

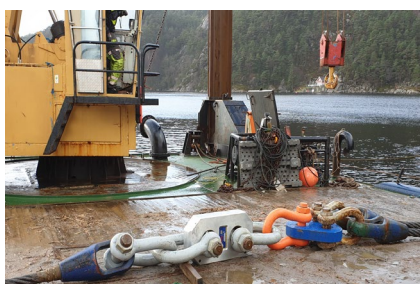
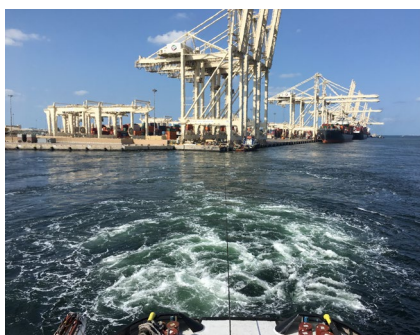
## Bollard Pull Trials

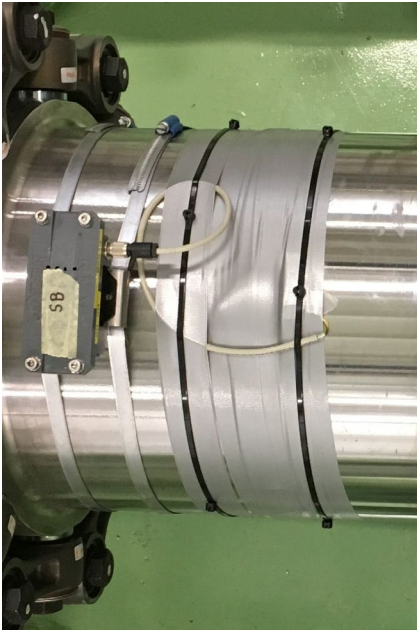
The Performance at Sea department performs measurements, anytime and anywhere around the globe. With the expertise of our specialists, we offer a wide range of services and measurements: onshore, offshore, or on board any type of vessel. Here we outline our Bollard pull expertise and equipment.

### Bollard pull trials

The direct towing performance of a tug is often expressed in tons bollard pull. Bollard pull trials are ideally conducted in deep, unrestricted water in stationary conditions. The line force between tug and bollard ashore is measured using a load cell. In practice environmental conditions and harbour restrictions may be different from optimal. In addition, operational aspects and incorrect use and calibration of load cells result in uncertainties in bollard pull execution and results.

To address these issues MARIN initiated the Bollard Pull Joint Industry Project. Together with thirty leading ship yards, owners and propulsion system providers, an extensive research programme was setup to understand the factors affecting a bollard pull test. This resulted in a deep understanding of vessel performance in bollard pull conditions and the development of the '[International Standard for Bollard Pull Trials](#)' (see also [www.vesseloperatorforum.com/international-standard-for-bollard-pull-trials-download/](http://www.vesseloperatorforum.com/international-standard-for-bollard-pull-trials-download/)). MARIN performs, analyses and reports Bollard Pull trials according to this standard which is set up in collaboration with several class societies (ABS, BV, LR). This results in transparent, repeatable and reliable performance figures.





## Equipment

To conduct the required measurements during bollard pull trials, MARIN Performance at Sea operates the following equipment:

- Load cells calibrated and certified in the range of 5 to 350 ton
- High range wireless data transmission for on-board towing force indication
- GPS at the tug
- High-frequent shaft power measurement system, measuring the shaft torque and RPM on the propeller shafts
- Wind, wave and current sensors when required
- Compact data acquisition system for synchronous logging of all data



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