

Gas Riser Support System on a Producing Platform

Engineering design, analysis, manufacture, testing and installation of a double-clamp support structure for permanent repair of a producing gas riser on an offshore platform. Rigorous FEA modelling and fatigue analysis were completed to ensure the structural integrity of the riser during the installation process and throughout the operating life. The support system was safely and successfully installed on the live riser, having minimised production downtime to the client.

Client: Undisclosed

Time: 2016 – 2017

Location: UK Continental Shelf

The main gas export riser on a highly-productive platform offshore UKCS suffered corrosion at a critical weld with its nonredundant support structure, resulting in substantial depletion of the riser wall thickness. The location was at 20m below the platform floor and 10m above the mean sea level, in the splash zone with accelerated corrosive environment and high wave and current induced loading. This condition caused a concern over the remaining fatigue life of the riser.

Conventional solutions to the problem involve relocating the riser support structure by welding a new large structure that braces the riser with adjacent jacket members. The welding process would require stopping the platform production for a long period of time, resulting in significant loss of production and revenue to the platform operator.

Neptune Subsea Engineering (NSE) was engaged by the platform operator to undertake first a concept study and then a Front End Engineering Design (FEED) study into an innovative riser support solution. As outcomes of the studies, Neptune developed a twin riser hang-off clamp system. The advanced finite element analysis (FEA) and fatigue analysis verified that the clamp system can mitigate against further fatigue damage and can provide access for inspection to the depleted weld zone. A further and major advantage of the Neptune solution is that it requires no hot work (i.e. welding) to the riser. It enabled installation and commissioning without taking the riser out of service, which presented a major advantage to the client. Upon completion of the FEED, the design was fully reviewed with the technical authority, based on which Neptune was granted the full scope of detailed engineering, offshore survey, manufacturing, testing and offshore installation supervision.

In summer 2017, Neptune's riser support system was safely and successfully installed on the live riser within a period of one week.

Our scope of supply included:

- ✚ Developing a conceptual design to minimise production downtime and meet practical installation requirements of the client
- ✚ Carrying out proof-of-principle tests to demonstrate the feasibility on the design
- ✚ Conducting advanced FE analysis to verify the structural integrity and fatigue capacity of the system under various installation and operation conditions
- ✚ Carrying out offshore surveys to gather dimensional data of the existing riser and its support structure. This data was employed as important inputs to the tolerance analysis to ensure correct installation of the clamp system.
- ✚ Developing a detailed offshore installation procedure to ensure a safe and efficient installation process
- ✚ Developing factory acceptance test (FAT) and system integrity test (SIT) procedures, and conducting the rigorous tests in-house to confirm the system capabilities
- ✚ Working closely with the operator and third-parties throughout the engineering and commissioning stages
- ✚ All aspects of project management, including weekly and bi-weekly progress updates and reporting, to meet the tight delivery period of approximately 6 months from start to finish

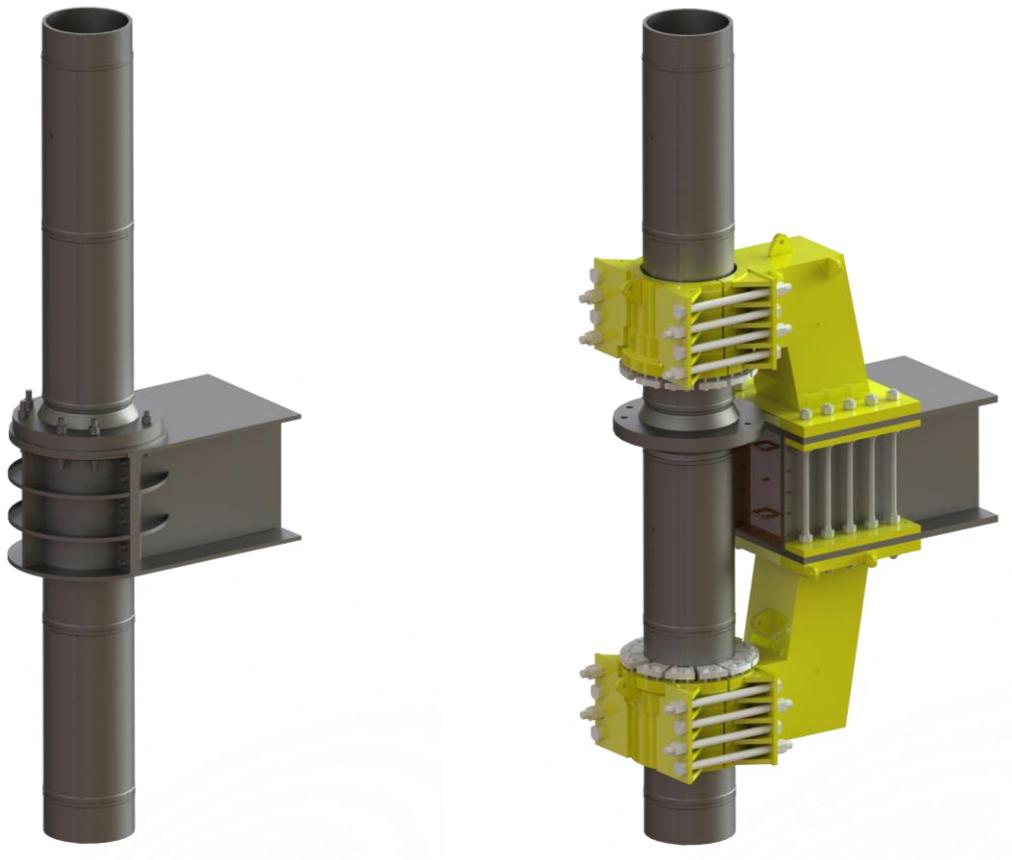


Figure 1: Existing riser support structure (left) partially replaced by Neptune-engineered double-clamp system (right).

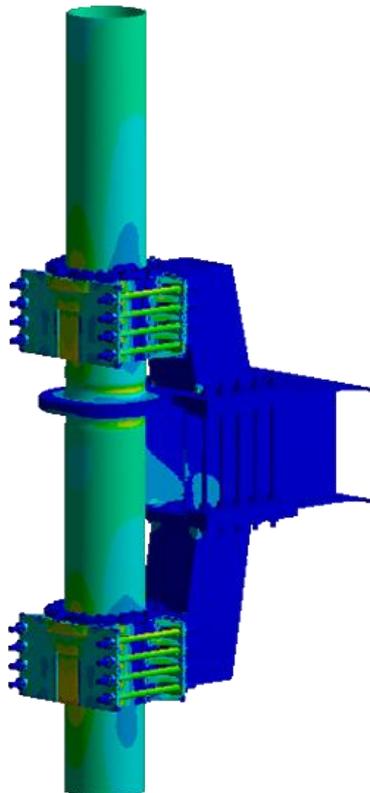


Figure 2: FEA model to predict stresses at fatigue-critical weld locations on the riser.



Figure 3: In-house strength and cyclic testing to validate FEA models.



Figure 4: Neptune-engineered double-clamp system successfully installed onto the producing gas riser.