

# TRANSHIPMENT IN THE UAE

**Marco Bertorelle and Sanjeev Mathur, Bedeschi, Italy,** outline the process behind an offshore transhipment project for Abu Dhabi Ports.

In 2019, Bedeschi was awarded a contract for the supply of complete cargo handling system for an offshore transhipment project in the United Arab Emirates. The contract, awarded by Abu Dhabi Ports (ADP), demonstrates the faith placed in the company's experience in the field of offshore transhipment of dry bulk cargo.



Emirates Steel Industries (ESI) is situated in the Mussafah industrial area of Abu Dhabi and receives iron ore pellets as the basic raw material for the steel making process. The iron ore pellets have to be received at their jetty, which is located on the 53 km-long Mussafah channel, connecting to the Arabian Sea. The depth of the channel is only 9 m, which restricts the movement of large vessels. It is therefore imperative that the iron ore pellets be transferred into barges, which can then transport them to the ESI jetty. At the jetty, ESI has a shore receiving hopper, connected to their plant by an



Figure 1. Bedeschi transhipper for EMCO, Russia.



Figure 2. An example of a Bedeschi transhipper.

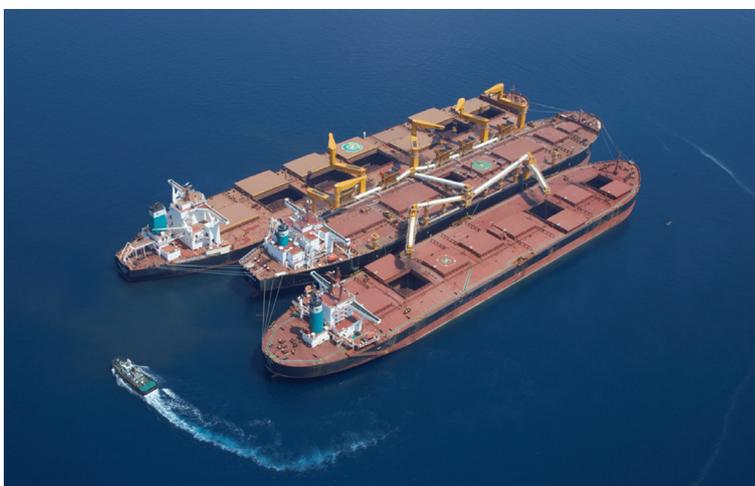


Figure 3. Bedeschi transhipper for Vale, Brazil, 6000 tph.

overland conveyor. The barges deployed are a bottom discharging type and have a delivery boom, which can deliver the pellets in the hopper. The entire transshipment, channel transportation and discharging contract has been awarded by ESI to ADP. For serving this contract, ADP needs to convert a bulk carrier into a transhipper.

The project thus entails the conversion of a bulk carrier into a self-loading and self-discharging transhipper vessel (TV) to discharge iron ore pellets from ocean going vessels (OGVs) into barges. On arrival at the designated anchorage, the OGV will drop anchor and a double banking operation of OGV and TV will be carried out in the open sea. The barges will then be berthed alongside the sea side of TV in triple banking. Pellets will then be transferred into the self-discharging barges by a combination of cranes and cargo handling system installed on the TV.

Once fully laden, the barge, up to the allowable draft, will then cast off and transport the pellets to the ESI jetty. Another barge will then take its place and the operation will continue. A carefully worked barges cycle calculation ensures maximum utilisation of the barges, thereby reducing the waiting time of OGV. However, while the TV is waiting for the barges, or during the barge's changeover times, the discharging of the OGV continues and the pellets are stored in the holds of the TV, which will be then be transferred to the barges once they are available. The priority remains the expeditious discharge is the OGV within the allowed time. The TV needs to guarantee a discharge rate of 35 000 tpd of the OGV.

The TV will be equipped with four port side-mounted Liebherr make CBG 350 cranes with extension arms that increase the cranes' outreach, so that they can reach all parts of the OGV's holds. These heavy-duty cranes have been developed over years of extensive feedback and innovation to make them suitable for offshore operations. This means strengthening slewing bearings and moving parts to overcome the stresses that occur as a result of high acceleration forces caused by wave and wind conditions in the open sea. The cranes will be equipped with spill-free grabs so as to guarantee no air and sea pollution while transshipment operations are being carried out. The location of the cranes on board the TV have to be strategically selected so as to maximise the cranes cycle efficiency, with minimum shifting of the TV and OGV. The cranes transfer the pellets from the OGV onto the cargo handling system installed on board the TV.

The cargo handling system comprises of hoppers, feeder belts, conveyors and barge loaders. Two hoppers, one catering to two cranes, are located between the cranes to receive pellets and transfer them smoothly onto the conveyor system through feeder belts.

The hoppers are of 60 m<sup>3</sup> volume with a top opening sufficient to accommodate the footprint of the grabs in use. The trunk-

pyramidal shaped hoppers have asymmetrical walls to ensure smooth flow of pellets through the hoppers into the transfer chute. The hoppers are fitted with vibrators to ensure free flow of pellets and ultimately maintain the required flow rate. Hopper walls are lined with ceramic plates to ensure smooth flow of material and eliminate any chances of material built up leading to choking. The top of the hoppers are fitted with a mesh grill to eliminate any undesirable material that could potentially damage or block the conveyor system. The grill can withstand the weight of an empty grab at rest if required.

Two additional features are designed to avoid pollution. These 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 opened during cargo operations to cover with gap between the TV and OGV, thereby eliminating any chances of sea pollution thru accidental spillage. The water sprinkler system is installed on top of the hoppers to suppress the dust generated during grab delivery.

Pellets from each of the hoppers are extracted by means of individual variable speed belt feeders. These frequency-controlled feeders extract pellets from the hoppers and transfer them to the longitudinal conveyor. The feeders' belt width is kept high and the speed low to ensure uniform extraction of pellets. The belt feeders are of rugged construction and fitted with impact rollers to withstand the forces of continuous grab unloading.

The belt feeders transfer the pellets onto two longitudinal conveyors running in opposite directions through the length of the TV and converging to a transfer point before discharging the pellets on to a transverse conveyor crossing over the entire TV beam leading to a barge loader.

The inclinations of all the conveyors have been designed in accordance with the grade of pellets to be handled in order to achieve smooth flow of cargo and avoid back flow. Special care is taken in designing the transfer points to ensure no blockage occurs and the material flows smoothly. Transfer points have been designed according to the flow property of the pellets to minimise spillage and avoiding problems of pellets degrading or breakage. This is achieved through the installation of curved deflectors that minimise impact

and guide the flow of pellets properly. All of the conveyors are enclosed to avoid airborne pollution.

The slewing and luffing type of barge loader, designed with a flow rate of 3000 tph, receives the pellets from the transverse conveyor and delivers it to the barges moored alongside. The slewing mechanism, including the slewing bearing, is of heavy-duty design to ensure trouble free operation in the open sea.

The discharging end will be installed with a delivery chute designed to ensure smooth flow of pellets and distribute them into all parts of the barge holds. The delivery spout will also have ceramic lining in order to avoid any material choking.

Infrared cameras will be installed at strategic locations to enable effective monitoring of the complete operations. The entire cargo handling system can be remotely and locally operated, therefore granting maximum flexibility to the operations staff.

With critical operations such as these, clients have to rely on companies that not only have the experience, but also the ingenuity to come up with designs that fit their exact requirements. Bedeschi forms long-term alliances with the customers, and continuous support is always given to the clients by way of providing service agreements, under which the company's technicians visit the facility periodically and carry out small maintenance and impart operation training to the crew. They also advise the crew on the spares' management. Having adequate stock of essential spares onboard is of great importance to avoid any costly downtime.

The TV is a critical component of the steel mill's supply chain and its availability and reliability is ensured thru constant interaction by the After Sales department of the company and the operation staff of the TV. ADP has selected.

Bedeschi to supply the cargo handling system because it has experience in handling a diverse array of dry bulk cargoes and has its own production facility to manufacture critical items in-house. Feedback from the ongoing projects are analysed and incorporated in the future designs. For Bedeschi, development and innovations are dynamic functions and the company to lead by example. **DB**