

# Scour protection in the Durban harbour

## BACKGROUND

At the end of 2011 Subtech was awarded the NEC3 contract for the provision of scour protection to all 15 of the Pier 1 and Pier 2 container terminal berths in the Port of Durban. The provision of the rock scour protection is required to withstand the propeller and bow thruster wash forces that occur during the berthing and un-berthing of ships. The existing scour protection had been eroded and the subsequent depressions in the sea bed were undermining the quay walls.

## OPERATION

The port could not afford to shut down operations on the berths for extended periods of time, so Subtech had to ensure that the

scour protection was placed within a limited berth occupation period, which often saw the company's teams working around the clock. The programme was updated and submitted bi-weekly to the client who was responsible for berth access and occupations.

The tender requirement was for a total water-based operation, allowing Subtech to utilise its diverse arsenal of water-based plant and equipment. The following plant items were used in the execution of this project:

- Subtech's barge JUMBO – used to transport rock from the stockpile area to the placement site, capable of transporting 600 m<sup>3</sup> of scour rock per load
- Subtech's spud-leg barge INKONKONI – used as a stable platform for the long-reach excavator



Stockpile of scour rock at Berth 205

- Subtech's tug REIER – used as a tow vessel for the jumbo barge
- 80-Ton long-reach excavator – used for the trimming and levelling of scour material
- Subtech's multi-beam survey boat ODIN – used to carry out accurate bathymetric surveys pre- and post-rock placement.

The scour protection comprised rocks up to 200 kg placed in a 25 m wide strip along the full length of the berth under construction. A total of 80 000 m<sup>3</sup> of rock was placed in an 800 mm layer to the designed finish level, and the process was carried out in the following sequence:

#### In-survey

Before any placement of scour rock Subtech conducted a multi-beam bathymetric survey of each berth. This survey would reveal the existing levels of the sea bed and dictate how much material would need to be dredged or levelled before placing scour material. The in-survey formed the basis for the calculation of quantities.

#### Trimming

In order to accommodate the 800 mm layer of scour rock, the existing sea bed, where required, had to be trimmed and levelled prior to rock placement. To carry out this trimming operation an 85-ton long-reach excavator, with a full DGPS DIG system, mounted on a spud-leg barge, was used. Via electronic information gained from the bathymetric survey, which was fed into the LRE's DIG system, the excavator barge was positioned over

the high areas, and the spud legs were lowered so that trimming could commence. Silt material would be side-cast for later intervention by the TNPA (Transnet National Port Authority) dredging team. Once the trimming operations were complete a progressive-survey would take place to ensure that the correct levels were attained.

#### Loading and dumping of scour rock

The scour rock was supplied by Transnet for this project and was stockpiled for collection at A-Shed and Berth 205. A special ramp was fabricated to allow front-end loaders to move the material from the stockpile onto the jumbo barge. This operation was mostly tide-dependent, given the fixed position of the ramp against the fluctuating level of the barge. Once the barge had reached its load capacity, one of the front-end loaders would stay on the barge to be transported to the placement site. A dump plot formulated from the surveys would then dictate how much rock to dump per 5 m x 5 m grid, and this was executed with the front-end loader on the barge.

Once the rock placement had been completed the LRE was used to do final levelling, after which an out-survey was conducted to ensure that final levels met the project specifications. If high spots or depressions were evident then Subtech would rectify these until Transnet was in acceptance. The acceptance of the close-out survey would conclude operations on the berth, and the berth would be handed over to the client. This process was repeated for all 15 berths and

# SUBTECH

## GROUP

where experience meets innovation

Subtech is one of South Africa's premier operators in marine construction and support services. We specialise in challenging projects and pride ourselves in our ability to innovate and engineer solutions to the most complex marine problems.

Our engineering and construction teams have collectively been involved in most of the port construction that has taken place in Southern Africa since 1995. Subtech offers a full range of marine construction services, including marine piling support, scour protection, confined dredging and capital dredging support, underwater demolitions, underwater concreting, preparation of caisson beds and caisson placement.

Our assets include tugs and barges, cranes and derricks, specialist lifting and rigging systems, winches and mooring systems, and dredging tools. Please visit our website for detailed spec sheets of all assets.



Specially designed ramp used to load material from the stockpile onto the jumbo barge at Berth 205



Scour rock being loaded onto the jumbo barge at the appropriate tide; the jumbo barge was moored to the berth allowing the ramp to rest on her deck



the project was successfully executed over 18 months with no major incidents.

There was very good interdivisional cooperation between Transnet National Ports Authority, Transnet Capital Projects and Transnet Port Terminals. TNPA's Port Engineer's department was responsible for the design of the scour rock, while Transnet Capital Projects was responsible for the management of the contract. All engineering decisions during the contract were undertaken by the Port Engineer's department, and all day-to-day programming and supplying of the rock to meet Subtech's demands were undertaken by Transnet Capital Projects. Close cooperation from Transnet Port Terminal's DCT management team ensured successful daily occupations and site arrangements when cranes needed to be moved or shipping adjusted.

### ACKNOWLEDGEMENT

Subtech would like to thank Transnet National Ports Authority, Transnet Capital Projects and Transnet Port Terminals for their cooperation in the successful completion of this project.

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A front-end loader busy stockpiling rock on the jumbo barge in preparation of the journey to the desired berth



Once the barge is positioned over the dumping grid using its GPS system the front end loader places scour rock into the allocated dump blocks



The jumbo barge is held in position over the dumping grid using her mooring and winch systems during the dumping operation



Placing the scour rocks into the desired dump blocks off the jumbo barge using a front-end loader