

Busy times for Ebara field engineers

Syd Harris looks at the practical and physical challenges of maintaining, servicing and refurbishing LNG carrier submerged electric cargo pumps



Lifting an Ebara cargo pump clear of an LNG carrier tank for servicing

The submerged electric cargo pump has been a key element in the success story of LNG carrier design and operations over the past half century. Without these sophisticated pumps, with their ability to operate within the liquid cargo, the progress from small prototype LNG carriers to the modern 266,000m³ Q-max ships would not have been possible.

Two cargo pumps and a spray pump are the usual arrangement for each LNG carrier cargo tank. LNG ships with membrane cargo tanks require an additional retractable pump for the emergency discharge of cargo.

The Cryodynamics Division of Ebara International is a major player in the manufacture and subsequent lifecycle maintenance of LNGC pumps. As executive director Don Polkinghorn points out, "All maintenance and service agreements must be focused on the requirements of the specific customer."

For Ebara the service agreements can be made with either the shiprepair yard or directly with the shipowner. When it comes to cargo pump servicing, the global nature

of LNGC trading routes creates logistics challenges and requires a high level of commitment and substantial investment by the original equipment manufacturer.

Technology advances in ship design and materials are changing vessel refurbishment periods. In the past a ship refurbishment would be completed within a five-year (60-month) time scale. In practice this would be divided into two parts, i.e. at 30 and 60 months, and the choice of equipment to be refurbished would generally be left to the operator unless there were some indications of decreased performance or pending problems with any specific pump. Typically either all the port or starboard main cargo pumps on an LNGC, together with half the spray pumps, would be refurbished at any one time.

The above maintenance cycle has served the LNG shipping industry to good effect for many years and supported the development of the high levels of ship reliability that are now characteristic of the LNG industry. However, in recent years pressures to lower the cost of LNGC pump maintenance have been growing. The advances in ship design and plans for longer periods between dockings represent one of the drivers for change. Ebara International is geared up for the evolving servicing scenario and can see a benefit for a full pump refurbishment every five years.

When the ship is in drydock the work of removing the cargo pumps is performed by an experienced shiprepair yard team, normally with some critical involvement from the pump manufacturer. The pumps are transferred to a suitable workshop, often referred to as the cryogenic workshop. In most circumstances pump overhaul work inside the tank is not a preferred option.

No entry into the cargo tank is possible until the space is gas-free and safe to enter. This operation needs to be carefully planned in order to avoid any undue delays to work on the pumps and unscheduled disruptions to the repair yard's work programme.

In most instances the construction of the cargo pumps used on membrane and spherical tank ships is the same,

as is the access tower mounting arrangement for the pumps. However, the tower height for spherical tanks is greater while the cross-section of tower is smaller than that for membrane tanks, as there is no retractable pump column.

Various types of rigging are used to support and remove the pumps from the cargo tanks. On more recently built ships useful rigging eyelets have been included in the tower design. Moving the pump inside the tank is accomplished by using pallet jacks, which allow for a crane lift out of the tank.

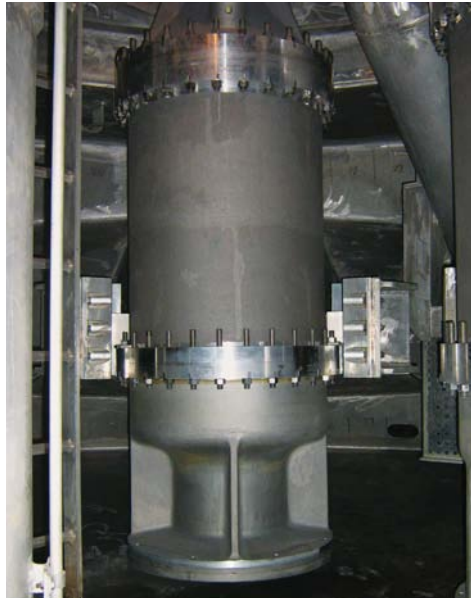
When lifting and/or removing the pumps from the tank, care must be taken to ensure that the pump does not hit the tank internal shell or membrane. Because both spherical and membrane tanks are uncluttered internally, the lifting of cargo pumps is relatively straightforward. The situation for LNG carriers, or LPG carriers, with prismatic cargo tanks is different, as the internal structures of such tanks are comprised of transverse webs and girders, brackets and stiffeners. Obviously impact with such structures has to be avoided and the removal and refitting of a cargo pump on a prismatic tank ship requires much more work.

Once out of the tank the pump is placed on a purpose-built cradle for carriage to the workshop. This cradle holds the pump securely and is suitable for use with forklift trucks or cranes. Once the pump is serviced and refurbished at the workshop, the same cradle is used to return the pump to the ship.

Having an adequate cryogenic workshop at the repair yard is a key consideration. This facility needs to be clean and, ideally, it will be located away from the drydock and the repair yard's other main facilities. The shop needs to be climate-controlled and have adequate lifting capacity for the pump maintenance work.

"The training of the shiprepair yard staff in working with the pumps is a most critical item and retaining these workers allows for the smoothest drydock work period," points out Lonn Hall, Ebara's after-sales director.

Mr Hall also offers five pieces of practical cargo pump servicing advice. Having the same pumps for each type of ship allows common parts and a familiarity



An Ebara cargo pump back in position in the tank after servicing

with procedures and methods for both the shipowner and shipyard. Pump spares can then be shared across the fleet, either for Moss spherical or membrane ships.

He also suggests that having handsets of special pump manufacturers' tool packages at the shiprepair yard allows for quick work in maintaining the pumps. It also enables the shipowner's tool set to be kept on the ship, thus minimising the risk of accidental loss during the drydocking period.

Another hands-on tip is ensuring the availability of US imperial size wrenches at the workshop, as Ebara pumps require

the use of such tools. The wrenches are equally useful for adjustment when lifting the pump by the eyelets.

Ebara also recommends keeping a spare pump in storage near the drydock facility. The availability of such a unit will enable the repair yard to complete its service contract on schedule on those occasions when a pump problem is discovered during drydocking that cannot be remedied in the short time available.

Lonn Hall makes a final plea, maybe from personal experience, explaining how useful it is for all parties concerned for the shiprepair yard to retain the documentation on a pump manufacturer's equipment for future use.

Looking ahead, even if longer gaps between full services on ships are established, the ever-growing size of the fleet of LNG carriers fitted with the company's cargo pumps means that Ebara field engineers will be busier than ever in the years to come. [LNG](#)



In addition to two cargo pumps each LNG carrier tank is provided with a spray pump