

Failure of proportional valve in saturation chamber control

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There was a failure during saturation diving operations.

What happened?

There were no injuries to personnel nor damage to equipment, but time was lost.

The automatic control system for the hyperbaric chamber detected that there was a proportional valve command/feedback discrepancy and stopped pressure control of the hyperbaric chamber.

The valve malfunction forced an abort of diving operations and lost time.

What went right?

- The PLC detected the discrepancy, isolated the line, alerted the operator in the control room and handed over control to the manual valve.
- The safety system designed to recover from the first failure worked effectively.
- The diving contractor involved, correctly decided to stop the diving activity, alerted the authorities, and started investigation sharing information with the saturation chamber suppliers and the valve manufacturer.
- The valve was correctly selected for the application, and had correct SIL2 certification.



Automatic control system for the hyperbaric chamber detected that there was a proportional valve command/feedback discrepancy and stopped pressure control of the hyperbaric chamber



Investigation found debris in the valve seat, which could have led to more serious problems

What went wrong?

- The valve feedback did not respond correctly, the potentiometer was found defective.
- The diving contractor's personnel had dismantled the valve (although this was prohibited by the manufacturer) in an attempt to solve the problem. It had to be reassembled 180° upside down because the drive shaft was out of alignment with its 'set' zero point. This made it impossible to understand if the potentiometer was damaged by wear of time or by wrong disassembly/assembly.
- Investigation found debris in the valve seat, which could have led to more serious problems (see second image).

Lessons learned

- Manufacturer's recommended maintenance should be followed. If operational experience falls outside this, the OEM should always be consulted with a view

to ensuring manuals are updated and knowledge shared.

- Work with manufacturers and suppliers to ensure there are up-to-date maintenance procedures.
- Follow an equipment supplier's recommendation for critical spares.
- Ensure personnel are properly trained to operate safety critical equipment in all circumstances.

Actions

- Share incident with operators of similar saturation systems equipped with that specific equipment.
- Ensure there is a stock of spares considered critical by the saturation system supplier.
- Amend planned maintenance system to include appropriate testing, maintenance or planned replacement of critical parts.
- The supplier of the saturation system further recommended:
 - Checking pipe cleaning status and filtering throughout the system.
 - Ship all dismantled valves to the manufacturer for further examination.
 - Perform appropriate tests before returning to dive operations.

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