IMCA Safety Flash 09/17

May 2017

Theme: Safety in Diving Operations

In the first incident, a Deadman Anchor (DMA) toppled over, trapping and injuring a diver. In this case, the DMA was top-heavy and unfit for purpose. The second incident, a near miss, involved an air leak on a transfer under pressure (TUP) system, the cause of which was a damaged O ring.

In the third incident, a member highlights the importance of correct identification by divers, of jobs and worksites. The fourth incident addresses the need for care with water jetting. The last, a high potential near miss, involves a gas release from a pipeline under repair by divers.

1 Lost Time Injury (LTI): DMA Toppled Over, Injuring a Diver

What happened? A DMA toppled over, trapping a diver on the seabed and causing an injury to his leg. The incident occurred whilst a diving support vessel (DSV) was working on preparation to install a closing spool. Three DMAs were being deployed to use static and mechanical hold backs attached to the spool. Two DMAs were deployed by the DSV. The third had been previously deployed and wet stored by a 3rd party vessel. The DSV had no involvement in the deployment to the seabed of this third Deadman anchor (DMA3), but upon arriving on site found it to be placed in the correct location and decided to use it rather than deploy the DMA identified on the approved dive plan.

Deadman Anchor (DMA): A clump weight which sits on the seabed and is used as a temporary anchor point for seabed construction activity.

Holdbacks were attached to DMA3 and as Diver 2 took up the slack in the rigging, it toppled over, trapping the diver on the seabed by his left leg. Diver 1 went to his assistance and helped free him.

Both divers made their way safely back to the bell and were recovered to surface. After decompression, diver 2 was flown ashore to hospital and was diagnosed with a fracture of the fibula and a torn ankle ligament. The diver has since made a full recovery and is expected to return to his normal work activities.

DMA as identified in procedures

DMA3 that toppled over

What were the causes?

- DMA3 that toppled over (blue DMA, right hand image) was different in weight and design from the one required in company procedures;
- DMA3 had a very narrow footprint and tall body with a high centre of gravity, making it unstable and unsuitable for rigging under tension and deploying in an upright position;
- The dive plan identified deployment of a 10te DMA (yellow DMA, left hand image). However, the team decided to use the one deployed by the 3rd party vessel;
- Whilst this was convenient, no check was made to ascertain whether or not it was fit for purpose;
- No management of change (MoC) process was initiated, and the risk of this DMA toppling was not identified.

Our member suggested that the following things went wrong:

- Existing procedures and risk assessments for the use of subsea DMAs were too generic;
- There was a 'change' which introduced an increased risk. However, the level of risk presented by the use of DMA3 was not adequately assessed and was perceived as being low;
- DMA3 was procured and sent offshore [by others] for another task. It was identified subsequently that DMA3 was in fact a crane counterweight and was not the most suitable piece of equipment for the task it was being used for;
- The lifting points on DMA3 were located on the top of the weight and it could only be deployed in the vertical position, offering a small footprint and high centre of gravity;
- The rigging arrangement placed the diver in close proximity to DMA3 during attachment, adjustment and detachment;
- There was a level of complacency within the offshore team – the hazards associated with the non-standard DMA3 were not immediately recognised and therefore not considered;
- The **root cause** identified was that the risk management process for the use of DMA3 was not effectively utilised and the work team risk perception on this occasion was poor.

Our member identified the following lessons learnt

There were a number of opportunities to prevent this incident taking place, starting with the onshore engineering team that sourced DMA3, the on-board supervisors who decided to use it and the divers who were working around it. The team were confronted by a change (different DMA design) which they failed to properly recognise and manage. There was a degree of complacency and poor perception of risk among all of the parties involved.

The company has a safe system of work that could have and should have compensated for inadequate equipment and stopped operations before the incident occurred. These systems failed in this instance.

Actions taken

While there are a number of actions specific to DMA operations, a great deal of focus has been put on behaviours and task supervision, captured in a vessel specific improvement plan.

- DMA rigging to be altered to allow divers to be outside of the DMA footprint;
- Appropriate review of company documentation and procedures (to include DMA design specification and diver positioning) and also of the MoC process;
- Information sharing – video footage and details to be shared for training purposes.

Members may wish to refer to the following incidents (search word: *DMA*):

- IMCA SF 11/01 – Incident 2 – *Dead man anchor supplied unfit for purpose;*
- IMCA SF 10/12 – Incident 1 – *Diver injured during subsea lifting operations.*

2 Diving Bell TUP O Ring Seal Damage

What happened

During the locking on of the diving bell to the saturation system on a DSV, difficulty was encountered in closing the locking clamp. After a few attempts, the clamp was successfully closed and the interlock pin inserted proving correct closure of the clamp. During pressurisation of the trunking a leak was detected, the pressurisation stopped, and the clamp opened up for further inspection and fault finding. A damaged O ring was discovered and changed out. The bell was then successfully mated and the divers transferred to the living chambers.

What went wrong?

When the bell was trolleyed back and access platforms raised to access the sealing faces, the O ring seal was found to have been damaged. The O ring had become displaced prior to the bell mating, and a section of the O ring had come out of its groove. When the bell was mated, the O ring prevented the two faces from coming into correct alignment and the clamp would not close fully to allow the interlock to engage. During repeated clamp closures, the O ring was damaged but pushed back into the groove and until the clamp closed fully and the interlock engaged. The subsequent pressurisation procedure proved there was a leak past the O ring and the bell mating was ceased and the leak investigated.

What were the causes of the incident?

The incident was caused by the damage to an O ring which had become misplaced. The O ring seal had not been fully inspected either by sight or touch before the bell lock off and reconnection, and this misplacement had not been identified.

Access to carry out this full inspection was difficult requiring working at height equipment and was only carried out on a scheduled basis and not every bell run.

Lessons learnt and actions taken

- Lesson: Bell mating flanges and seals should be inspected between every bell run to ensure they are in correct location and in good condition;
- Actions taken:
  - a process is now in place requiring the inspection and recording of the bell mating flange faces and seals;
  - access has been improved to carry out this task without the need for specialist work methods and associated personal protective equipment (PPE).

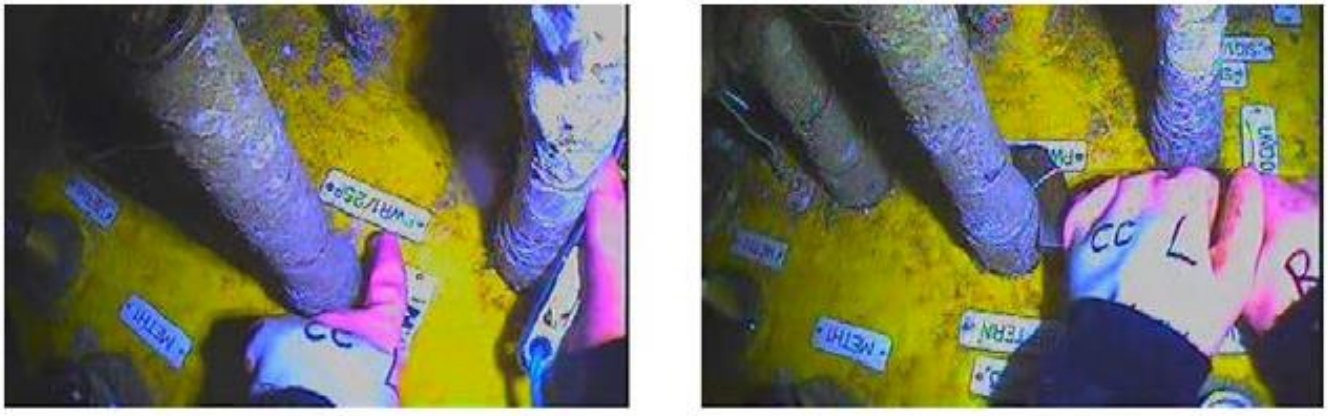
Members may also wish to refer to IMCA SF 10/04 – Incident 1 – *Uncontrolled decompression of diving bell.*

3 Diver's Worksite Identification Errors

A member reports continued worksite identification errors by divers. This is in spite of a significant reduction in such errors following improved engineering procedures and the application of operational good practice. Mistakes are still being made, primarily when returning to the worksite after an initial correct identification.

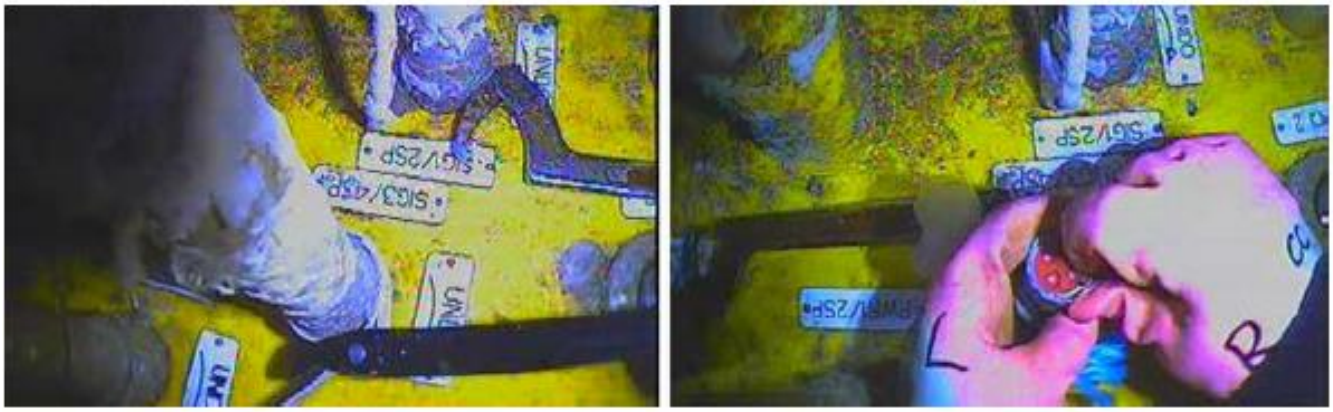
Example 1:

During a recent dive, a Tronic connector was correctly identified by the diver on the panel with its corresponding jumper tail labelled back from the connector. Positive confirmation was provided by the team in Dive Control. There followed an unsuccessful attempt to loosen and remove this connector with a C-spanner.



Initial attempt to remove correct Tronic unsuccessful

In order to provide more leverage, it was decided to try a strap wrench so the diver moved away from the worksite to collect this tool. Crucially, the C-spanner was left on a different but adjacent connector and when the diver returned with the strap wrench he mistook this connector for the one previously identified. The error went un-noticed and the diver removed and cleaned the wrong connector.



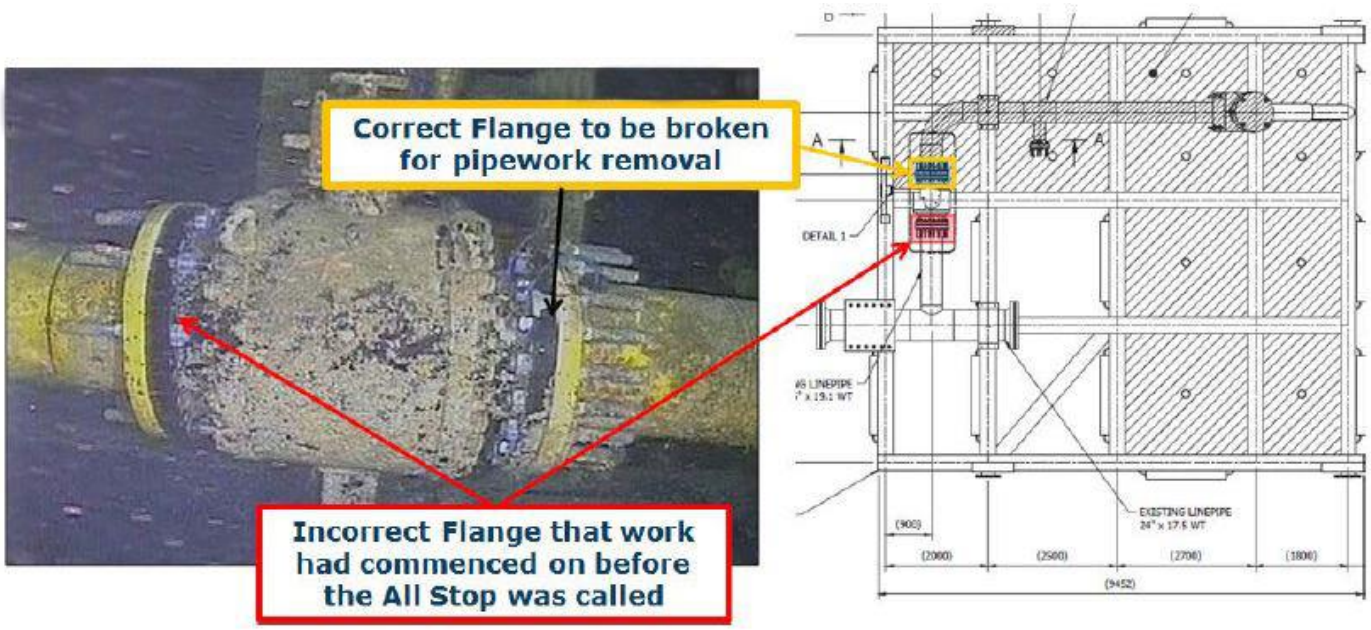
Incorrect Tronic removed and cleaned

The mistake was noticed while preparing to connect the jumper to the wrong port as the colours did not match. The job was immediately stopped and a "Time Out For Safety" held, before retracing the steps and continuing with the correct Tronic connector.

At no time was the diver or equipment at risk as the power was isolated.

Example 2:

Planned operations for removal of a section of pipework from a flange took two dives. The section to be removed was correctly identified during Dive number 1, but after bell turnaround and the meal break, during Dive 2, the incorrect flange was identified and the wrong bolts were removed.



After several bolts had been removed, the Dive Supervisor called an "All Stop", as it was identified that work was being conducted on the wrong flange. A "Time Out for Safety" was called to discuss actions already taken and to agree the further actions needed. At no time were the divers or equipment at risk as the Pipeline End Manifold was shut down.

Our member notes that both of these recent incidents have their own set of contributory factors such as inadequate handover between Dive Supervisors in the second example, but both events featured identical failings which were consistent with previous incidents.

Actions:

- Increase focus/attention in setting up for worksite identification;
- Procedures and task plans should include steps to positively identify and mark the specific item to be worked on;
- Dive Supervisors should ensure the specific item to be worked on is positively identified and appropriately marked for intervention;
- Should the worksite be left, even momentarily, the item to be worked on should be reacquired and again positively identified before work resumes.

Members may wish to refer to the following incidents:

- IMCA SF 23/16 – Incident 3 – *Dropped object fell from crane – poor communication/lack of awareness/control of work:*
  - a job had to be left half-finished but this was not properly communicated or handed over - a causal factor was poor communication, particularly at shift handover;
- IMCA SF 33/16 – Incident 5 – *First aid injury – electric shock:*
  - the injured person mistakenly accessed the wrong transformer cabinet and got an electric shock. A lesson learnt identified was the ***importance of clear labelling and the ability of crew to differentiate between similar sets of co-located equipment***.

4 LTI: Leg Injury Caused During HP Water Jetting

What happened?

During diving operations to clean a riser with a HP water jet type *Cavitek*, a diver cut his leg (thigh) with the water jet.

The incident occurred whilst the diver was not properly secured during the cleaning operation. The diver should always be comfortably and securely positioned during HP water jetting operations. It is especially important to ensure that this is so during mid-water work, otherwise there is a greater likelihood that the diver may lose control of the trajectory of the jet stream during jetting operations. The likelihood of such an event will also be increased if the retro jet and forward jet on the gun is strongly unbalanced.

Our member notes that there was an incorrect calculation of the HP hose length needed for this job. The minimum length of hose required per jetting gun unit is normally considered to be 1.5 times the maximum anticipated working depth. The length of the hose should not impact upon the comfort and security of the diver during HP water jetting operations.

The length of the waterjet lance may not have been appropriate (too short). The inherent potential for accidental self-injury during use of high pressure jetting guns increases as the length of lance (barrel) decreases.

IMCA D 049 – *Code of practice for the use of high pressure jetting equipment by divers* states:

"Hoses should be tied off at convenient locations to assist in minimising movement due to pressure supply changes or tidal/current movement.

Hoses should never be tied off to any part of any diving equipment."

Key Lessons Learned

- Before water jetting operations:
  - ensure proper and dedicated tool box talks are held
  - ensure there us a full assessment of risks and needs at the work area
  - check the required length of hose;
- When cleaning vertical parts of structures in mid-water divers should be rigged to be stable and comfortable for jetting operations;
- Check that the gun is appropriately designed, properly balanced, well-maintained and fit for purpose;
- Ensure the diver holds the gun with two (2) hands;
- Stop/release the trigger before each movement.
- Ensure regular communication from the diver to the dive supervisor about the situation at depth;
- Remind the dive team of the importance of good communications and **consistent observance of safe working** practices.

Water jetting incidents:

- IMCA SF 05/11 – Incident 5 – *Diver safety – high pressure water jetting operations;*
- IMCA SF 03/15 – Incident 2 – *Diver sustains water jetting injury;*
- IMCA SF 12/16 – Incident 2 – *Lost time injury (LTI): serious hand injury during high pressure washing operations;*
- IMCA SF 19/16 – Incident 4 – *Restricted work case (RWC): injury to eye during deck washing.*

5 Near Miss: Gas Release from Subsea Pipeline

A member has reported a near miss incident in which there was an unplanned release of gas from a subsea pipeline, when divers were working nearby. A vessel was engaged in connecting a 32" (81cm) spool to the pipeline with the vessel crane connected to the spool. Divers were in the bell for changeover of shift. Suddenly there was a release of gas near to the vessel. The Master took immediate action and moved the vessel 150m out of the area; the clearing crane wire was slacked off, and at a safe distance when no bubbles were observed in the water, the ROV was launched. The ROV went to the crane hook location, and the crane hook was released safely. ROV and crane wire was recovered without any damage to any property. The divers were unharmed.

Initial investigation records the following:

- An energy isolation permit was in place which was issued by the refinery and platform;
- The refinery failed to inform the vessel about the valve opening and expected gas flow down the pipeline.

Our member noted the following:

- There should be proper communication established between the refinery and the vessel before opening any valves and permitting gas flow down the pipeline;
- The vessel should be ready always to face any H_2S emergency at site;
- Drills for H_2S emergency, general muster, abandon ship and LARS bell recovery should be carried out regularly;
- H_2S detectors and appropriate PPE should be tested periodically.

IMCA notes that the importance of a properly understood and properly communicated Permit to Work process cannot be over-emphasised, particularly in high potential incidents such as this, and where communication between remote sites may be at a premium.

Members may wish to refer to the following incident:

- IMCA SF 01/04 – Incident 2 – *Gas release from pipeline during diving operations.*