IMCA Safety Flash 22/15

December 2015

This final Safety Flash of the year has no theme, although two of these incidents do involve corrosion-related failure of equipment.

1 Near Miss: Corrosion-Related Failure of Bolts Used To Secure Lifeboat Winches

A member has reported a potentially serious near miss on one of their vessels, involving the lifeboat launching system. The incident concerned the failure of a number of bolts used to secure lifeboat winches to the deck. The use of the associated lifeboats either during trial launch or emergency use could well have resulted in a very serious incident.

During a vessel inspection, a severed bolt was observed in the vicinity of a lifeboat winch foundation plate. It was quickly established that the failed bolt was one of eight bolts forming part of the assembly used to secure the lifeboat winch foundation plate to the deck.

There are four lifeboats on board the vessel, each with a similar winch and foundation arrangement. Further investigation of the first winch foundation plate detected an additional four bolts that were severed but still retained within the foundation assembly – in summary, a total of five out of eight bolts had failed. This prompted an inspection of all the winch foundation units on the remaining lifeboats. On a second lifeboat three out of eight bolts were detected as being severed while still being retained in place on the assembly by the paint coating. The remaining two lifeboat winch foundation assemblies were found to have no bolt failures.

Winch foundation plate assembly (with some failed bolts removed).

The condition of the severed bolts.

Our member noted the following:

- There was no mention of inspection or replacement routines in the lifeboat manual supplied by the ship builder. The inspection and replacement actions outlined herein are now considered prudent by our member;
- There was an almost identical failure of bolts identified and reported in a DNV casualty report issued in 2003. In that particular case the winch foundation failed and the lifeboat wires snapped, and a person was seriously injured in the incident.

The following immediate actions were taken:

- A safety flash was issued to all company vessels instructing them to thoroughly examine similar lifeboat foundation plate hold down bolts;
- The vessel on which this incident took place, all foundation hold down bolts on all four lifeboat winch foundations were replaced;
- The severed bolts were taken onshore for metallurgical investigation to determine the root cause of the failure;
- The ship builder and the supplier of the lifeboats were notified of the incident and invited to participate in the investigation.

A metallurgical investigation was performed by an independent, experienced testing company. Their conclusions are summarised thus:

- The bolts failed as a consequence of intergranular corrosion;
- The chromium-manganese alloy from which these bolts were manufactured was not considered a suitable material for bolting in the marine environment;
- The carbon content of the alloy used would make the material highly susceptible to grain boundary sensitisation and consequently to intergranular corrosion.

In short, the bolts supplied and installed (which had been in place for approximately eight years) were not suitable for use and had failed through corrosion.

Our member took the following longer term actions:

- All fleet vessels with similar winch foundation arrangements were to replace the existing bolts with grade 8.8 – Hot Dip Galvanized bolts and nuts as soon as possible;
- All fleet vessels with similar winch foundation arrangements were to ensure that the bolts are replaced every five years with grade 8.8 Hot Dip Galvanized bolts and nuts immediately before the 110% load testing of lifeboats. This will become part of the five-yearly lifeboat routine;
- Maintenance routines were revised to include the above changes;
- The ship builder was asked to investigate their own quality control procedures for nuts and bolts used in critical areas;
- The ship builder was asked to liaise with other ship owners for whom they had supplied similar davit foundation assemblies, to inform them of the situation and to ask them to check the condition of hold down bolts.

2 Catastrophic Failure of a Pipework Clamp Connector

The UK Health and Safety Executive (HSE) has published a safety alert regarding an incident in which there was a catastrophic failure of a pipework clamp connector. The incident occurred on an offshore production platform where a 1" diameter Vector 'Techlok' pipework clamp connector catastrophically failed causing a gas release. The failure was caused by poor heat treatment during the manufacturing process, which led to failure by cracking.

Cracking caused by poor heat treatment during manufacturing process.

The full report can be viewed here.

Members may wish to review the following similar incident (search word: *connector*)

- IMCA SF 06/13 – *Failure of connector on marine riser* [cause identified as stress corrosion cracking caused by hydrogen embrittlement]. Report can be viewed here.

3 Confined Space Entry Incidents – A Reminder

A member has reported a number of confined space incidents during a class renewal docking of a vessel, and has brought these to IMCA's attention as a reminder to raise awareness of the hazards of confined space entry.

These incidents occurred when a vessel was undergoing a class renewal docking. During the docking there were numerous requirements for confined space entry. As a result of procedures and the company safe system of work not being followed, a variety of confined space entry incidents occurred involving third-party subcontractors and included one near miss involving company personnel. Due to the diligence of, and the intervention of, company personnel at the worksite, no-one was injured. None of these cases resulted in harm to personnel.

These brief descriptions are taken from our members' safety database:

- Void space tank lid entry blocked by flammable locker that was welded to the deck preventing safe access/egress;
- Confined space tank cleaning in progress in engine room. No standby person or entrance roster. Entrants were not wearing harnesses as required;
- Standby man identified contractors cutting valves using acetylene without any means of ventilation in a confined space;
- Steel workers in the engine room were undertaking confined space entry work using personal gas detectors supplied by a third party contractor. On examination it was determined that the gas detectors had not been bump tested prior to use. One of the detectors was reading 21.8% for oxygen;
- Confined space entry attendant noted that hot work was taking place in a space without forced ventilation. Reporting person notified the bridge that he was stopping the job and asking contractors to use the required means of ventilation;
- Access to the confined space without informing a standby person;
- Confined space entry attendant observed a fire watch preparing a carbon dioxide fire extinguisher for the enclosed space;

- Electrical cable and oxygen / acetylene hoses approximately 15 cm from halogen light inside a confined space;
- Persons entering into the confined space without Permit to Work. They entered from another tank;
- Whilst performing tank sentry duties, one person was observed attempting to enter a confined space (a wing tank) without a personal gas detector;
- Third party contractor welder attempted to enter tank without wearing a harness;
- Near miss: confined space entry into fuel tank in breach of company integrated safe system of work - after observing smoke coming from open hatch.

Our member notes the following lessons:

- Care should be taken to ensure procedures are being followed and that all crew members remain situationally aware when potential risks are identified in an ever changing work environment;
- All personnel should remain vigilant with contractors on site during dry dockings and maintenance periods;
- In these cases, through the vigilant observations and intervention of the company vessel crew, the hazards were identified and controlled.

Our member notes:

- Bad planning and losing sight of basic safety procedures can cost lives. Work in confined and enclosed spaces has a greater likelihood of causing fatalities, severe injuries and illness than any other type of work on board a ship or marine installation. More people die or are injured in enclosed spaces than through any other related on-board work activity;
- Establishing set drills and procedures for entry into confined spaces, and the rescue from them, may not be enough to bring about the cultural change in everyday work practice that is needed. It has to be second nature for everyone to stop, think and act safely. This means crew members should be properly trained in the risks, and vessel management should be able to demonstrate due diligence and safety leadership when planning and assigning tasks;
- Confined space entry is an ever present danger in the work of marine contractors and if lessons are not learnt, it can be a "silent killer".

Members may wish to review IMCA SEL 032 – *Guidance on safety in shipyards.*

4 Hydraulic Company Sentenced After Employee Loses Sight in One Eye

The UK HSE has published the following incident in which an employee was badly injured when he was struck in the face during a test procedure. The employee suffered a broken jaw multiple facial lacerations and total blindness in the right eye as a result of being struck in the face by a pressurised hose during a test when a connector catastrophically failed. His employer was prosecuted under Section 2(1) of the Health and Safety at Work etc. Act 1974 and was fined.

Investigation found that the test zone was not segregated or safeguarded and that the test equipment was not maintained and suitable for the task. The company failed to assess the risks or provide a safe system of work for pressure testing hydraulic cylinders.

Further information available here.

This may be of interest to members, as all members use hydraulic equipment and equipment under pressure. There have been at least 15 IMCA safety flash incidents published that involve failure of hydraulic hoses or other hydraulic equipment. Members may wish to review the following incidents which relate particularly to stored energy release:

- IMCA SF 18/09 – Incident 1 – *Fatality during pressure test*
- IMCA SF 03/11 – Incident 1 – *Failure of hydraulic fitting at pressure*

5 Near Miss: Contained Hydraulic Oil Spillages from Cranes

A member has reported a number of incidents in which there have been contained hydraulic oil spillages on deck. Three were hydraulic hose failures and the fourth, a hydraulic tank failure. In all four cases there was no pollution and the oil spillages were contained and cleaned up both quickly and effectively by the crew.

Following a spate of external hydraulic hose failures, our member introduced an increase in external hose inspections and proactive hose replacements. These measures appear to have been effective.

The three hydraulic hose failures all occurred on vessel cranes at the point at which the flexible hoses span the pedestal bearing. This is a weak area for flexible hydraulic hoses due to the nature of the working movement of the crane – chafing and stress to the hoses is much more likely in these areas than in other areas. These hoses are often covered by a protective guard.

It is important that whilst conducting your pre-use and planned maintenance inspections that this guard is occasionally moved to ensure a thorough check of the hoses and the ferrules can be made. Although from the outside a hose can look in good condition, it can sometimes deteriorate from the inside out – damage can appear overnight in some cases. This stresses the need to complete pre-use checks of all hydraulics before beginning an operation.

Our member provides a useful guide to checking hydraulic hoses and fittings:

- Fastenings - Inspect all fastenings and fittings for corrosion and correct connection;
- Feel - Wearing dry gloves, run your hand over all the fastenings and hoses, feel for signs of any hydraulic leaks or damage;
- Faults - Visually inspect the hoses for faults or blemishes including any lumps, scars or signs of colour deterioration or internal corrosion;
- Free - Are all hoses free from constraint or abrasion? Do the hoses need to move in operation – are they free to be able to do this?
- Forward planning - How old are the hoses or fastenings? Does the replacement date need to be bought forward? Can any preventative measures be taken to prevent deterioration – installing protective guards or additional fixings or supports?

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

- IMCA SF 05/05 – Incident 2 – *Pollution caused by burst hydraulic hose*
- IMCA SF 16/14 – Incident 5 – *Ruptured hydraulic hoses*

6 Fire Risks Associated With Electrical Storage Batteries

The National Offshore Petroleum Safety and Environmental Management Authority of Australia (NOPSEMA) has published a safety incident involving a fire that occurred in the battery room on a production facility. This incident has highlighted the potential for thermal runaway events, specifically, when there is a short circuit between two or more battery banks of uninterruptible power supply (UPS). This incident was likely caused by leaking electrolyte fluid contacting a conductive metal cabinet frame in the UPS battery room. There were no injuries.

These are lead acid batteries, which are capable of delivering an electric charge at a very high rate and, when charging, can release flammable hydrogen gas, which when combined with oxygen, has the potential to cause an explosion.

More information is available here.