KONGSBERG MARITIME

Activity Specific Training for Critical Marine Operations

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Contents - Activity Specific Training for Critical Marine Operations

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Introduction

Kongsberg Maritime has been working in close cooperation with Statoil and marine contractors in developing risk reducing measures for critical marine operations performed in the vicinity of offshore facilities.

As part of this work Kongsberg Maritime have reviewed operation and vessel specific details to identify risk potential for the operation.

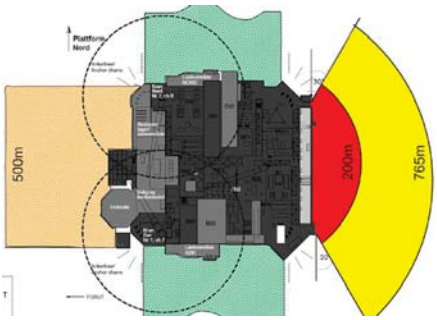
Kongsberg Maritime have together with Lloyd's Register Consulting reviewed historical DP incidents to better understand root causes and their relevance for the specific operations in order to plan the risk reducing measures.

The main objectives with this work have been to mitigate the major risk potential and minimize operating restrictions.

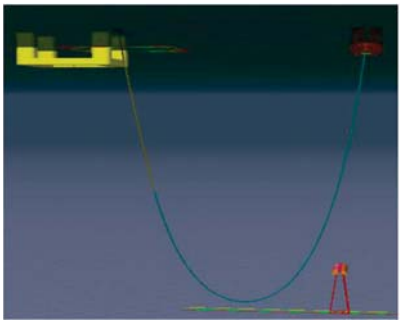
Project Description – Troll C SIMOPRO Example

Replacement of Oil Export, T-test and T-Prod flexible risers inside Troll C exclusion zone using Statoil developed SIMOPRO method

Troll C semisub platform



Troll C Red and Yellow Exclusion Zone



Vessel operating at min 200m distance to platform

Statoil requirement: Vessel operations inside exclusion zone require approved dispensation with risk reducing measures. Vessel operations inside red exclusion zone require shut down of exposed risers.

SIMOPRO method developed where vessel operate outside red exclusion zone to avoid shut down of risers. Increased distance to platform reduce risk of collision and vessel exposure in case of a platform gas leak

Preparations – DP verification study

Planning, Engineering & Risk Assessment

Study Objective:

- Identify DP failure modes that may cause drift-off or drive-off
- Identify activity specific risk reducing measures for the operation

The work included:

Review of previous SIMOPRO operations
- Riser replacement methodology
- DISP requirements
- Risk analysis
- Mitigating measures

The work provided:

- Clarification on DP failure modes
- Identification of main operational risks
- Identification of risk reducing measures
- Recommendations for SIMOPRO operation

Main conclusions:

- Perform black-out risk analysis
- Develop the following mitigating measures
  - ASOG
  - Training
  - Familiarization

Preparations – Specific SIMOPRO Study

Planning, Engineering & Risk Assessment

Operations Study & Analysis

The recommendations from the pre-study was followed up in a detailed study for the specific Troll C SIMOPRO operation

The work included:
- Risk analysis for a vessel black-out scenario
- Review specific vessel DP system set-up
- Establish ASOG for the Troll C operation
- Develop and execute training and familiarization program for the operation

In parallel Kongsberg performed:
- 3rd party review and verifications of analysis
- 3rd party review of procedures and contingency plans
- Dropped object analysis for different riser drop scenarios

Normand Vision mobilized for Troll C operation

Activity Specific Operating Guidelines (ASOG) – Troll C operation

Condition	Green	Advisory		Yellow		Red	
	Status	Status	Action	Status	Action	Status	Action
Position Footprint From set-point	Less than 3m	More than 3m	Contact OOW & SS. Assess weather & check thrusters & ref.systems	More than 4m	Stop operation Inform Captain and OM. Prepare to suspend operations.	More than 6m	Abandon Operation from order by Captain.
DP heading footprint	Less than 3°	More than 3°	Contact OOW & SS. Assess weather & check gyros	More than 6°	Stop operation Inform Captain and OM. Prepare to suspend operations.	More than 10°	Abandon Operation from order by Captain.
IAS System (SEAQ)	2 OS operational	Any failure or loss of performance in IAS system	Contact Electrician	Loss of IAS System on bridge	Stop Operatin Inform ECR and Captain. Inform SS. Prepare to suspend operations.	Loss of IAS system/server	Abandon Operation from order by Captain.
IAS Message	No critical warning or alarms	Critical warning or alarm Ref. ERC ASOG	Contact ECR & inform SS	Alarms critical that might impact vessel position or project Ref. ERC ASOG	Inform Captain and OM. Prepare to suspend operations.	Alarms critical to keep vessel in position	Abandon Operation from order by Captain.
Electrical power supply 24 V to DPC	No warning	Any charger alarm	Contact Electrician & inform SS	Loss of Redundancy	Stop Operation Inform Captain and OM. Prepare to suspend operations.	Loss of 24 V system	Abandon Operation from order by Captain.

Development of Training Program

Planning, Engineering & Risk Assessment → Operations Study & Analysis → **Training** & Familiarizations

Main objective: Familiarize and train the DPOs in the use of the ASOG.
Input: Incident Review, Vessel DP operation manual, check lists, ASOG, interface with marine contractor/ vessel operator

Outcome: Main Learning objectives
- Introduction and use of ASOG
- Class 3 operation
- Incident studies
- Communication
- Repetition of basic DP knowledge
- Thruster and Power failures
- Position reference systems
- Sensors input management
- Transfer of command (DP – Joystick – Manual levers)

- Development of 60 off detailed learning objectives 20% theory and 80% simulator

Execution of 3-day training program

Planning, Engineering & Risk Assessment → Operations Study & Analysis → **Training** & Familiarizations

Day one included:
- Project familiarization
- Classroom activities with exercises and tests
- ASOG review and discussion

Day two included:
- Incident review
- K-Sim familiarization
- Scenario based exercises in the classroom and K-Sim

Day three included:
- Continue training in K-Sim and classroom using different scenarios
- De-brief and evaluation

Assessment of Training Program

Learning (including feedback from Solstad):
- Refreshment on how to operate the DP system including introduction in use of new and improved software
- Training in vessel specific software on Class C simulator and practice on internal communication/ interaction
- Familiarization and testing of the ASOG
- Familiarization and training on activity specific emergency scenarios in K-Sim

Evaluation by Kongsberg Maritime:
- Improved performance seen as a result of the training (DP knowledge and interaction)
- Main learning objectives were achieved
- Not up to date DP knowledge seen from pre-test and course observation
  - DPOs have limited refreshment training after having had their DP education
  - Little experience in handling emergency scenarios due to the low probability

Workshop familiarizations

Planning, Engineering & Risk Assessment → Operations Study & Analysis → Training & **Familiarizations**

Workshops conducted for different ASOG and emergency scenarios

Objective:
- Practice interaction between key personnel
- Assess situation and perform corrective actions
- Perform required actions following ASOG/ procedures

Workshop onboard Normand Vision

Normand Vision Troll C SIMOPRO Riser Replacement Operation

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Case 1: Installation new OER (this case will also cover T-TR and T-PR)
Situation occurs during riser topside end transfer to Troll C, vessel at 200m distance to Troll C, load in PIW, topside end approx 150m below guide tube, ROVs in water monitoring riser configuration. "Drift-off weather condition".

Scenarios:
1. ASOG advisory (heading set point) situation returns back to "Green"
   - ✓ Learning objective: DPO to recognise (Understand) the effect of drifting gyro on the DP system. All: Interaction, assess situation correctly, perform required actions
2. ASOG advisory (reference systems HiPAP failure) situation continue to "Yellow" and Red".
   - ✓ Learning objective: DPO to evaluate the accuracy of remaining PRS and the effect of the lost PRS on positioning. All: Interaction, assess situation correctly, perform required actions
3. Platform emergency – PIW failure (not possible to continue pull in riser)
   - ✓ Learning objective: Interaction with Troll C, understand use of contingency procedure

Troll C Project Execution – THE FULL PICTURE

Planning, Engineering & Risk Assessment → Operations Study & Analysis → Training & Familiarizations → Operation Execution

Project added value to Statoil:
- ❑ **Increased production efficiency by reduced need for shut down of production**
- ❑ **Less risk for major accidents and equipment damage by strengthening of mitigating actions**
- ❑ **Improved human factor by activity specific training**
- ❑ **Cost savings (reduced project execution time and vessel down time) by improved operating criteria**

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