



**Oil & Natural Gas Corporation Limited (ONGC) are in the process of re-developing Mumbai High South field. The well-developed field has an extensive infrastructure of well head platforms, process platforms and pipelines. As part of Mumbai High South Field Redevelopment Phase-III, NauticAWT was engaged to carry out underwater repairs and pile remedial work on a number of platforms.**

**NauticAWT  
Disciplines:**

Pre-Engineering Survey

Design and Detail  
Engineering

Supervision of Onshore  
Fabrication

Supply of Grout Material  
& Grouting Services

Offshore  
Installation/Execution

Project Management



**QUICK FACTS:**

**Client:**  
ONGC

**Main Contractor:**  
SapuraKencana HL  
Sdn Bhd (SKHL)

**Location:**  
Mumbai High South  
Field, Arabian Sea

**Project Completed:**  
May 2017

**Materials:**  
NaX™ Q110 and  
Q140

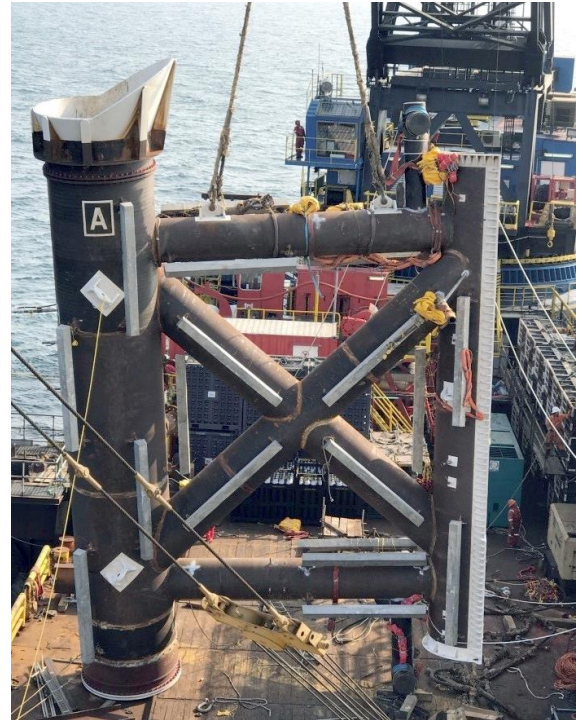
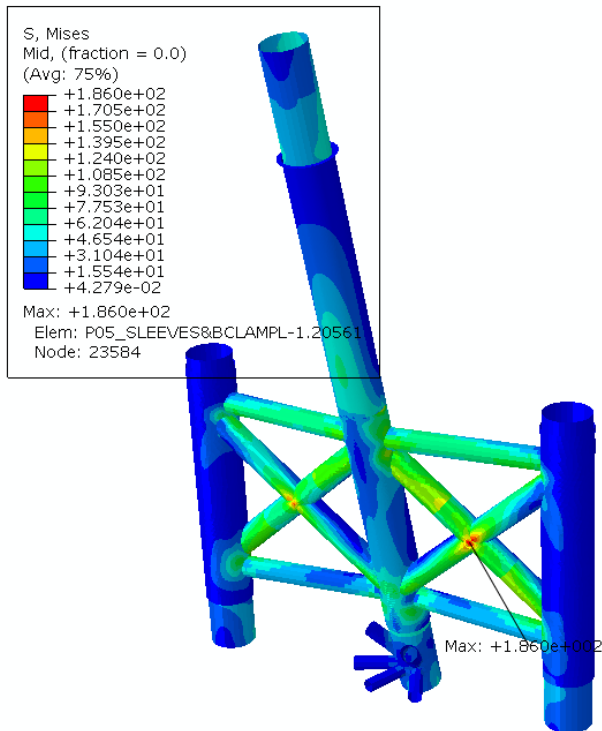
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www.nauticawt.com

**The Scope**

- Pre-engineering survey and inspection supervision, design / engineering, grouting and repair of NU, WI-9 and SJ platforms
- Pre-engineering survey and inspection assistance, detail engineering and grouting of pile-sleeve connection and grouted clamp connection of D1C platform
- Grouting and repair of SCA platform

**The Services**

- **Pre-Engineering Survey:**
  - Pre-Engineering Survey Procedure for NU, SJ, WI-9 and D1C platform
- **Design and Detail Engineering:**
  - Structural strengthening analysis and design for NU, SJ, WI-9 and D1C platform based on field inspection data.
  - Structural design basic, In Place Re-analysis and Finite Element Analysis
  - The D1C clamp was designed to facilitate the installation of two skirt piles for pile remedial works at D1C platform.
  - Fatigue Analysis for strengthened joint A2 leg of D1C platform
- **Grouting Work:**
  - NU Platform:  
The NU platform underwater jacket member strengthening work involved the strengthening of a horizontal bracing member at EL (-) 7.00m. A total of 9 tons of NaX™ Q110 was consumed on this operation.



➤ SJ Platform

The SJ Platform strengthening work included the strengthening of one Member between EL (-) 7.00m and EL (-) 22.00m), one Member between EL (-) 39.00m and EL (-) 57.00m) and strengthening of one Joint at EL (-) 77.695m. A total of 62 tons of NaX™ Q110 was used for this grouting operation.

➤ WI-9 Platform

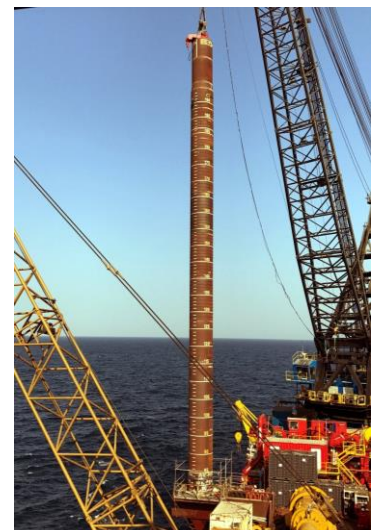
The WI-9 platform strengthening work involved strengthening of two joints between EL(-)78.495m to EL(-)57.00m. A total of 43 tons of NaX™ Q110 was used during this grouting operation.

➤ D1C Platform

The D1C platform strengthening work included the installation of two new skirt piles (84 inches) with pile penetration of 55m. The skirt piles were connected to the leg by grouted clamp connection on the jacket leg at El (-) 87.729m so as to integrate the added skirt piles with the jacket leg. A total of 82 tons of NaX™ Q140 was used for the pile sleeve annulus grouting and the grouting of the leg clamp and inline clamp at D1C platform.

➤ SCA Platform

The scope of this underwater jacket member strengthening operation involved the strengthening of five members and a total of 98 tons of NaX™ Q140 grout material was used for this infill member grouting work.





NauticAWT comprises 200+ personnel and has the global reach of 12 offices across Australasia, the Middle East and Central America, providing a complementary technical and commercial offering unique to the oil and gas industry.

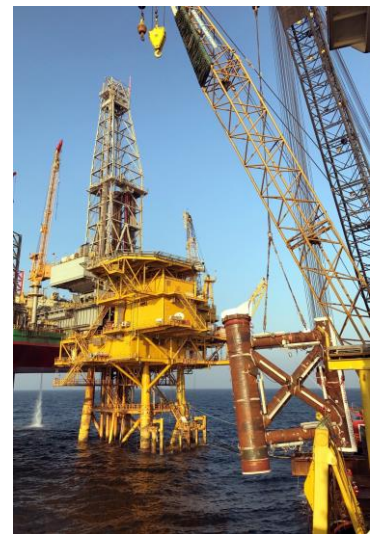
NauticAWT has established a QEHS Management System that conforms to the following standards: ISO 9001:2008, ISO 14001:2004 and OHSAS 18001:2007 on 3rd February 2013. All certificates were issued by DNV, Singapore.

### The Challenges

- During the design stage, it was discovered that the helideck of one platforms topside would obstruct the piling work.
- By providing suitable grouted clamp framing configuration for sufficient transfer of loads to the skirt pile and within the allowable pile installation clearance on site, the underwater skirt pile installation was successfully carried out.

### Client Benefit

- The underwater repair of Jacket brace members & joints was carried out by strengthening the brace members and joints without the removal of existing structural members as per clients' requirement.
- NauticAWT developed a cost effective and safe design solution for the pile remedial work by proposing the concept of installing new piles integrated with grouted clamps, which did not require any underwater welding work.



For more information contact:  
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