companies are becoming more responsible about protecting our environment for future generations. Krupp Canada Inc., located in Calgary, Alberta, Canada, is designing equipment that is breaking new ground and setting the standards for the future by meeting or exceeding the current environmental requirements.



Krupp Canada and their sister company Krupp Robins, located in Denver, Colorado, USA, together have designed, built, and commissioned three environmentally friendly shiploaders, located in Canada, the USA and Chile, over the last three years. Due to the success of these shiploaders, specifically the "Eco Shiploader" in Chile, Krupp Canada was chosen to design a radial quadrant shiploader for a US Caribbean refinery.

THE RADIAL QUADRANT SHIPLOADER

The design mandate of the radial quadrant shiploader is to effectively manage spillage and dust associated with the loading of petroleum coke. The shiploader is on an island with a predominately tourist-based economy, making environmental protection a crucial requirement. The reduction of spillage and dust has an additional benefit of representing a cost saving to the owner. The design criteria also had to take into consideration that the area is located in an Earthquake Zone 4 region and occasionally is hit by hurricanes with winds up to 250 km/h. Currently, Krupp Canada has completed the design and the anticipated commissioning of the shiploader is in 2001. The design combines proven shiploader technology with the advanced concept developed for the Collahuasi "Eco-Shiploader".

GENERAL SHIPLOADER REQUIREMENTS

A shiploader must be designed with the ability to load the diverse range of ships that will utilize the port. It must accommodate movement in three axes in order to properly and efficiently load ships. The required movements can be defined as follows:

- Travelling or slewing (radially), to offer movement parallel to the ship's axis.

- Luffing, or vertical movement.
- Shuttling, or movement perpendicular to ship's axis.

Environmental protection must be guaranteed throughout the operating range of the shiploader, as well as during cleaning and maintenance.

TRADITIONAL SPILLAGE AND DUST PROTECTION

Traditionally spillage pans have been used in "environmentally sensitive" areas to prevent material spillage into the ocean. These systems consist mainly of trays suspended below the conveyor belt and are equipped with washdown systems. Additional protection against spillage and dust is provided with belt covers and wind guards. All these additional components assist in managing spillage and dust control, however, they are not cost effective and add unnecessary weight to the boom. In addition, they require extensive effort and are costly to design, fabricate, install and maintain.

DESIGN INNOVATIONS

In the shiploader design the innovative concept of the Collahuasi shiploader was further developed to accommodate a shiploader of larger size and capacity. Combining the boom and carriage structural system of the shiploader with the environmental protection system eliminates many of the inconveniences that are experienced with a conventional spillage protection system. The boom and carriage structure are designed as tubular galleries of 3.2-m diameter, which provide both the structural system as well as a fully enclosed design where all spillage and dust is 100% sealed from the environment. This protects both the environment and the product.

The tubular design can perform all of the mechanical

Figure 1
The Caribbean Refinery Shiploader is similar to the Collahuasi "Eco Shiploader" in Chile

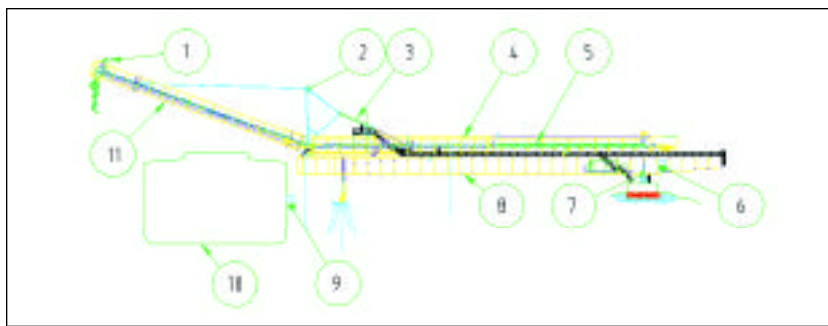


Figure 2
General arrangement drawing
Key:

1. Dust collector
2. Mast
3. Hydraulic cylinder
4. Shuttle
5. Belt conveyor
6. Central vacuum unit
7. Rigid structure
8. Bridge
9. Berth
10. Vessel
11. Boom

functions of the shiploader, luffing, slewing and shuttling, which is required to load bulk carriers. These motions allow entire hatch coverage for ships from 30,000 DWT and up to 65,000 DWT, 100% of a Panamax vessel.

The slewing function is accomplished as in conventional shiploader designs on a quadrant beam with a headbeam, equalisers and boogie assemblies.

The luffing is performed by hydraulic cylinders. The flexure point is close to the shiploader mast where a hinge point between the boom and carriage section is sealed with rubber bellows, thereby providing the dust and spillage control.

The rails for the shuttle motion are located on the bridge and the boogie assemblies are attached to the underside of the tubular carriage section. A longitudinal slot on top of the tubular carriage section equivalent to the shuttling length allows feeding of the shiploader conveyor for the full range of movement. The slot is covered to guarantee the environmental protection.

All chutes and the skirtboard systems are designed for optimum dust control with rubber gaskets between the flanges and dust-tight seals in the inspection doors. Material spillage in the conveyor gallery is collected by a built-in industrial vacuum cleaner that is operated during maintenance periods.

TECHNICAL DETAILS

Material: Petroleum coke

Boom length: 50.5 m

Bridge span: 69 m

Luffing range: ± 9 degrees operational
+20 degrees out of operation

Figure 3
Artist's rendering of the shiploader
in the Caribbean

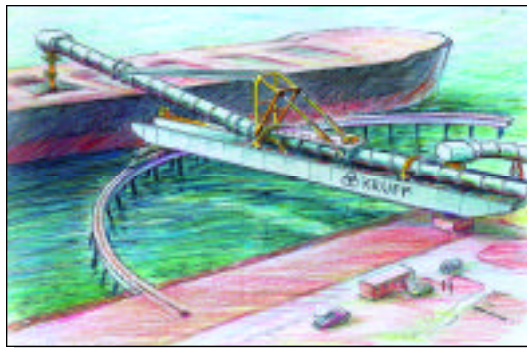
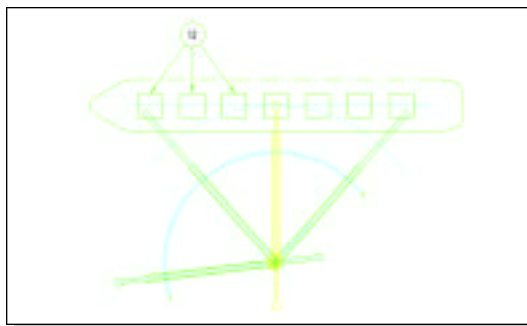


Figure 4
Illustration of the degree of
rotation. 12-Ships hold



Slewing range: 120 deg
Design capacity: 1700 mtpd (1850 stph)
Belt speed: 3.3 m/s (590 ft/min)
Conveyor width: 54"

CONCLUSION

Protecting the environment is paramount to a terminal operator's success in the future, and companies that can supply equipment to meet the required demands are necessary. The new design innovations of the shiploader, initiated with the design of Krupp Canada's Collahuasi "Eco-Shiploader" and subsequently refined, combine cost effectiveness with protecting the environment. Krupp Canada has proven that they are capable of designing and supplying equipment that exceed stringent environmental protection requirements and sets the standard for shiploaders for the future.

Krupp Canada is involved in the design and supply of turnkey mining and bulk materials handling projects. The product line of equipment encompasses ship loaders and ship unloaders, conveying systems, crushing systems, stackers, storage and reclamation systems. Krupp Canada, with their sister company Krupp Robins have completed many prestigious installations in both North and South America. Projects include the entire conveyor system for the Los Pelambres project in Chile, the radial quadrant shiploader for Collahuasi in Chile, a bridge stacker, conveyor system and travelling shiploader at LAXT-the largest coal export terminal on the west coast of the United States. In Northern Alberta, Krupp Canada has designed and supplied numerous semi-mobile and relocatable crushing plants, including a double-roll crushing plant that is currently the largest of its type in the world.

ABOUT THE AUTHORS

Martina Shehata is Vice President of Engineering at Krupp Canada where she is responsible for overseeing the engineering and project management activities. Martina has been actively involved in the design and supply of many prestigious projects at Krupp Canada including conveyor systems and large overland conveyors, shiploaders, crushing plants and stockpiling and reclaiming systems.

Linda Frederick, Marketing & Communications at Krupp Canada has a Bachelor of Commerce degree from the University of Alberta and oversees the marketing and communications activities for Krupp Canada.

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