



Aquainnova

www.eatip.eu

SUBCTEST

Assessing the causes and developing measures to prevent the escape of fish from sea-cage aquaculture

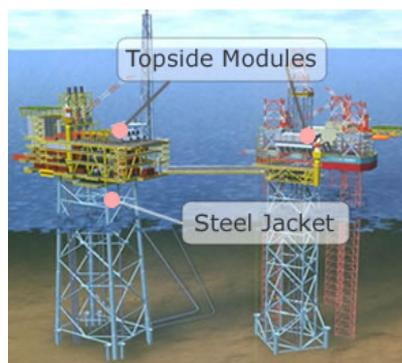
The Challenge

The majority of oil and gas production in European waters takes place from fixed platforms that normally comprise of a steel structure (jacket) permanently anchored (through a series of piles) to the seabed that supports an above sea level topside, composed of different modules for accommodation, power generation, pumping and initial product processing etc. (see Figure 1, North Sea Buzzard offshore platform complex and Figure 2, artists impression of the Shell Shearwater platform support jacket and topsides).



Figure 1. North Sea Buzzard offshore platform complex clearly showing the steel jacket structures supporting the top-side modules. The water depth is about 100 metres.

Figure 2. Artists impression of typical steel jacket support structure. Shell Shearwater platform assembly (with topside modules in place) showing module support frame, legs.



The need for this project arises from the fact that the older offshore installations were designed to earlier, since superseded, technical standards and their conditions have significantly deteriorated during service. Historically much of the inspection and non destructive testing (NDT) has been on the top-side, pressure and structural components and comparatively little sub-sea NDT and inspection has taken place on the vital support jacket structure, many of which have now exceeded their design life.

There is little if any routine NDT carried out on critical sub-sea welds in offshore support structures because current NDT equipment and techniques do not currently lend themselves to be applied sub-sea

EATiP Thematic Area of Relevance

TA1: Product Quality, Consumer Safety and Health

TA2: Technology and Systems

TA3: Managing the Biological Lifecycle

TA4: Sustainable Feed Production

TA5: Integration with the Environment

TA6: Knowledge Management

TA7: Aquatic Animal Health and Welfare

TA8: Socio-Economics and Management

Key Words

NDT technology, NDT systems, Remote Operating Vehicles (ROVs), offshore platforms

Project Information

Contract number:

222174

Contract type:

Research for SME

Research area:

SME – Research for SME

Duration:

24 months (01/09/2008 – 31/10/2010)

Coordinator:

Mr Graham Edwards - TWI Corporate headquarters

Granta Park, Great Abington, Cambridge

CB21 6AL United Kingdom

Tel:

+44 1223 899000

E-mail:

graham.edwards@twi.co.uk

Project website:

<http://www.subctest.com>



below depths of about 25 - 30metres and those cases are exceptional and rely on divers applying visual inspection and electromagnetic techniques for surface weld examination. The operating oil companies, under the encouragement of the regulatory authorities, are committed to reducing diver operations because of safety issues .

This SubCTest project is for the benefit of participating high technology SMEs that want to develop their existing Non Destructive Testing (NDT) and robotic technologies and techniques into new offshore sub-sea inspection applications.

Project Objective

To develop novel prototype robotic manipulators that can be deployed from ROVs for the inspection of sub-sea platform structures (including those in deep water) using developed NDT techniques and systems that can be applied for the examination of critical welds in steel platform support jackets and also detect and evaluate corrosion/erosion in risers and import/export pipelines carrying hydrocarbon products.

Two designs of robotic manipulator will be designed, one for high resolution NDT sensor movement, necessary for detecting small weld flaws with a high level of ruggedness, the other for clamping multiple sensors around a pipe. The manipulators will be light enough to deploy from an observation-class ROV. Among the development topics will be scanner design for combined NDT sensor usage, multi-element sub-sea connectors and compressed data transfer between sensors and surface.

Key Points

The NDT techniques, systems and sensors to be developed for sub-sea ROV deployment via purpose built marine sub-sea robotic manipulators developed in the project include:

- Alternating Current Field Measurement (ACFM) for the surface and near surface examination of critical sub-sea jacket welds on structural tubulars, support legs and node sections.
- Phased Array Automated Ultrasonic Testing (PA - AUT) for the volumetric examination of critical sub-sea jacket welds on structural tubulars, support legs and node sections
- Long Range Ultrasonic Testing (LRUT) using guided ultrasonic waves for the examination of sub-sea flow lines, oil & gas import and export lines, risers and jacket legs for corrosion and pipe girth welds for root cracks and preferential weld corrosion.

The project will also develop:

- Sub-sea data link will be developed for transfer inspection data from the NDT sensor systems via periodic intervention by the ROV
- Prototype scanning manipulators that can inspect the specified agreed configuration(s) using single probe (ACFM and PA-AUT) or multi-probe (LRUT) and incorporating cameras for visual inspection and observing sensor movement

Key New Knowledge Expected

- Improvement in ACFM and PAUT techniques for inspecting welds with complex geometries as are found in jacket nodes
- Possibility to operate sub-sea from small observation class ROVs instead of work-class ROVs.

Potential Impacts



Knowledge Transfer

- The relevant research organisations will train the technical staff of the performing service inspection companies in the project.



SME

- A business plan will detail the most appropriate route for dissemination to benefit the SME participants and will include the publishing of technical papers in appropriate technical and industry journals

- Enhance their NDT technology base by becoming specialist providers of the service to offshore oil and gas operators
- Avoid severe adverse consequences that could include loss of life, environmental pollution, loss of production & revenues and taxes for the EU
- It is anticipated that patents may be generated to protect new knowledge on the development of the sub-sea NDT systems, sensors and techniques and also for the sub-sea marinised robotic manipulators.

Related Publications/Projects

Edwards G.R. 'System for NDT deployment from an observation class ROV – SubCTest', BINDT conference September 2010, Cardiff, UK'.