Jetty management

Sandy Thomas, Strainstall UK Ltd, UK, presents an integrated approach to *jetty management* at *LNG terminals*.

With the growing number of new LNG transfer terminals (both export and receiving) and the significant increase in the LNG vessel size and traffic, safety is of an even greater concern than ever before. This has resulted in the need for terminal owners and operators to pay for more attention to the potential risk factors when planning to handle these LNG carriers. These include possible damage to berths and dock structures during docking and whilst moored, the risk of fire, and environmental pollution caused by ruptured loading facilities, cargo tanks or bunker tanks due to collision with dock structures. In order to reduce these potential hazards to an acceptable level and to ensure the safe berthing and mooring of a vessel, dedicated facilities are needed to monitor and control the speed of approach of a vessel during berthing, the drift-off of the vessel whilst moored during cargo transfer, the tensions in the mooring lines, the status of each hook, and the meterorological and oceanographic conditions. In order to achieve this Strainstall has designed and developed several systems and components that provide the latest technology with known durability.

Speed of approach

Strainstall's DockAlert system provides protection of the jetty infrastructure by calculating the vessel approach speed to ensure that it is kept within the allowable limits for the jetty's safe operation. The system uses two eye safe laser units installed on either side of the jetty head and aimed perpendicular to the berthing line. These measure the distance of the bow and stern relative to the jetty, while also providing speed and relative angle of the vessel to the berth. The data from these lasers is fed into a central control system, where it can be displayed in the jetty control room and relayed to either hand held telemetry units (i.e. pagers and PDA) or a large digit display mounted on the jetty. The large digit display is visible from over 200m and provides the pilot and vessel master with information on the speed of approach and distance from the jetty. Incorporated in

Figure 1. New UK LNG terminal

Figure 2. Large digit display within hazardous area.


Figure 3. Load measuring pin installed into quick release mooring hook.

the display are arrows indicating whether the vessel's speed is increasing or decreasing and simple traffic light indicators to warn against excessive speed. These units can be set against safe parameters to ensure a smooth and gentle berth.

Mooring load monitoring

Strainstall also provides a mooring load measurement system. MoorAlert uses load measuring pins that are designed and installed into the quick release hooks to provide constant real time monitoring of the loads they are subjected to, which are directly due to the tensions in the mooring lines. Strainstall has been designing and manufacturing these load measuring pins for over 40 years, and the design utilises the almost unique experience gained over this period to provide a reliable and totally environmentally sealed unit that will perform unhindered over the life of the installation.

The signals from the load pins, together with the hook status sensors (open or closed), are consolidated by a network interface unit mounted in the hook motor starter enclosure, situated to the rear of the hook base. This unit allows the digital signals from all the hooks (in the case of the base units with two or more hooks) to be transmitted over a simple two wire loop system back to the jetty control room. In the case of excessive distances, a consolidation unit would be mounted on the jetty and then signals sent via fibre optics to the jetty control room to maintain continuity and stability of load and status data from the hooks.

To ensure secure mooring of the vessel, Strainstall provides in-house designed and manufactured quick release hooks. The hooks have been tested and supplied to a large number of customers, both on and offshore, over the past 35 years. Strainstall are able to supply a vast range of hooks from 30 - 180 t, to ensure that all mooring patterns and systems can be accommodated in today's facilities. These units give the customer a reliable and secure safe mooring point, and as part of the quick release hook equipment, a remote release system can be provided that is completely integrated into the hook assembly. They can be released by a control panel on the motor start enclosure or manually in case of power failure. Strainstall can also operate the hooks remotely from the jetty control room, where a centrally controlled unit can operate the hooks. The release is key coded to ensure accidental release is avoided. The hooks have no protruding parts (such as cables that can be damaged by the mooring lines), are fitted with non-contact sensors, and there is a direct connection between the hook release mechanism and the release activation device. Each hook is proof tested to 150% of its rated SWL, and the release mechanism is tested to full load at the company's test facility, where it is witnessed by a third party inspectorate and, if required, the client.

Integrated jetty management

With reliable sensors gathering data on and around the jetty, a user friendly interface is required to provide the operators with clear displays, an alarm facility and data recording. This comprises a desktop or rack mounted PC running Strainstall's BerthManager software, usually located in the facility control room. The software takes the data from all of the systems mentioned above to provide a fully integrated berth management system. This allows the user to review any berthing or mooring sequence to ensure that optimal usage of the berth is maintained. In the event of heavy berthing or an expected ESD departure, the operator can replay the sequence of events leading up to and during the event, allowing the cause to be determined.

By consolidating the modular system data, Strainstall is able to relay this information via telemetry to a pager, PDA or laptop. This ability to transfer real time data to operators who are not located in the central control room allows additional flexibility and monitoring during a vessel's approach, mooring and departure. These telemetry systems can either provide passive data displays that alert the operator/handler to specific warnings, or allow full functionality of all systems via the laptop. The modular systems mentioned above are designed to be 'plug and play', allowing the operator to purchase the different elements of the systems that they specifically require, but also allowing any system to be easily upgraded at a later date.

Hull stress monitoring

Another related product that Strainstall supplies to the LNG industry is its hull stress monitoring system, StressAlert. Today most LNG vessels are fitted with these systems in order to monitor and log the hull stresses both during cargo handling and at sea. The basic system meets all requirements of the various Classification Societies Notation for hull stress monitoring systems, and includes long baseline sensors for the deck to monitor bending and a bow accelerometer to monitor vertical accelerations produced during bow slamming. These ensure that the stress levels on the vessel are monitored and recorded, and in the event of any being over predetermined

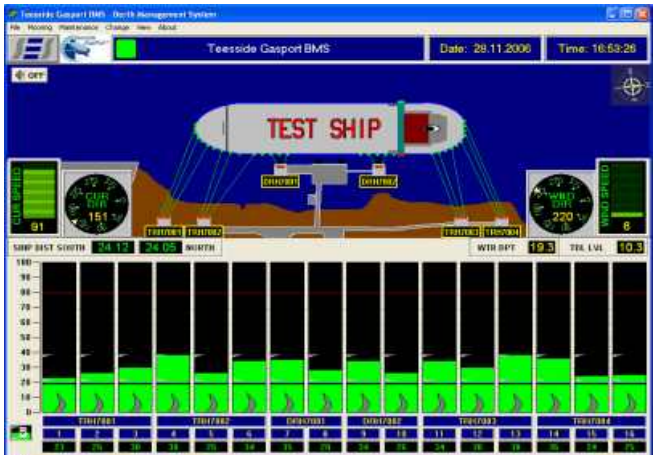

Figure 4. Main BerthManager display.

Figure 5. Quad hook with hydraulic release.

limits, provides alarms for the ship personnel. This allows the ship's master to alter course or speed to lower stress levels. In some conditions a minor change of heading will result in significant reductions in stress levels without the need to reduce speed, and in other situations decreasing or increasing speed may be beneficial. During cargo operations, loading and discharging plans can be adapted to minimise the effects of structural stress. Additional features can be added to increase the parameters monitored (roll, pitch and heave, bow pressure sensors, ballast tank sensors, strain gauges around the main anchor points of the tanks, interface to wave radar, etc). Over the long term, by having a record of the stress to which a vessel has been subjected, the hull life can be maximised and risk management demonstrated, Early structural damage can also be detected, cutting repair costs.

Conclusion

Strainstall offers a complete solution with a proven track record to jetty owners/operators and to vessel owners/operators. The combined ability to design and manufacture both a quick release system and instrumentation on and offshore has been a significant factor in the success of Strainstall over the past 20 years. For example, the company has installed over 200 hull stress monitoring units and over 70 BerthManager system to LNG terminals worldwide, 40 of which are in LNG facilities in Japan, where Strainstall are, to date, the only suppliers of such systems.

Strainstall continues to develop its systems through continual feedback from owners, operators and design institutes, to ensure that its products remain at the forefront of technology.