



DYNAMIC POSITIONING CONFERENCE
October 13-14, 2015

TRAINING AND COMPETENCY

DP Emergency Drills

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TRAINING AND COMPETENCE SESSION

DP Emergency Drills

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Introduction

- ✓ Project vessels and drilling units can be 75% or more of their operational time on DP.
- ✓ Many of the key operations and critical tasks of DP vessels/installations are carried while on DP.
- ✓ A loss of position incident is a threat to safe operations and the environment.
- ✓ A loss of position can lead to loss of life, human injury, damage to the environment, damage to property, loss of reputation and lost time.

Introduction

- ✓ Common identified shipboard emergency scenarios:
 - Abandon
 - Fire
 - Collision
 - Flooding
 - Grounding
 - Man over overboard

- ✓ These emergency scenarios are normally provided with safety management procedures and included in a programme of routine drills.

ISM Code

- ✓ Potential shipboard emergency situations should be identified.
- ✓ Procedures to respond to potential shipboard emergencies and a programme of drills to prepare for emergency actions should be implemented.
- ✓ DP operations started in 1961 and in 2013 there were more than 3,000 DP vessels in operation worldwide.
- ✓ ISM Code was introduced in 1993 and became mandatory in 1998.

ISM Code

- ✓ DP emergency procedures and drills or DP operations procedures are still not included in some Safety Management Systems.
- ✓ From 19 vessel and offshore installation operators, working in Brazil:
 - 68% have SMS DP procedures or manuals available.
 - 26% have DP drills formally implemented.
- ✓ Considering a loss of position as a potential threat to safe operations and protection of the environment on a DP vessel:

DP emergency procedures and drills should be part of every Company's Safety Management System that operates DP vessels/offshore installations.

Guidelines and Codes

- ✓ IMCA M117: *Best practices of DP emergency drills are included in Appendix 8.*
- ✓ IMO MSC.1/Circ.738 recommends IMCA M117. MODU Code refer to IMO MSC.1/Circ.738.
- ✓ STCW Code Part B Section B-V/f: *“Consideration should be given to conducting appropriate DP drills as part of on board training and experience”.*
- ✓ DNVGL Standard ST-0023 Competence of DPOs.
- ✓ MTS DP Personnel Guidance for Professional Development (MDAT).

DP Drills Objectives

- ✓ Familiarize the personnel with response to DP failures and emergencies.
- ✓ Improve the knowledge of the personnel on the vessel's DP system faults and failures.
- ✓ Promote technical discussions.

DP Emergencies

DP emergency is a system failure that results in an inability to maintain position or heading control (IMCA M103).

✓ **DP Drift Off** is a loss of position caused by a partial or total loss of thrust leading the DP vessel/installation to drift.

✓ DP Drift Off can be caused by:

- power system failure.
- thruster system failure.
- DP control system failure.
- fuel failure.
- DPO error.

DP Emergencies

✓ **DP Drive Off** is a loss of position caused by an improper and undesired force applied to the DP system or a DP control system instability leading the DP vessel/installation to move on an undesirable direction (yaw, surge and/or sway).

✓ DP Drive Off can be caused by:

- thruster failure (frozen pitch/RPM and/or azimuth).
- reference system failure.
- common failure on two or more reference systems.
- DP control system failure.
- DPO error.
- sudden changes in weather/current.

DP Emergency Procedures and Drills

- ✓ Procedures can be included in the Operator's Safety Management System or in the DP Operations Manual.
- ✓ Procedures should be in line with the vessel/installation operations and take into consideration the operational limitations of the DP vessel/installation.
- ✓ Drills should provide realistic scenarios and be operational specific: drilling, diving, supply, etc.

Method

- ✓ As best practice DP drills should cover not only DP emergencies (loss of position) but DP failures.
- ✓ **For most of the DP incidents, an adequate response to a DP failure can avoid a DP emergency.**
- ✓ The drills can be carried out as table top exercises or realistic simulations.

Method

- ✓ Some types of drills are very important to be always carried out as practical exercises:
 - Blackout recovery drills.
 - Manual ship handling / emergency escape maneuvers.
 - Transfer of control and setup on backup DP control system station.

Method

- ✓ Every DPO in charge of a DP watch should be able to perform an emergency escape maneuver.
- ✓ According to IMCA M182 the DP watchkeeper on an offshore supply vessel should be competent at least to take manual control and move away from the offshore installation.
- ✓ Manual ship handling knowledge is very important as following a loss of position incident it can be necessary that the DPO manually maintain the vessel's station keeping until safe termination of the operations (recover of divers/diving bell, coflexip hose disconnection, etc.).

Method

- ✓ Blackout recovery drills are even more important on vessels not provided with automatic blackout recovery systems.
- ✓ Vessels with automatic blackout recovery systems should also consider manual blackout recovery drills as the automatic blackout recovery system may fail or be unable to actuate due to a system malfunction, design problem, improper maintenance or incorrect setup.

Personnel

- ✓ All DP Key Personnel should participate on the DP drills.
- ✓ IMCA M117 DP Key Personnel:
 - Master/OIM.
 - DPOs.
 - Chief Engineer.
 - Marine Engineers.
 - Electric-Electronic Maintenance Staff
- ✓ The DP key personnel should be prepared to respond to the DP failures and emergencies.

Personnel

- ✓ The drill schedule should make feasible the attendance of both DP crews.
- ✓ DP drills can be exercised individually by bridge and engine room teams, but combined drills are much more beneficial for the DP team.
- ✓ As the response to DP failures and emergencies may also involve project personnel (drilling, diving, ROV, etc), it should be considered the participation of project supervisors or project team on joint drills involving scenarios such as emergency disconnection, abandon diving, etc.

Competence

IMCA M117

- ✓ **Master:** competent to plan, execute and lead DP drills including blackout recovery.
- ✓ **Chief Engineer:** competent to plan, execute and lead blackout recovery drills.

Competence

DNV Standard ST-0023

✓ **DPOs:** integration level (maximum level of cognition) on taking actions in case of DP failure or emergency, including:

- drive off.
- drift off.
- vessel emergencies.
- collision.
- full blackout recovery.
- moving away the vessel to a safe position in a controlled manner.

Competence

MTS MDAT

- ✓ **SDPOs:** maximum level of cognition skilled competence level (maximum level of cognition) on DP drive off and drift off strategy, procedures and drills.
- ✓ **DPOs, Maintenance personnel and Master:** knowledgeable competence level (medium level of cognition) on DP drive off and drift off strategy, procedures and drills.
- ✓ **OIMs and Client representatives:** awareness competence level (basic level of cognition) for DP drive off and drift off procedures and drills.

Annual DP Trials

- ✓ The DP emergency drills should not be understood as a replacement of the Annual DP Trials or vice-versa.
- ✓ Annual DP Trials are a useful training exercise for the vessel staff, but the main objective of the trials is to provide DP assurance on the DP system.
- ✓ All relevant DP key personnel should achieve satisfactory involvement, participation and discussion of an emergency or failure scenario, thus the Annual DP Trials may not replace a DP emergency drill.

Supporting Tools and Documents

- ✓ DP FMEA.
- ✓ DP FMEA Proving Trials, Annual DP Trials and DP Mobilization Trials.
- ✓ DP Procedures and DP Operations Manual.
- ✓ CAMO, ASOG/WSOG.
- ✓ DP Incident Reports.
- ✓ DP Safety Alerts and Technical Bulletins.

Example of DP Emergency Drills Subjects

DP Emergency

✓ **Drive Off and Drift Off:**

- Safe recovery of failed equipment.
- Drive off and drift off response strategy.
- Disabling or stopping a failed/malfunctioning reference, sensor or thruster.
- Emergency escape maneuver and manual ship handling. Escape route or sector.
- Communications during a DP emergency.

Example of DP Emergency Drills Subjects

DP Emergency

✓ Drive off / Drift Off with Drilling/Project Department (Emergency Disconnection, Abandon Dive, etc):

- Review time to terminate operations.
- Team work with project/drilling team.
- Project/drilling operational limitations: riser angle, pipe tension, emergency escape strategy considering the diving bell limitations, etc.

Example of DP Emergency Drills Subjects

DP Emergency

- ✓ **Transfer of control and setup on backup DP control system station :**
 - Transfer of control and setup from main DP to backup DP step by step.
 - If the backup DP is located in the ECR, Engineers should be able at least to perform the transfer of control, setup and monitoring of the DP control system until the arrival of the DPO.

Example of DP Emergency Drills Subjects

DP Emergency

✓ **Vessel emergency during DP operations (fire, flooding or collision):**

- Effects and response to vessel emergencies while the vessel is carrying out DP operations.

Example of DP Emergency Drills Subjects

DP Emergency

✓ **Emergency Escape Maneuver and Manual Ship Handling (DP Joystick, Independent Joystick and Manual Controls):**

- Transfer of control from DP to manual levers or independent joystick step by step.
- Practical manual control of the vessel (DP joystick, manual levers or independent joystick).
- Evaluation of the primary option to carry out the emergency escape maneuver: manual levers, independent joystick or DP Joystick/Auto DP (if available).

Example of DP Emergency Drills Subjects

DP Failure

✓ **Blackout Recovery:**

- Test automatic blackout recovery functionality.
- Exercise manual blackout recovery actions.

✓ **Worst Case Failure:**

- Compare design worst case failure with capability plots: deselecting thrusters or partial blackout as per FMEA WCDF.
- Vessel operational limitation to maintain the redundancy following the worst case failure.

Example of DP Emergency Drills Subjects

DP Failure

✓ **DP Control System Failure:**

- Review DP control system failure modes on the FMEA: loss of references, sensors and DP control equipment, disagreement and instability of references and sensors, etc. Effects, detection and response to failures.
- Common failures on reference systems, etc.

Example of DP Emergency Drills Subjects

DP Failure

✓ **Power System Failure:**

- Review power system failure modes on the FMEA: loss of switchboards, generators, auxiliaries, automation, etc. Effects, detection and response to failures.
- Safe start of equipment on alternative switchboard, etc.

Example of DP Emergency Drills Subjects

DP Failure

✓ Thruster System Failure:

- Review thruster system failure modes on the FMEA: loss of thrusters, command/feedback errors, etc. Effects, detection and response to failures.
- Detection: alarms on DP control, alarms on automation, alarms on thruster control, comparing different thruster feedbacks.

Example of DP Emergency Drills Schedule

Scenario		Crew	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
DP EMERGENCY	Drive Off and Drift Off	A	●											
		B		●										
	Drive off / Drift Off with Drilling/Project Department (Emergency Disconnection, Abandon Dive, etc)	A			●									
		B				●								
	Vessel emergency during DP operations (fire, flooding or collision)	A						●						
		B							●					
	Transfer of control and setup on backup DP control system station	A								●				
		B									●			
	Emergency Escape Maneuver and Manual Ship Handling (DP Joystick, Independent Joystick and Manual Levers)	A										●		
		B											●	

Example of DP Emergency Drills Schedule

Scenario		Crew	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
DP FAILURES	Blackout Recovery	A											•		
		B												•	
	Worst Case Failure	A		•											
		B			•										
	DP Control System Failure	A				•									
		B					•								
	Power System Failure	A								•					
		B									•				
	Thruster System Failure	A											•		
		B												•	

Conclusion

- ✓ On board continuous training is a key factor to improve and maintain DP key personnel competency.
- ✓ DP Drills are also a great opportunity for knowledge sharing between DP key personnel.