DANISH ENERGY AUTHORITY

# DEA Supervisory Study of Safety Conditions of Well Control Equipment 2004 - 2005

**March 2006**

## Summary

As an element in the supervision of safety and health for drilling rigs working offshore Denmark[1], the Danish Energy Authority planned and carried out a study related to well control equipment. The study was initiated late in 2004 and finished in 2005.

The objective of the study was to get an overall evaluation of safety conditions related to safety critical elements in well control equipment used for drilling operations offshore Denmark.

Conditions related to Blow Out Prevention systems, internal BOPs, choke manifolds and mud degassers, including certification, testing and maintenance of the equipment were evaluated with reference to Danish regulations and applicable company procedures as well as international standards and recommendations.

For all drilling rigs operating in Denmark at the time of study initiation, the study included review of

- well control equipment certification,
- maintenance programmes,
- maintenance records,
- test records.

The study also included rig visits with inspection of well control equipment as well as audit of related procedures and documentation. For each rig owner company having operating rigs in Denmark (ENSCO Offshore, Maersk Contractors and Noble Drilling), one rig was visited.

The study indicated that all investigated companies and all visited rigs have well functioning procedures and good personnel performance. A few deviations / uncertainties were located during the study. These have now been addressed through change or clarification of company procedures.

## Study Scope

**Companies studied**
ENSCO Drilling, Maersk Contractors, Noble Drilling Limited

**Drilling rigs visited**
ENSCO 101, Mærsk Endeavour, Noble Byron Welliver

**Participants from DEA**
Gert N. Christensen, Mohamed El Halimi, Søren Strange

[1] The project was performed in accordance with section 9 subsection 1 of the Danish Offshore Installations Act (Act no. 292 of 10 June 1981).

**Documentation reviewed**
For all rigs, DEA requested:

- Documents describing the well control equipment used on the rigs incl. specifications from the manufacturers.
- Well Control Equipment Testing Requirements procedure and other documents relevant for the description of equipment testing maintenance and certification.
- Overview regarding tests and maintenance performed the last three months.

At the rig visits, key rig personnel were interviewed and rig based documentation reviewed.

**Study aims**
The study aimed at:

- Verifying that Danish regulations were applied with regard to well control equipment.
- Getting an overview of the procedures and systems used by the rig owners for ensuring reliability of safety critical well control equipment.
- Evaluating the practical efficiency of procedures and systems on the rigs.
- Getting an overview of the safety standard for the well control equipment in use offshore Denmark.

## Method

The project started in October 2004 by collecting relevant information/documents concerning status for Well Control Equipment specification, test, maintenance, requirements etc for each operating drilling rig in Denmark.

The documents were reviewed and supplementary documentation requested where relevant.

Based on the received documents, DEA planned supervisory visits with focus on well control equipment maintenance and test procedures on three rigs, one from each company operating in Denmark.

For the well control equipment in use on the visited rigs, relevant managers and rig personnel (typically OIM, rig engineers, mechanics and electricians, drillers and/or toolpushers) were interviewed regarding the preventive maintenance systems, the testing procedures and the corresponding responsibility distribution on the rigs. Furthermore, selected maintenance and test records and certification documentation were reviewed.

Where the visits on the rigs showed needs for further clarification, the issues raised were answered and commented by the rig owner companies after the visits.

## Study Observations

### Preventive maintenance systems

All investigated rigs use computer based systems for management of preventive maintenance.

The computer systems are supplied and maintained by the rig-owner onshore organisations while rig personnel will be responsible for carrying out the maintenance tasks generated by the systems including recording of performed tasks. The rig personnel are instructed to perform the tasks in accordance with specific company procedures (either paper based or computer based).

Basically, the preventive maintenance systems ensure that any piece of equipment covered by the systems is traceable. The maintenance programme for any piece / type of equipment is based on manufacturer specifications, statutory and classification society requirements, company and rig experience etc. Maintenance performed on any piece of equipment is recorded in the computer system.

When a maintenance job is due, the system will advise the relevant manager / rig department about the job. The responsible person will ensure that the job is performed and recorded as prescribed.

It is general practise to keep a log of all completed jobs and of jobs that have been generated but not yet completed.

Generally, the study indicates that rig personnel know and use the preventive maintenance systems in accordance with the relevant company procedures. The study did not investigate the validity of the maintenance requirements (scope, interval, procedures) that are generated by the maintenance systems.

### Pressure testing

For all companies, there were clear requirements regarding scope of and interval between pressure testing of safety critical elements in the well control equipment. Where operator companies and rig owners had different requirements in their corporate management systems, these differences were resolved in bridging documents.

The study indicates that rig personnel know the requirements and perform the tests in good agreement with company requirements.

### Documentation / certification

Generally, the study indicates that documentation for safety critical well control equipment is in line with regulatory as well as company requirements.

## Conclusion

All rig owner companies have contributed timely, efficiently and convincingly with regard to material, information and services needed by DEA in connection with the study.

DEA verification processes have indicated good agreement between Danish regulation and company procedures / documentation. Furthermore, actual conditions on the rigs have been found to correspond well with company procedures and regulatory requirements.

A few deviations, that were uncovered in the study, have been resolved through changes in the related company procedures. A lack of clarity in the Danish regulations concerning well control equipment certification will be addressed in connection with the up-coming renewal of Danish offshore safety regulations.

# Appendix 1

## Summary information concerning the DEA "Well Control Equipment" evaluation on

## ENSCO 101, 30 November 2004

The objective of the offshore evaluation was to assess the actual conditions of the well control equipment - including related documentation and maintenance procedures - on ENSCO 101. The evaluation was based on Danish regulations as well as on well control equipment and procedures documentation received from ENSCO.

**Rig owner:** ENSCO International

**Operator:** ConocoPhillips Petroleum international Corporation Denmark (CPPIC D)

**From DEA:** Mohamed El Halimi, Gert N. Christensen and Søren Strange.

**Interviewed persons:** OIM, driller, mechanic and cementer

## Deviations observed

Maintenance routine DW 29 for the BOP accumulator: According to ENSCO procedures, this task should be performed weekly. However, the maintenance records show intervals of up to 4 weeks or more between the tasks.

ENSCO comments: ENSCO 101 has special equipment. DW 29 is rather complex and not absolutely relevant for this rig. The ENSCO maintenance systems require that all the steps of a maintenance routine have been carried out prior to signing off the task.

DEA finds that maintenance routines should be suitable for the equipment used on the specific rig. This should be addressed by ENSCO.

## Follow-up

By E-mail 21 December 2004, ENSCO has informed DEA that the matter has been discussed at corporate level in ENSCO and that it has been decided to use rig specific procedures for this task in the future.

This change of procedures corresponds to DEA expectations. DEA regards the matter as closed.

# Appendix 2

## Summary information concerning the DEA "Well Control Equipment" evaluation on

## Mærsk Endeavour, 19 April 2005

The objective of the offshore evaluation was to assess the actual conditions of the well control equipment - including related documentation and maintenance procedures - on Mærsk Endeavour. The evaluation was based on Danish regulations as well as on well control equipment and procedures documentation received from Maersk Contractors.

**Rig owner:** Maersk Contractors

**Operator:** Maersk Oil and Gas AS

**From DEA:** Mohamed El Halimi, Gert N. Christensen and Søren Strange.

**Interviewed persons:** OIM, rig engineer and tool pusher.

## Deviations observed

**BOP certificates:** The certificates for the 13 5/8" BOPs are issued in February 1999 and for the annular preventer in December 1998.

Normally accepted validity for BOP certificates are 5 years. In conditions where a BOP has been out of service within the 5 year period, DEA has experienced that a relevant certification body has been asked for and has accepted a longer validity for the BOP certificate. Maersk Contractors presented a deviation notice where the validity for the certification was extended to October 2005. This notice was an internal document, issued on the assumption that there are no statutory requirements for valid BOP certificate when working in the Danish Sector.

**Limitations for the evaluation:** The scope of the evaluation on board Mærsk Endeavour was limited due to the fact that the basic parameters in the maintenance system (for all rigs in the MC fleet) are generated by Maersk Contractors personnel in Esbjerg.

## Follow-up

In a letter to DEA dated 11 May 2005, Maersk Contractors have - with supporting documentation - explained the company policy (including interpretation of the Danish regulatory requirements) regarding BOP certification. Maersk Contractors have also explained the safety evaluation used for the deviation notice. It is also stated that the BOP on Mærsk Endeavour is planned for change-out early in 2006.

Based on this, DEA found the present conditions for the Mærsk Endeavour BOP acceptable. Matters concerning BOP certification regulations will be addressed in a general regulatory process, in connection with development of regulations for the new Offshore Safety Law.

# Appendix 3

## Summary information concerning the DEA "Well Control Equipment" evaluation on

## Noble Byron Welliver, 25 May 2005

The objective of the offshore evaluation was to assess the actual conditions of the well control equipment - including related documentation and maintenance procedures - on Noble Byron Welliver. The evaluation was based on Danish regulations as well as on well control equipment and procedures documentation received from Noble Drilling.

**Rig owner:** Noble Drilling

**Operator:** Maersk Oil and Gas AS

**From DEA:** Mohamed El Halimi, Gert N. Christensen and Søren Strange.

**Interviewed persons:** Rig Manager, Assistant Rig Manager, Electrician, Mechanic and Driller

## Deviations observed

**Verification of equipment documentation:** Documentation for some DEA selected random pieces of well control equipment (BOP side outlet and choke valves), could not be located at the time of the rig visit.

It was agreed that Noble should investigate these deviations and report to DEA.

## Follow-up

In a letter to DEA dated 26 September 2005, Noble Drilling has forwarded documentation for the equipment in question.

In the letter, Noble Drilling explains that improvements to the preventive maintenance system have been identified and implemented. The improvements ensure that the preventive maintenance system for choke manifold equipment will address itemised components (rather than complete systems).

With the received documentation and the changed procedures, DEA regards the matter as closed.