

Quick release mooring hooks go high tech

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Mooring hook load monitoring is becoming ever increasingly important when dealing with large ships. Correct mooring is vital for a safe operation. Too many incidents and accidents happen due to not paying enough attention to the mooring. New technology has increased the safety remarkably through a hook redesign, thus minimising the human element.

Introduction

If we take a look at the Quick Release Mooring Hook (QRH) mechanical design, nothing major has changed over many years. Yes, the mechanics have been improved to withstand the tough environment, including basic things such as better surface treatment, better bushing and greasing methods as well as optimised steel quality.

Load cells are placed in the hook for precise measurement of the tension of the mooring line. Accuracy greater than 1% of the maximum load is easily achieved in the new balanced hook design. The former QRH design was not in zero balance in unloaded position resulting in inaccurate load measurements. Therefore an unloaded hook could easily show several tonnes of loads, thus destroying the accuracy of the readings in the normal loading area.

The electronic QRH

QRH's (Figure 1) can be either hydraulically or electrically activated. Electrical hooks are the most simple and easy to maintain, as the new electrical actuator is imbedded into the hook body, making it well protected against damage. Hydraulically operated hooks require often more maintenance due to their hydraulic power packs and hydraulic hoses.

The load pin (Figure 2) that measures the load in the individual hook has been improved through a special stainless steel material and the strain gauges have been imbedded in the centre of the pin, providing perfect protection. As an extra precaution, the load pins are double gauged should a gauge fail due to a large electrical shock. The load cell strain gauges are connected to a dedicated

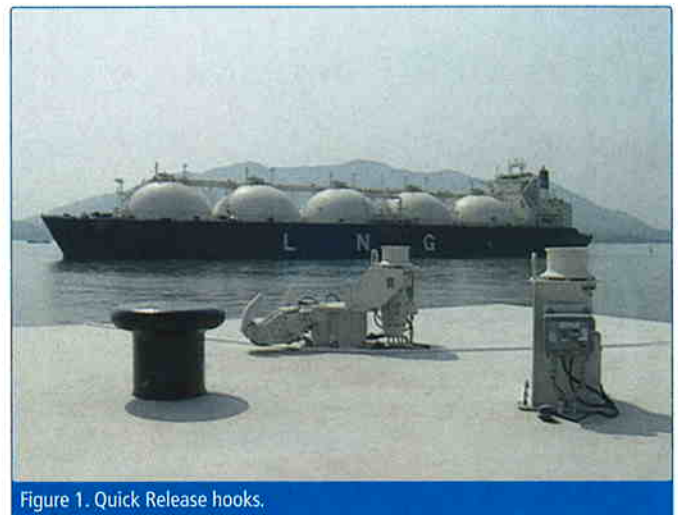


Figure 1. Quick Release hooks.

electronic module often located inside the hook station starter box or in a separate cabinet. The module shown here, the LAN Micro Server (LMS), reads the loads through integrated amplifiers. The module has its own microprocessor and memory integrated. Therefore the readings and calibrations are done in this local module. Like a 'black-box' installed in planes, the module records all events for over half a year. Data is available on an Ethernet LAN network linking all the hooks together in a network, making for easy data access both on-line and off-line. The connection between the hook stations is via LAN cable connection, fibre optical data connection or wireless (Wi-Fi).

Data delivered on the network is provided in real-time measurements as well as in extremes (Peaks) within given intervals. It can also be recorded in a network-connected computer that often is also used for berthing aid data as well as for environmental data. Should the network computer fail, the data is always, as a back up, available in the LMS control module (Figure 3).



Figure 2. New and improved load pin.



Figure 3. LMS control module.



Figure 4. Remote control panel.



Figure 6. The QRH can be operated directly using a PDA.

Remote controlled quick release

The control module is also controlling the remote QRH release activator, as well as watching the hook station sensors. Via the Ethernet LAN network it is possible to activate the release actuator. This function is done via the dedicated Remote control panel (Figure 4) that has a built-in redundant control module (LMS) that is independent from the system computer. This is to avoid accidental release. The security for releasing a hook is equal to that of the release of a missile from a warship. The old hardwired technology was not safe, and failures in hook station sensors and actuators



Figure 5. Remote control hand held EEx approved unit.

were found only at the time of activation, thus being too late. The LMS unit keeps local controls of all components on the hook, and in case of any failures, a message is sent on the LAN network. From there the alarm will be shown on the system computer, as well sending alarms directly from the LMS to the DCS network.

The LAN network allows a connection of more than one QRH release control module, as often there is one in the jetty control room and one in the hazardous jetty area. The latest development is the use of remote control via radio telemetry from a hand held EEx approved unit (Figure 5). With this development, one operator on the jetty can operate all of the QRHs, thus reducing mooring personnel to a single person. This system also gives ship pilots the opportunity to operate the QRHs directly, using a PDA (Figure 6) installed with dedicated software. The remote control units will also display the actual and peak loads as well as alarms.

With this modern hook upgrade, it is now possible to watch the QRH remotely via the Internet, which is a handy feature for service, as well as for statistic control from the owners head office.

The QRHs still have a mechanical release lever should the auto function fail. The remote (electrical) control can also take place at the hook station panel. To increase the safety, a Safeguard panel (Figure 7) has been designed. This panel is located behind the QRH on a safe position. The panel has a display that will show loads and alarms. On top is mounted a light, which will flash should a hook be overloaded. As you can see, a lot is done to provide the crew with security and information. On systems with pagers installed, the QRH messages are sent over the transmitter directly to the person in charge of the operation.



Figure 7. Safeguard panel for improved safety.

Design of hooks in general

A hook station is not just a hook station. Each designer seems to have their own opinion about hook sizes, capstan sizes, and features. Often two equal jetties can easily have up to a 30% difference in design loads without any reason for them. Over designed systems, as well as marginal solutions, are not unusual, which is a good reason why the client should be more deeply involved in setting out the system specifications. Foundations however, are often an issue. Here the designers should work in cooperation with the QRH supplier who has solid experience, as well as modern computer design models.

As hooks are exposed to seawater and tough handling, it is strongly recommended that the end user has a maintenance contract with the supplier for yearly inspections. Too many times we have seen QRH systems mishandled, creating a direct conflict with safety. It is a money saver to have yearly inspections, and if necessary, an overhaul.

Although the developments in mooring equipment have shown magnetic solutions and vacuum solutions, the traditional QRH will survive for many years to come, particularly with the advent of the new electronic control and data recorder integrated into the hook station.

ABOUT THE AUTHOR

Erik Brinch Nielsen graduated as an Electronic Engineer B.Sc. E.E from Copenhagen in 1969, after which he was employed by the Royal Danish Navy in the field of hydrography. Educated as a navigator, he has been involved with the merchant marine for many years and has had 20 years experience in research and development in the marine industry.

ABOUT THE COMPANY

Marimatech is a private owned Danish company formed in 1988, located in Hinnerup Denmark. Their main activities are R & D, services, consultancy, manufacturing and sales within the maritime industry worldwide. Marimatech's crew of engineers have more than 30 years experience in hydrographic, oceanographic and positioning systems. Marimatech has specialised in a comprehensive product program within its core areas of hydrographic, oceanographic, and navigational positioning and piloting. They have developed state of the art: Hydrographic products, berthing aids systems and marine piloting systems.

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