

IMCA Safety Flash 05/04

June 2004

These flashes summarise key safety matters and incidents, allowing wider dissemination of lessons learned from them. The information below has been provided in good faith by members and should be reviewed individually by recipients, who will determine its relevance to their own operations.

The effectiveness of the IMCA safety flash system depends on receiving reports from members in order to pass on information and avoid repeat incidents. Please consider adding the IMCA secretariat (imca@imca-int.com) to your internal distribution list for safety alerts and/or manually submitting information on specific incidents you consider may be relevant. All information will be anonymised or sanitised, as appropriate.

A number of other organisations issue safety flashes and similar documents which may be of interest to IMCA members. Where these are particularly relevant, these may be summarised or highlighted here. Links to known relevant websites are provided at www.imca-int.com/links. Additional links should be submitted to webmaster@imca-int.com

I Remote Pulling Operations – Warning

Keywords: Lifting

A member has reported an incident which occurred while a diving support vessel was conducting subsea operations installing j-tube clamps on a jacket. In this particular case, divers had resumed installing a particular j-tube clamp where the angle of the clamp extension had not been correctly aligned on the original installation. The bracelet clamp had been loosely closed around the jacket tubular member and was being held in place by two winches on the platform. The clamp had to be rotated. The divers had confirmed that the clamp bolts were loose and that the clamp was free to rotate. Tension was being taken up on the outboard winch in 15cm increments and, as a result, the clamp started to rotate towards the correct angle, but then came to a stop.

Instruction was given to come up another 15cm. However, during this last movement, the 5 tonne round-sling between the platform winch wire and the clamp rigging master-link broke.

Following the event, the lifting equipment was inspected. Apart from the round-sling, all of the rigging appeared to be in good condition.

Although the cause of the snagging is not exactly known, it appears that the round-sling had been overloaded. Both winches on the platform could monitor the exact load being pulled, but this has not helped the company in identifying the cause.

The control method used to minimise overloading had been to use small incremental steps, but it seems that this failed to prevent overloading in this case. Such operations are fairly commonplace, thus the event is being reported to warn others intending to conduct remote pulling operations.

The company involved has recommended that if a load comes to a stop and does not move as previously observed when lifting/pulling force is applied, rather than applying further force, the lift/pull should be suspended and the route of the lifting/pulling wire investigated first for any apparent snags. The load being applied should be continuously monitored where such systems are fitted. It has instructed its personnel to include such precautions in task plans and in toolbox talks conducted before such remote pulling/lifting operations commence.

2 Fire in Switchboard Room

Keywords: Welding

A member has provided the following account of a fire which broke out in a carousel 660v switchboard room aboard one of its vessels.

The purpose of the 660v switchboard room was to provide power distribution to the vessel's carousels. As well as having a primary function as the switchboard room, the area had been shelved to provide storage space for consumables and spare parts. Below the switchboard room was an open store containing more stores and machinery. In addition, numerous cable runs for the main propulsion and ancillary gear were routed through this area of the vessel.

A welder had been issued with a hot work permit by the duty engineer in connection hot work to be conducted in the carousel holds. The period of validity of the hot work permit was 12 hours and during this period there was a requirement for the automatic fire detection system in the holds to be disabled.

An engineer entered the hold area to speak to the welder. During their discussion it was noticed that the paint work was starting to bubble and blister towards the switchboard room. The engineer located the nearest dry powder extinguisher and

entered the switchboard room, in the correct manner, to attack the fire. The welder was meanwhile instructed to raise the alarm and to locate another extinguisher.

Following the exhaustion of the fire extinguisher, the engineer left the switchboard room and closed the door to prevent the fire spreading. The welder had been unable to locate another extinguisher or raise the alarm, so the engineer moved to the azimuth room, where he knew more extinguishers were located. On entering the azimuth room, he called the engine control room and advised the chief engineer of the situation. The chief engineer subsequently called the bridge and the alarm was raised manually by the duty deck officer. The alarm was raised, all onboard mustered and the fire parties apprised of the situation.

Although the engineer returned to the source of the fire, he was unable to continue due to the amount of smoke and was forced to abandon the space.

Five minutes later, men from the main fire party entered the space to access the situation. Both were suitably attired in breathing apparatus. During this period, the back party was instructed to close all ventilation to the space and electrical isolation of the area was confirmed.

The bridge party ensured that the nearby platform was informed of the situation and a helicopter was put on standby as a contingency measure. A further four men entered the switchboard room, wearing breathing apparatus, and assisted the first fire party in successfully extinguishing the fire with water.

Forty-five minutes after the initial incident, the chief officer reported the fire to be extinguished. The area remained under observation in the hours following and all fire fighting equipment was checked, replenished and returned to its correct locations.

The engineer who had initially tackled the fire was treated by the medic due to suspected intake of both dry powder from the extinguisher and smoke from the fire.

Although this incident highlighted deficiencies in the systems in place, a number of positives were gained from the response onboard. All fire fighting systems had worked well and the muster was adhered to by all personnel. Communications between the parties were satisfactory and contact with the shore was easily established and available at an early stage in case of escalation of the incident. It was also felt that training provided both onshore and onboard had ensured that the marine crew were able to deal with the situation in a confident and professional manner.

The company involved has noted the following lessons learned:

- 1 A failure in the onboard permit-to-work system was highlighted with the following recommendations made:
 - ◆ The person preparing and issuing the permit (the issuing authority), or a nominated deputy, must satisfy himself/herself that an effective inspection of the worksite has been concluded prior to issue of a permit-to-work;
 - ◆ The vessel master must satisfy himself/herself that the system is being effectively utilised, by periodically auditing the system;
- 2 It has become evident from the fire that, under stress, the crew found it difficult to connect the fire connections. It was therefore recommended that two keys be provided at each fire hose station;
- 3 More powerful torches are to be stationed around the vessel;
- 4 A compatible throat walkie-talkie microphone should be obtained for the person in charge of the fire party.

3 Pipe Stacking Incident

Keywords: Rigging

A member has reported a near-miss which could have been a potentially serious incident, which occurred during the stacking of lengths of pipe. The pipe joints were being off-loaded from the transport vehicle, and were being stacked pending further loading into U-frames for delivery to the pipelay vessel.

The procedure specified a stack with a maximum height of 8 layers of the 10" pipe joints. When placing the seventh layer on a stack, the front end pipe joint in the bottom layer slipped out of the restraining chock, pushing the other chocks ahead of it. This was followed by a slow slippage of the entire base layer, causing the rest of the pipe stack to slump. The slippage of pipes continued until it came to rest against a fork lift truck that was parked in front of the stack.

The area in front of the stack was used as an inspection area, but at the time of the incident no people were in the area and, as a result, nobody was injured and there was only negligible damage.

The method employed for stacking the pipe had been used on several projects without any previously recorded incidents.

The investigation showed that the pipe coating was smooth, not sintered as expected, with little or no friction. This had been noted upon reception of the pipe joints, but not considered a problem. A subsequent sensitivity analysis, conducted as part of the investigation, revealed that the smooth surface more than doubled the forces that the wooden restraining chocks would have to withstand.

The discovery of the smooth pipe coating should have resulted in the initiation of a management of change process, which would have led to further engineering and a new risk assessment for the pipe stacking. This was not done.

As a result of this incident, a new method was employed to secure the bottom layer. Four lengths of pipe were inserted into pipe joints and these were secured with chains and turnbuckles (see photo below).



Original method



New method employed after the incident

The company involved has noted the lessons learned from this incident as including:

- ◆ Always use a management of change process when things are different than expected;
- ◆ Pipe stacks should be located so that work in front of/or behind the stack is avoided;
- ◆ The method of stacking pipe should be evaluated for each type of pipe, taking into account the coating, to determine if securing the stack with wooden chocks is sufficient or other methods have to be adopted.

4 Shore Leave

Keywords: Incidents Ashore

A member has brought to IMCA's attention that two of its offshore personnel were assaulted and seriously injured while their ships were in port and they were on shore leave. Neither of the assaults was brought on by aggressive behaviour by the victims and both incidents happened in European ports, neither of which would normally be associated with being particularly dangerous.

The company has requested each captain to place a warning notice at the top of the vessel's gangway when in any port, reminding personnel that there is an element of risk associated with going ashore where there may be violent behaviour brought on, for example, by excessive alcohol consumption. Its advised notice is as follows:

"[Company] is unable to comment on the general safety of this port and, in particular, of the bars, night clubs, etc. in the surrounding area. We recommend, for your own wellbeing, that you do not go alone and that you avoid unlit alleys, parks, etc. Neither should you get into confrontational situations with aggressive or drunk individuals or groups. Going ashore on non-company business is at your own risk. We would remind you also of the company alcohol policy."

5 Staphylococcal Infection in Deep Water Saturation Dive to 200 Metres

Keywords: *Helmet*

A member has reported the following infection during a deepwater saturation dive. Nine divers were stored at 170 meters (557 feet) in the chambers, and were working at a bottom depth of approximately 200 meters (656 feet).

Staphylococcus infected six members of saturation dive team onboard the vessel and one more during decompression. One of the diver's infection was quite severe and, at one point, affected his gal bladder and/or other organs (the liver or kidneys), due to the antibiotics prescribed.

It is likely that there was an index case from whom others contracted the infection. The index case could have entered the chamber complex with an active staphylococcus infection or developed an infection in the complex. The location of the rash suggests that minor skin damage from the dive helmet or more likely oral-nasal mask and chin-pad provided a suitable location for the development of the infection. The infection spread readily from the index case through the chamber atmosphere, from person to person or via commonly-used equipment or bedding. Why all the divers were not infected is a matter of chance and it is very possible that they would all have been infected, given time.

The member involved has identified the following reasons as to why the infection spread from one diver to another?

- ◆ Nine divers were living in one chamber;
- ◆ There was an insufficient number of chambers to allow isolation and decompression of infected divers;
- ◆ Using Tego 2000 as a hat wash may have caused the skin around their divers' chin and upper lip to become irritated, causing the skin to 'break' and lose its defensive ability to shield against bacteria;
- ◆ The helmets were not rotated out of saturation on a regular basis;
- ◆ Surface support did not fully know the extent of the diver's infection as it was spreading;
- ◆ Humidity levels were high in the nine-man living chamber;
- ◆ There had not been enough KM17C chin pads available for each diver to have his own;
- ◆ At 200 msw divers are easily tired and immunity levels can quickly decrease;
- ◆ Chamber hygiene was difficult to maintain due to nine divers living in the same chamber;
- ◆ Divers' personal hygiene had not been monitored closely enough;
- ◆ Pre-saturation medicals had not been stringent enough;
- ◆ There was high TVC in the potable water system.

6 Near Miss – Internal Bell Door

Keywords: *Door*

A member company has reported a near miss which occurred recently when a fitting failed due to corrosion. This was part of the hydraulic system for the handling of the dive bell's inner door. This caused the bell door to fall shut of its own accord during a dive, narrowly missing the bellman's feet.

The company has noted that the following points raised by this undesired event:

- ◆ all of the pipes and fittings that form part of the bell door handling system should have been made of stainless steel – this particular fitting wasn't;
- ◆ inner bottom doors should have been secured in the open position by a gravity-driven 'automatic' latch. It notes that a manual device, such as a safety chain and clip arrangement, is not appropriate as a primary device, as it requires a deliberate action to operate. This could potentially be forgotten, as has been the case on past occasions.

The company has instructed each of its dive teams to inspect the bell door arrangements on their vessel and confirm to the company's diving manager the configuration of door arrangements. Where any non-conformities are found in relation to the advice given by the company as above, the team should indicate a programme for rectification.

The company has asked that its bulletin be transmitted to relevant personnel on local dive ships, including sub-contracted ships, other relevant offshore worksites and workshop-based technicians, all of whom should be aware of this issue.

7 Underwater Explosions

Keywords: Explosion

We have received reports from members of four separate incidents of underwater explosions occurring when oxy-arc cutting techniques have been in use:

- 1 A diver was making corner holes in the ship's shell plate using ultrathermic cutting rods to mark the area that had to be cut out. The rod did not ignite and the diver was forced to tap a number of times with the rod on the cutting spot. Every time he tapped, an amount of oxygen must have been escaped from the rod and eventually the mixture in the gas pocket reached its lowest explosion level value. When the rod ignited, the heat, together with hydrogen, reached the gas pocket, which was followed by an explosion. The diver was hit by the pressure wave of the explosion and became dizzy/ unconscious for a short period. The standby diver guided the victim out of the wreck. The diver went into the decompression chamber and was then taken to the hospital for observation. He had some chest pain but was able to resume working after three days.
- 2 Salvage divers were cutting an access hole into a tank for lifting slings to be installed. The hole had to be burned from the inside to the outside. Before starting with the cutting, the remaining oil and air pockets were removed by a pump. After checking that there were no visible residues of oil the diver started to cut a hole in the tank. Within approximately five seconds an explosion took place. The standby diver immediately started to retrieve the umbilical and the supervisor kept talking to the injured diver. The injured diver managed to climb the dive ladder himself. When the injured diver was on deck the paramedic examined him and he was then taken to hospital. Both of the diver's eardrums had been perforated and he had a sore throat and nose and chest pain. The diver could not resume his work for 37 days.
- 3 During cutting work in a double bottom on a salvage job while cutting the bottom plating in longitudinal direction, a diver tried to cut a small hole in the tank to avoid gas pockets building up under the tank top. When the cutting rod had initially gone through the tank top plating, the diver had reported some suction into the hole. While he drew the cutting-rod back, an explosion occurred. The diver was able to come to the surface without any problem or assistance of the stand by diver. After the decompression, the diver medic diagnosed a perforation of both eardrums.
- 4 The fourth incident occurred during the cutting of tank wall plating. The intention was to flush the tank for a couple of hours using an air hose before and during the actual cutting. The diver wanted to cut a small hole in the tank wall, just beside a hole made by his predecessor, to connect a thin rope to keep the air hose in place. Before resuming cutting, the diver felt with his hand inside the hole to check for a gas-pocket and everything seemed to be okay. Within a few seconds of starting cutting, he saw a fire inside the tank and an explosion followed. The diver was able to come to the surface without any problem or assistance of the stand by diver and was transferred to a nearby rig for medical treatment. The medic diagnosed perforation of both eardrums.

Oxy-arc cutting involves the use of large quantities of oxygen and generates hydrogen during the process. When the proportion of hydrogen to oxygen reaches a certain level, an explosive mixture is formed, which will ignite when the arc, or a spark, reaches it. Reminders of the following factors known to cause an explosion during oxy-arc cutting have been identified by those involved with these incidents:

- ◆ Gas pockets – gas pockets are formed when the shape of a structure is such that bubbles of gas are trapped on their way to the surface and allowed to accumulate in sufficient quantity;
- ◆ Blow backs – blow backs are spontaneous explosions of varying intensity which appear to be generated at the cutting point. A research project was carried out on the oxy-arc cutting technique at depth. It showed that there is enough hydrogen produced, during the time between making the rod 'hot' and striking the arc, to cause an explosion. During the research an interval of four seconds was shown to be long enough to produce sufficient hydrogen to cause a serious explosion, even in half-used rod;
- ◆ Explosive or flammable substances – depending on the substance involved, various gases or fumes can be released during cutting which can contribute to the mechanism of blow back. For instance: hydrocarbons inside a pipe, paint or bitumastic coatings, and some light alloy materials.

Actions instigated by those involved include specifying the use of hard helmets such as the super-lite for use during operations of this type and cold-cutting-drilling of holes to flush enclosed spaces prior to commencing hot work.

Particular recommendations arising from these incidents have included the following.

It is recommended that detailed risk assessments are carried out before underwater cutting operations commence, specifically when there may be a potential of gas entrapment and/or residual traces of hydrocarbons (such as in double bottom tanks/fuel tanks of vessels). Risk management measures such as diver awareness, for example divers should be familiar with

IMCA D 003 (Oxy-Arc Cutting Operations Underwater), use of cold cutting techniques and flushing void spaces with inert gasses such as nitrogen. The use of Arc Air Rods could also be considered in some cases. Whenever carrying out potentially hazardous operations such as those described in the text, it is imperative that diving supervisors and diving personnel are competent in terms of the skills required by the operation and the identification and management of hazards associated with the operation.