

# Learning the ROPES

When bulker *Yusho Regulus* broke her moorings as a result of the wake of a passing ship at Brazil's Port of Santos in September 2012, she smashed two loaders, hit a pier, and was herself damaged – **Tony Slinn** went to Rotterdam to look at a possible cure

**Y**usho *Regulus* was just one statistic among many hundreds – the UK P&I Club alone cites 160 personnel accidents due to mooring line failures and problems – and underlined the importance of the Research on the Passing Effects on Ships (ROPES) project, an international joint-industry research initiative that's investigating the impact of wash created when ships move in and out of ports and how it affects moored vessels.

The three-year participant-funded project has a budget of €1.5M (\$1.9M) – some €500,000 of that from the Dutch government – and will wrap up in November 2013. Its objective is to set new international guidelines for the design and construction of future ports and it will do that via the following:

- A computer tool to predict the effects of passing ships
- Results of 'reality check' measurement campaigns
- Assessment of new concepts to restrict moored vessel motions and mooring loads
- Results of the research to cover missing knowledge
- Best practice.

"Wash can cause moored ships to come loose," ROPES chairman Marco Pluijm told me. Senior ports specialist at international

engineering consultancy and contracting giant Bechtel, Pluijm added: "It also affects the safe loading and unloading of vessels, leading to potentially dangerous situations when the transfer of oil, gas, or other hazardous materials is involved.

"In recent years, the size, speed, and power of ships have all increased dramatically, thus increasing the size of their wash, and that can result in safety issues, environmental damage, and financial loss," Pluijm continued. "Little research had been done on this subject, but our project is identifying the full effect of a passing ship's wash and what can be done in terms of port design to mitigate it."

### Scope of work

That research began in 2010 and is being conducted in multiple phases, including extensive computer simulations, scale-model testing, and now full-scale testing in the Port of Rotterdam. Taking part are 26 members (see panel), including port authorities, terminal operators, maritime research institutes, pilots, linesmen, consultancies, and hardware suppliers.

While most of the research and testing has been carried out in the Netherlands, some of it has also occurred in the United States and Belgium. It's been concentrated in Europe,

however, largely due to the fact that those port authorities taking part are based in the Netherlands and Belgium.

"They recognised that they were all facing the same issues and decided to bundle their knowledge and do something about it," Pluijm noted. "But ROPES is addressing a global issue that's becoming increasingly common as ships get larger."

That's not to say the project is entirely altruistic: the results will be available only to participants for three years until 2016, providing project members with a competitive advantage. However: "The project is still open to new members; they can join now and receive full benefits," project member Dutch research institute MARIN's head of trials and monitoring Hen van den Boom stated. "And we will publish some results – as long as all project partners agree."

### In the tank

The technical visit began at Dutch research institute Deltares, which houses a 50m×50m test basin, a major flume named East & West Scheldt (220m long, 7m deep, and 5m wide), and is building a 300m long, 9.5m deep, and 5m wide flume that will give it the capability of generating waves up to 2.2m high and simulating North Sea conditions. It will be

on stream by November this year, Deltares' harbours, coastal and offshore engineering chief Dr Martijn de Jong told me.

Deltares is home to ROPES' scale-model test tank, in which a moored Panamax vessel (about 4,500teu) is subjected to the wash of a passing post-Panamax vessel and takes into account the 'surge and sway' effects and much more at 1:100 scale.

Using multiple sensors and monitored by a bank of computers, it was an impressive test that's given project participants huge amounts of valuable data to take into the field.

### In Rotterdam

The port, along with project member ECT – one of the world's biggest container transshipment terminals located at the Amazon harbour – is taking ROPES extremely seriously and has already embarked on a multimillion-euro project to build a new quay 50m back from the existing one.

"It's critical because of the Amazon harbour's orientation and design," Rotterdam's nautical development director, Capt Ben van Scherpenzeel, told me. "The harbour's relatively narrow and situated perpendicular to the entrance channel. Because of the harbour's geometry, ships have to make a sharp turn to enter. Moreover, ships must approach the harbour at low speed, making the effect of local currents relatively large."

It gets more complex. "The Beerkanaal entrance channel on the north side is connected to Nieuwe Waterweg main channel, and on the south side is connected to the Hartelkanaal channel. These channels are connected to, respectively, the River Nieuwe Maas and the River Oude Maas, which are in open connection with each other. Due to this situation, the currents in the Amazon harbour area are driven by both tidal influences and river discharge that are coming from two directions."

### A perfect real-world laboratory for ROPES

"For safety and security reasons, Rotterdam Port Authority restricts large ships from entering the harbour at specified tide periods of three hours per tide cycle," the captain continued. "In order to help pilots [the Dutch Pilots Association – NLC/Loodswezen – is a ROPES project member] manoeuvring the ships into the harbour, real-time current information is of importance. Moreover, the current information may lead to enlarging the restricting tide period. This could increase the number of vessels that can enter the harbour, which is of importance for the economy."



Facing the issues – Marco Pluijm

Tommy Shinn



Testing – Martijn de Jong

Tommy Shinn



Safety and security – Capt Ben van Scherpenzeel

Tommy Shinn

### Finally...

Like Santos, Rotterdam's had its share of serious mooring incidents, not least in 2007, when a tanker broke free and caused infrastructure and oil spill damage. That triggered the Royal Boatman's Association Eendracht (KRVE) to instigate its own research and then become a major player within ROPES.

KRVE's resources and development director Gert van der Burg and project engineer Chris Clement were on hand to explain their 'ShoreTension' mooring system, which is now being tested in the Port of Rotterdam. Like project member Cavotec's MoorMaster (see DPCs passim), it too offers a solution to both mooring

safety and security.

"ShoreTension is a mooring system that addresses the problem of safety – so-called 'mixed mooring' – which means the ropes paid out do not always equal the same tension as the ropes that are paid out by the tension winches on deck of the vessel concerned," Van der Burg explained. "In other words, the safest way to moor a vessel is to make sure all ropes paid out are at the same tension, so they work together as one.

"How does ShoreTension work?" Van der Burg continued. "It's hydraulic and automatically keeps mooring cables tense in



Scale model test at Deltares

Tommy Shinn

### ROPES participants

There are 26 organisations involved in ROPES, including associations, government agencies, port authorities, terminal owners and operators, consultants, suppliers, and marine research institutes:

- **Associations and government agencies:** NLC/Loodswezen, KRVE, and Dutch transport and infrastructure ministry Rijkswaterstaat
- **Port authorities:** Amsterdam, Antwerp, and Rotterdam
- **Research, consultancy, and engineering contracting members:** Arcadis, Bechtel, Deltares, MARIN, Moffatt & Nichol, OMC International, Pinkster Marine Hydrodynamics, Svašek Hydraulics, Worley Parsons, and Waterbouw Lab
- **Suppliers and hardware:** Cavotec, ExxonMobil, Lankhorst, Mampaey, Sipoort, and Smit International
- **Terminal owners and operators:** ECT
- **Universities:** Ghent, the National University of Singapore, and TU Delft

severe conditions, such as suction caused by passing ships, severe weather conditions, and swell. It also prevents mooring cables from breaking in the case of on/offloading and tidal differences."

Certified by Lloyd's Register and now in its third generation, ShoreTension is available at €150,000 per unit, Clement told me, and can be retrofitted to an existing quay without special adaptations.

"A port authority's able to monitor the actual status of any mooring via the web 24 hours a day – a great advantage for safety," he added. "The system also allows ships to be moored closer together, and gives more stability for ship-to-shore crane operations."

The last word went to Port of Rotterdam's researcher, Herm Jan van Wijhe

"It's extremely important for us to be able to look ahead and form a judgement about likely problems. We're very happy to be involved in ROPES and look forward to the results," he concluded. **DPC**

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