

## **Diver Safety – High Pressure Water Jetting Operations**

### **What happened?**

A saturation diver undertaking High Pressure (HP) Water Jetting Operations sustained a serious injury when the retro diffuser tube became detached from the gun allowing the full force of the retro jet to penetrate the diver's arm.

This accident serves as a reminder of the risks to divers involved with using this type of equipment and in particular those risks posed by the retro jet of underwater jetting guns.

### **What could go wrong?**

HP water jetting equipment has been in use in the offshore petroleum and diving industries for many years and a number of related incidents have occurred. Many of these were caused by the forward lance, however NOPSA is aware of at least two other incidents in which divers operating this type of equipment have sustained injuries from the retro jet.

Whilst there are a number of types and designs of HP water jetting guns for underwater use, they all employ a retro diffuser tube to balance the force of the forward jet. Additionally, some guns utilise a shroud which is positioned over the venturi inlet holes to reduce the likelihood of items being drawn into the venturi water flow.

As this type of equipment requires the retro jet to be necessarily positioned close to the body of the diver operating the gun, the retro diffuser tube is designed to protect the diver from the retro jet and dissipate the energy by allowing surrounding seawater to enter through machined holes in the retro diffuser tube. The retro diffuser tube should be designed such that the exit wash from the tube is no longer of a velocity that can cause harm to the diver or equipment (umbilicals for example).

Underwater HP water jetting guns are subjected to a number of dynamic forces which act on safety critical components including the retro tube. The retro diffuser tube is the only control barrier protecting the diver operating the gun from the retro jet, therefore great care is required to ensure this barrier is appropriately designed, tested and is functioning correctly.

Injuries caused by HP water jets are typically serious with high risk of infection due to injection of debris and other water borne contaminants. This is a particular consideration for divers in saturation who will have to complete lengthy decompression before they have full access to medical intervention.

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### Key Lessons:

Prior to using HP water jetting equipment NOPSA strongly recommends thorough checks are carried out by competent persons to ensure that the associated risks are reduced to a level that is as low as reasonably practicable.

Whilst not a complete list, those considering use of such equipment should ensure that:

- The manufacturer's operating instructions and recommendations are detailed within documentation that is held on site with the equipment;
- The equipment is assembled and used in accordance with the manufacturer's operating instructions and recommendations;
- The design of equipment used is appropriate for the intended use and has been rigorously tested and proven before use;
- All components, including the retro diffuser tube and venturi shroud (if fitted) are correctly assembled and secured in accordance with manufacturer's instructions;
- The equipment is inspected, tested and maintained in accordance with the manufacturer's instructions, supplemented with regular inspections to check for signs of:
  - physical damage and wear; and
  - erosion, especially on the inner wall of retro tube and around the venturi holes. (Grit and other debris resulting from the activity can be entrained into the retro tube via the venturi holes, giving rise to erosion potential).

Operators of facilities are reminded that they have a duty to take all reasonably practicable steps to provide and maintain equipment that is safe and without risk to health.

Diving contractors are similarly reminded that they have the responsibility to take all necessary steps to provide and maintain equipment that reduces risks to the safety and health of divers to as low as reasonably practicable.

### Contact

For further information email [alerts@nopsa.gov.au](mailto:alerts@nopsa.gov.au) and quote Alert 46.