SAFEGUARDING THE SHIP-TO-SHORE INTERFACE

While they may not steal the limelight for most visible port assets, fenders form the backbone of quay protection, finds **Alex Hughes**

Admittedly, fenders are not the most high profile pieces of port equipment. Yet, poorly designed or damaged fenders have serious implications for regular port operations. Innovations in technology and materials are improving the performance of these invisible port workhorses, allowing manufacturers to enter even the most challenging markets.

Today, astute ports look at life cycle, durability, reliability, smooth operation and ease of maintenance when evaluating the effectiveness of their fenders.

However, they do not do enough monitoring of existing fenders and damage is often recorded too late, in the opinion of Dominique Polte, board member of ShibataFenderTeam. Furthermore, essential maintenance is often neglected, but is nevertheless essential if the effectiveness of fenders is to be maintained, he adds.

Ports, Mr Polte notes, tend to have their own maintenance crews and some appoint engineering companies to undertake surveys, but fender problems are often identified co-incidentally, rather than through proactive monitoring. Data collection is still largely a manual process, with electronic data collection still in its infancy.

Ports could be missing a trick here, as performance data is invaluable. In ShibataFenderTeam's opinion, it is also useful to monitor the berthing speed and berthing angle of vessels as this data gives important insight and could influence prospective design tailored to the port.

DIFFERENT STANDARDS

When tendering for fenders, suppliers need to be aware that fender standards do differ from region to region. Designs and testing can follow different standards, the most popular being PIANC 2002.

"The environmental conditions on site are very different, too, and need to be taken into close consideration for the fender design, as do project requirements," adds Mr Polte. "A ferry leaving from Port A to Port B might need different fenders in Port B than in Port A, for example."

Surprisingly, one aspect that has not significantly affected fender design over the last five to 10 years is vessel size. Even though ship size has increased considerably in recent years, the slower berthing velocity of larger vessels has meant that the calculations for energy absorption required by fenders have remained relatively constant. "Velocity is the most important factor in berthing energy calculations, and often more important than mass," explains Mr Polte.

> "When tendering for fenders, suppliers need to be aware that fender standards do differ from region to region

■ Fenders have to be tailor-made to their environment

In terms of lifespan, ports undertaking port rehabilitation projects can expect to get 15-20 years of service from fenders before replacement becomes necessary, unless they need to be changed sooner in line with vessel developments, for example where the overall draft is deeper. Also newer vessels typically withstand a lower hull pressure than older vessels, which means newer ships might require a transition of fenders from, say, cylindrical to a fender system that includes steel panels, says Mr Polte.

MATERIAL COSTS

For the standard range of fenders, rubber remains the most reliable and cost efficient material. For special products, other materials, such as polyurethane or high-density polyethylene (HD-PE), are used. The material choice is further influenced by changing regulations, many of which now require a certain

■ Ports should do more to capture data relevant to fenders

amount of recycled content in HD-PE fenders to meet environmental regulations.

However, Mr Polte, argues that recycled materials are not at all appropriate for rubber fenders as they can degrade the fender performance and life cycle.

The preferred fender type can also be influenced by ship owners calling at a port, who may have certain requirements in respect of hull pressure and marking. They may also want a say in the layout of fenders at the ports they berth at.

However, Mr Polte notes that while high quality fenders can help speed up mooring, the time savings are more often gained through more efficient container handling.

Ports considering automated mooring systems also need to consider that fender design and automated mooring systems need to be synchronised, if they are to work well together.

Mr Polte also comments on recent high profile quay strikes by vessels, noting that while fenders are designed for normal and abnormal energy, quay strikes fall out of that range. "Overall safety factors can be increased, but if these are too high, the fender system could be 'over designed' and too rigid, especially for small/medium size vessels," he says. "A better approach would be to upgrade mooring systems in terms of approach systems to measure and record berthing velocity and angle to correct speed and angle before quay strikes."

MEETING EXTREMES

One of the most challenging fender projects handled by ShibataFenderTeam in recent times was that for the Yamal LNG Terminal, in Russia, where the company is already the leading fender supplier.

The contractor issued a tender for what was an entirely new project. The terminal operator had a clear idea of what they wanted and issued a very strict performance specification with the tender, against which bidders were asked to put forward solutions.

The main difficulty was that the ambient temperature regularly drops as low as -55˚C, during which liquefied natural gas production and vessel berthing needs to continue. ShibataFenderTeam's winning bid – tailored specifically to meet such conditions – incorporated a special rubber compound which had to be developed specifically to withstand these Arctic temperatures. Steel also had to be supplied which could function at -60˚C. On top of this, a special high abrasion resistant icebreaker paint had to be applied to the steel panel to resist sharp ice particles. The polyethylene wear pads were tested to withstand -150˚C.

The fenders had to be produced to meet these rigid specifications right from the start. To ensure success, a comprehensive exchange of information took place locally between manufacturer and client, with quality requirements discussed and approved.

■ Rubber remains the most reliable and cost efficient material for fenders

Although the project first surfaced in 2012, development was undertaken over a five-year period, with implementation completed in 2017, in time and on budget for the maiden voyage of a new fleet of ice class LNG carriers.

In total, 6 CSS 2000 Double Cell Fender Systems were supplied, along with 13 sets of CSS 1600 and one CSS 1600 Corner Fender System.

The fender systems performed well through their first winter, allowing the terminal to function normally. The system is also expected to be very low maintenance due to a safety-driven design. However, maintenance checks are required according to an installation checklist provided by the supplier.

The Yamal LNG Terminal also followed the manufacturer's suggestion of setting up a spare parts stock. Although a capital cost, this helps to prevent operational downtime and could prove, compared with the downtime costs, a prudent investment.

■ Dominique Polte, ShibataFenderTeam, says that recycled materials are not appropriate for rubber fenders

Systems for greenfield terminal designs

When APM Terminals started its planning for a new container terminal in Moín, Costa Rica, it issued a private open tender for fenders. The terminal was a greenfield development, part of which was offshore. APMT's requested design was specified in some detail and the main challenge for the fender supplier was the long design period, during which several parties were involved.

Furthermore, the fender design changed during the planning process and close co-operation between all concerned was therefore crucial for the success of the project.

ShibataFenderTeam provided its CSS 1450 and CSS 630 Cell Fender Systems, which were uniquely designed for the terminal. Installation of the fenders started in 2017 and with container cranes recently delivered to the terminal, the fenders have been put through their first test.

The fender installation is expected to remain in situ for at least 15-20 years, although that will be reliant on routine maintenance being undertaken as outlined by the accompanying maintenance manual. Immediate replacement and repair of fender system components if damaged through accidental berthing will be crucial.