

## Serious DP diving incident

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**A member has reported an incident during diving operations when the Dive Support Vessel (DSV) suffered a DP Control System failure and consequent uncontrolled vessel movement.**

Diver 1 and Diver 2 were located within a subsea drilling template, in 90m water depth, carrying out valve operations for barrier testing when a number of DP alarms sounded related to K-Pos RBUS communication (Redundant Communication BUS). The amber alarm was activated by the DPO (this was upgraded to red shortly afterwards) and the instruction was immediately given by the Dive Supervisor for the divers to make their way back to the dive bell staging.

The initial DP alarms were followed by the loss of all analogue and digital RBUS Input / Output (I/O) signals (positioning references and environmental signals) with a subsequent loss of DP control, resulting in a vessel position drift-off. While the divers were attempting to relocate back to the bell staging Diver 2's umbilical snagged on a transponder bucket located on the west face of the drilling template. The vessel continued to drift in an easterly direction and Diver 2's umbilical severed resulting in the diver losing surface supplied gas, hot water and communications. Diver 2 immediately went onto bail out and made his way back onto the template structure roof. Diver 1 successfully located back to the bell staging.

The Chief Engineer, 1st and 2nd Engineers and ETO verified the status of DP controls and thrusters in the instrument room and main propulsion, confirming that the problem was contained in the DP control system rather than the thrusters. The Master and Chief Officer gained control of the vessel in manual control mode of the thrusters and headed the vessel back towards the drill template. The power to DP was recycled and the vessel was able to return to full DP auto mode. The vessel had drifted off a distance of 240 m from the original position at the drilling template.

The vessel located back at the drilling template where upon Diver 2, now unconscious, was recovered by Diver 1. He recovered consciousness shortly after his recovery back to the bell, the bell was locked on and he was able to transfer to the saturation system with assistance from the dive team. The condition of Diver 2 was constantly monitored by the medical team during decompression where his condition was determined as satisfactory. Further examination of Diver 2 was carried out by the medical team following the completion of decompression and bend watch and again his condition was determined as satisfactory.

The incident has been described by all involved as changing our concept of 'worst case scenario' with regard to DP Control System failure. A number of personnel/departments onboard the vessel have been recognised for their unquestionable professionalism, teamwork and calmness under extreme conditions in the rescue/recovery of Diver 2.

## Investigation

The investigation into the incident was conducted in a collaborative approach by the contractor, DP manufacturer/supplier, the Classification Society and also the regulatory authority.

The investigation determined that the RBUS jammed involving faults in one or more RBUS I/O modules in the DPC-3 cabinet (one of 3 cabinets/central processing units containing DP control system hardware). No definitive cause of the jamming was identified. However, a number of hardware faults were found, and the control system did not detect the jamming of the RBUS and take appropriate action.

## What were the causes?

- Loose/intermittent connections of fuse in DPC-3 cabinet.
- Grounding: current was measured in the bond from the RCU units to ground.
- Inner shield on field cables not connected to instrument earth.
- DPC 3 cabinet not earthed to ship hull structure.

The failure resulted in a loss of communication between the DP control computers and the RBUS I/O. The loss of communication made the RBUS I/O modules enter a failsafe condition as per design.

In failsafe condition the electrical thruster command signals were set to a predefined value in accordance with the classification requirements; in this case zero thrust.

The analogue and digital inputs to the DP control computers were also blocked, causing the loss of 'Gyro ready' signals with the consequence of heading and position dropout.

## Preventative Action

A permanent solution has been made available as a RBUS I/O Modules (RMP20X) Firmware Update kit.

The kit consists of a CD and an installation & verification procedure.

## Lessons learnt

Immediately following the incident the member kicked off a number of engagement sessions with their client base, industry associations (IMCA, OGP, DIWG, MSF) and the regulatory authorities to present the incident, the

investigation findings and to discuss the lessons learnt.

The member has instigated an internal project on the Safety Enhancement of Diving and Marine Operations. The objective of this project is to identify where potential improvements could be made to future diving and marine operations both internally but also across in the industry. The project Terms of Reference includes:

- Design of the bell staging to assist the recovery of unconscious diver
- The design of rescue equipment and method of recovery of unconscious diver back to the bell.
- The design and provision of diver transponder/locator beacons.
- The design and provision of thermal protective undersuits.
- The specification of diver bailout bottles.
- The assessment and technology of diver re-breather units.
- Provision of addition life support equipment on the seabed for the dive team.
- ROV interface to aid and assist diver recovery.
- Review of existing dive management system procedures and risk assessment criteria.
- DP control system (software and hardware) design, inspection and verification regime.
- DP field entry trials and set up to enable time for driving the vessel in manual mode.
- Enhancement of the understanding and familiarity of manual systems and operation.
- Bridge Team Management and the management of major emergencies / command and control.
- Fully integrated approach to FMEA/FMECA and the schedule and criteria for FMEA/FMECA review.
- Competency scheme performance criteria, training, drills and exercises.

HSE/OSD Safety Notice 1-2013

The Offshore Division of the UK Health and Safety Executive has published a Safety Notice. This draws attention to the need for a review of DP control system design to determine resilience to single faults (active or passive) resulting in blocking of data communications.

[hse.gov.uk/safetybulletins/dynamic-positioning-](https://www.hse.gov.uk/safetybulletins/dynamic-positioning-)

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