IMCA Safety Flash 19/14

December 2014

1 Injuries due to Failure of Diver's Emergency Gas Cylinder

A member has reported an incident which a valve failed on a diver's emergency cylinder. The incident occurred on board a diving support vessel (DSV) whilst divers were preparing for a dive and were putting on their diving suits. A valve forcefully parted from a high pressure (HP) compressed air cylinder filled to 180 bar. Five divers were injured by the parted valve as it flew off the cylinder.

Investigation is still ongoing but preliminary assessment has confirmed that the inner thread on the HP cylinder was not compatible with the outer thread of the pillar valve. The pillar valve outer thread was an M25x2 parallel thread and the inner thread of the HP cylinder was a 3/4"x14 TPI parallel thread. How the incompatible valve and HP gas cylinders came to be used together, is still being investigated.

Figure: inspection of the inner thread type at a HP gas cylinder

Figure: inspection of the outer thread type at a pillar valve

A pillar valve or cylinder valve is the point at which the cylinder connects to the diving regulator. The purpose of the pillar valve is to control gas flow to and from the cylinder. The neck of the cylinder is internally threaded to fit a cylinder valve. Parallel threads are made to several standards and the most common standards are: M25x2 parallel thread, which is sealed by an O-ring, M18x1.5 parallel thread, which is sealed by an O-ring, 3/4"x14 BSP parallel thread, [5] which has a 55° Whitworth thread form, 3/4"x14 NGS (NPSM) parallel thread, sealed by an O-ring, 3/4"x16 UNF, sealed by an O-ring. These parallel threads are very similar but not compatible, as pitch, pitch diameter and thread forms are different.

The main lesson learnt is that the incompatibility of the valve thread and HP cylinder thread led to a serious incident. Members involved in diving operations should perform an immediate check to confirm the compatibility of the HP gas cylinders and valve threads in use at their operations. They should also clearly mark and register both HP gas cylinders and valves separately, so that compatibility can be verified and assured.

The following actions were recommended:

- Make documented check of all HP gas cylinder threads and pillar valve threads for compatibility;
- Mark the cylinder thread size for all HP cylinders; mark the thread size for all pillar valves, applying a unique identification that will be permanently visible and traceable;
- Develop and implement a working procedure and instructions that include the verification of the compatibility of both the pillar valves and HP gas cylinders;

- Include the HP gas cylinder and pillar valve identification numbers in the six-monthly inspection certificates;
- Include compliance with this working procedure in the IMCA DESIGN audits which validate the six-monthly internal and external inspections of HP gas cylinders.

Members may wish to refer to the following similar incidents (key words: *thread, incorrect, wrong, pillar, and valve*):

- IMCA SF 02/04 – Incident 2. *Near-miss involving bail-out bottle pillar Valve*;
- IMCA SF 12/09 – Incident 1. *Pillar valve failure*;
- IMCA SF 05/10 – Incident 3. *Diver injury during air cylinder recharging*;
- IMCA SF 07/13 – Incident 1. *Near miss: failure of gas quad fitting*.

2 Confined Space Entry Fatality

The International Association of Oil and Gas Producers (IOGP) has published the following safety alert regarding a confined space entry fatality in which one person lost his life and another required medical treatment. The incident occurred when two shipyard workers entered a confined space after welding under argon gas shielding.

The safety alert can be downloaded from: http://safetyzone.iogp.org/SafetyAlerts/alerts/Detail.asp?alert_id=259.

Confined space entry remains a very serious risk for IMCA members' personnel, one that needs to be taken very seriously. IMCA has created a DVD addressing the issue of safety in confined spaces; the DVD can be obtained from IMCA and can be viewed online, please click here.

Members may wish to refer to the following similar incidents (key words: *confined, space, fatality*)

- IMCA SF 06/11 – Incident 2. *Confined space – multiple fatalities;*
- IMCA SF 07/12 – Incident 4. *Confined space entry fatality*.

3 Near Miss: Dropped Object from Cargo

A member has reported a near-miss incident which a crew member was almost struck by a falling object. The near-miss occurred when the crew member was executing a daily sea-fastening inspection. A steel object of approximately 1.8kg fell from a height of 12m onto the deck, landing close to the crew member.

Figure: dropped object

Figure: cargo showing loose debris

Our members' investigation revealed the following:

- The cargo was not sufficiently cleaned or prepared before loading;
- During vessel movement, the loose object moved towards the edge and at a certain moment fell over the edge;
- The immediate causes were identified as follows:
  - insufficient cleaning of the cargo prior to delivery
  - insufficient checking of the cargo prior to loading by the member;

- The root cause was identified to be insufficient awareness of client failure to clean the cargo could result in a hazardous situation.

Our member noted that although the responsibility for delivering the cargo in a safe state lies with the client, it should not be taken for granted that this had been done, and the condition of the cargo should always be checked before loading.

The following actions were taken:

- Immediate inspection of the cargo for other loose items and removal thereof – insofar as the objects could be reached safely;
- Creation of exclusion zones underneath areas which could not be cleaned;
- Circulated this incident report to re-emphasize the hazards of dropped objects;
- Ensured pre-job risk assessments emphasize the possibility of loose objects on the cargo;
- Ensured client awareness of the responsibility to deliver the cargo in safe state.

Members may wish to refer to the following similar incidents (key words: *dropped, cargo*):

- IMCA SF 11/12 – Incident 5. *Able seaman injured by shifting cargo*;
- IMCA SF 11/13 – Incident 3. *Securing of cargo*;
- IMCA SF 01/14 – Incident 2. *High potential dropped object – rigger struck by falling object*;
- IMCA SF 13/14 – Incident 6. *Potential dropped object – poor housekeeping*.

4 Collision and Near Miss Caused by Guard Vessel

A member has reported two incidents, one involving a near miss, the other involving a collision between two vessels, with the common factor between them being the way in which a guard vessel was managed. The incidents occurred during inshore diving operations on a wind farm under construction.

Near Miss – Yacht Nearly Collided with Diving Vessel at Anchor

In the first incident, a private yacht narrowly missed colliding with an anchored vessel involved in inshore wind farm diving operations, with a diver in the water. A sailing yacht was encountered, with no name or home port visible on the hull. The spinnaker sail was fouled, and the crew of the yacht were on deck trying to clear it. The yacht drifted across the 500m zone and barely cleared the port forward anchor buoy.

Our member noted the following:

- The guard vessel lay at anchor and did not respond appropriately to the approaching yacht, only calling the yacht when it entered the 500 metre zone;
- The yacht was called by the guard vessel on channel 16 – there was no response;
- The guard vessel did not call the diving vessel to alert it of the approaching yacht;
- The crew of the yacht were unaware of their surroundings;
- The yacht's rigging was fouled and the crew onboard where trying to regain control;
- Given the relatively low speed of the yacht there should have been plenty of time for the guard vessel to see it, hail it and following lack of radio response from the yacht, move to intercept it, or to alert its crew to the impending danger, by sounding a fog horn or alarm whistle.

Our member suggested that this incident might have been prevented by:

- A better look out from the guard vessel;
- Pre-emptive action from the guard vessel before intruder came into exclusion zone.

Collision between Guard Vessel and Diving Vessel

In the second incident, there was a collision between a guard vessel/anchor handler and a vessel at anchor involved in diving operations on an inshore wind farm. The incident occurred in daylight when the guard vessel/anchor handler was asked to come alongside the vessel at anchor. The guard vessel/anchor handler approached the anchored diving vessel not as requested (from aft) but from forward, barely avoiding the forward anchor wire. The guard vessel/anchor handler collided with the diving

platform, distorting the diving basket, damaging the clump weight wire and possibly damaging the frame itself (which had to be to be checked later and the complete system re-certified).

Our member noted the following:

- The master of the guard vessel/anchor handler was not sufficiently in control of the vessel when manoeuvring;
- The crew of the guard vessel/anchor handler ignored communications and put the guard vessel/anchor handler at great risk, ignoring the expressed wishes of the bridge crew of the anchored vessel;
- The guard vessel/anchor handler was temporarily removed from duty.

Our member reported the further following action recommended by their client, which was to arrange for a replacement master for the guard vessel. This was done and the guard vessel has returned to work with a new master, and the working relationship between the two vessels has been very good.

Members may wish to refer to the following similar incident (key words: *collision*)

- IMCA SF 11/12 – *Collision between vessel and installation resulting in damage to both*.

5 Fatality: Worker Hit by Ship Crane during Lifting Operation

The Workplace Safety and Health Council of Singapore (WSH) has published the following safety bulletin regarding an incident in which a worker was hit and fatally injured by a ship crane during lifting operations. The worker was assisting in a lifting operation to unload cargo from a vessel to the wharf. He was within the slewing zone of the ship crane on the main deck when he was struck by the crane's structure as it moved. The worker was conscious at the time of the accident but he passed away whilst being conveyed to the hospital.

The safety bulletin can be downloaded from here.

Members may wish to review the following similar incidents (key words: slewing):

IMCA SF 07/11 – Incident 4. *Near miss: personnel almost caught between crane house and scaffold* pipe.

6 Fire in Wheelhouse on Offshore Renewables Crew Transfer Vessel

An incident has been reported to IMCA in which there was a small fire in a below-decks space on an offshore wind turbine crew transfer vessel (CTV). The incident occurred whilst the CTV was near a wind turbine tower, with the passengers working as engineers on the turbine tower.

The vessel master smelled burning plastic in the wheelhouse and went to investigate in the space under the wheelhouse, while a crewman opened panels in the back of the console. When the panels in the console were opened, grey/white smoke was seen. Flames were observed coming through the dashboard vent in the wheelhouse. Dry powder fire extinguishers were deployed into the console and below-decks space. The windows in the wheelhouse were closed and there was some smoke, but the fire appeared extinguished and there were no further flames. The local coastguard were called and it was reported that there had been a fire onboard and that assistance was required.

Shortly thereafter, just before the arrival of the lifeboat, smoke was seen from the underdeck hatch and the panel and it was thought that the fire had re-ignited. A CO^2 fire extinguisher was discharged through the access hatch; vessel electrical systems were isolated, and the master and crewman evacuated to the lifeboat. After a wait of about 15 minutes the vessel master and a lifeboat crewman returned to the CTV with a fire extinguisher. No further smoke or flames were observed. The CTV returned to port under its own power, escorted by the lifeboat.

Although there were no injuries, both the vessel master and the crewman inhaled some smoke and powder from the extinguishers they reported feeling "chesty" and had headaches, but no further medical advice was sought. There was some damage to fittings and equipment on the CTV.

Figure: damaged survival suit

Figure: main control cable conduit burned through

Figure: exterior sheath of the main control cable burned through;

Figure: Flexible hoses to the windscreen demisters in the wheelhouse had burn damage

Figure: damage caused by dry powder extinguishers

Figure: charred remains of laminated notices

Figure: main discharge trunking from the heater system was seen to have become disconnected from the heater

Figure: several items had been stored in the underdeck space

An investigation noted the following:

- At the time of the incident, several items had been stored in the underdeck space including a number of solid buoyancy lifejackets, a stretcher in its valise, a chart canister, a vacuum cleaner and three immersion suits in storage bags. One suit and its protective bag suffered burn damage;
- The main control cable conduit had been burned through. The exterior sheath of the main control cable itself had been burned although the internal sheathed strands appeared undamaged;
- Flexible hoses to the windscreen demisters in the wheelhouse had burn damage;
- Signage in the form of laminated paper sheets had been secured in several locations within the underdeck space. Some of these signs were damaged in the fire. Charred remains of such sheets were found in the area;
- The main discharge trunking from the heater system was seen to have become disconnected from the heater. The crew had commented that prior to the incident, the heating in the wheelhouse had been erratic although the console had been warm, occasionally hot;
- Electrical engineers examined the control cable and system but found no faults that would have caused the cable to ignite. Damage to the cable appeared to be mainly external indicating a separate heat source;
- The **root cause** of the fire appeared to have been a detached outlet hose from the electrical heater which allowed hot air to melt and possibly ignite the outer casing on the main control cable. Burning or molten material from this cable then dripped onto the laminated sheet immediately beneath the cable, and possibly the bagged immersion suit underneath. The burning materials would have fallen onto the bagged immersion suit and the flames subsequently burned through the demister conduits immediately above;
- The underdeck storage area and all electrical connectors and circuit boards were heavily coated in powder from the fire extinguishers.

It was noted that the actions of the vessel crew during and after the incident were positive and commendable. Attempts were made to deal with the fire in a safe and practical manner and the relevant authorities were informed although there was some delay in locating the out of hours contact number for the client.

The following recommendations were made:

- Heater connections on other vessels to be checked to ensure all hoses and connections are secure and in good condition;
- Storage of items in the underdeck space to be prohibited pending a review of alternative arrangements;
- Use of laminated sheets in confined spaces and/or near heat sources to be prohibited;
- The use of dry powder extinguishers behind the wheelhouse console, whilst effective, resulted in considerable contamination of electrical systems and components delaying the return to service of the vessel. Ready availability and use of CO^2 extinguishers would obviate this problem;
- Access to the interior of the wheelhouse console and the underdeck area was difficult and a review of firefighting provision for this space should be undertaken;
- Contact details of clients, including out of hours contact, should be readily available in case of emergencies.

Social Media and Information Handling

There were two communications-related aspects of this incident which are of particular interest to members:

- During the incident there was communication by radio and mobile phone between the engineers working on the turbine tower and the vessel crew, which interfered with handling of the incident, particularly during communication with the local coastguard and lifeboat;
- The engineers on the tower took photographs of the incident and some of these were uploaded to social media before the CTV was in port following the incident.

The contractor involved held a review of policies on the use of social media and information handling.

Members may wish to refer to the following similar incidents (key words: *fire, wiring*):

- IMCA SF 09/13 – Incident 4. *Generator Fire Incident*;
- IMCA SF 10/14 – All incidents in this safety flash are fires.