

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](mailto: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](http://www.imca-int.com/links). Additional links should be submitted to [webmaster@imca-int.com](mailto:webmaster@imca-int.com)

## I Container Door Hinges Failure – Container Door Fell on Deck

Keywords: Corrosion

IMCA has received details of an incident highlighting dangers from the lack of maintenance to container doors.

A container was being opened as illustrated in the two photographs below. As the left hand door was opened the top hinge broke, followed by the second and third hinges, and the door fell onto the deck.



Nobody was struck or injured during this incident.

The cause of the incident was found to be lack of lubrication between the vertical rod and the hinges, which should rotate on the rod. They had become corroded and jammed intermittently and had suffered fatigue due to opening and closing of the door resulting in cracking and eventually failure.

The company has noted the following precautionary measures:

- ◆ Container door hinges of this design should be routinely checked every time they come on board for signs of jamming, wear, tear, and lubrication applied accordingly;
- ◆ If lubrication and corrective actions are required on board, particularly to hinges in containers, then a non-conformance report should be submitted so that appropriate preventive measures can be taken.

## 2 Fatality – Pressure Build-Up leading to Sudden Release of Mechanical Plug

Keywords: Pressure

A member has reported the following incident, whereby a mechanical plug installed inside a pipe to isolate hot work from process fluids released suddenly, striking and killing a welder.

Results from the investigation indicate that the direct cause of the incident was blockage of the purge vent line on the back side of the plug due to freezing water vapour in the line. This allowed pressure to build up and eject the plug.

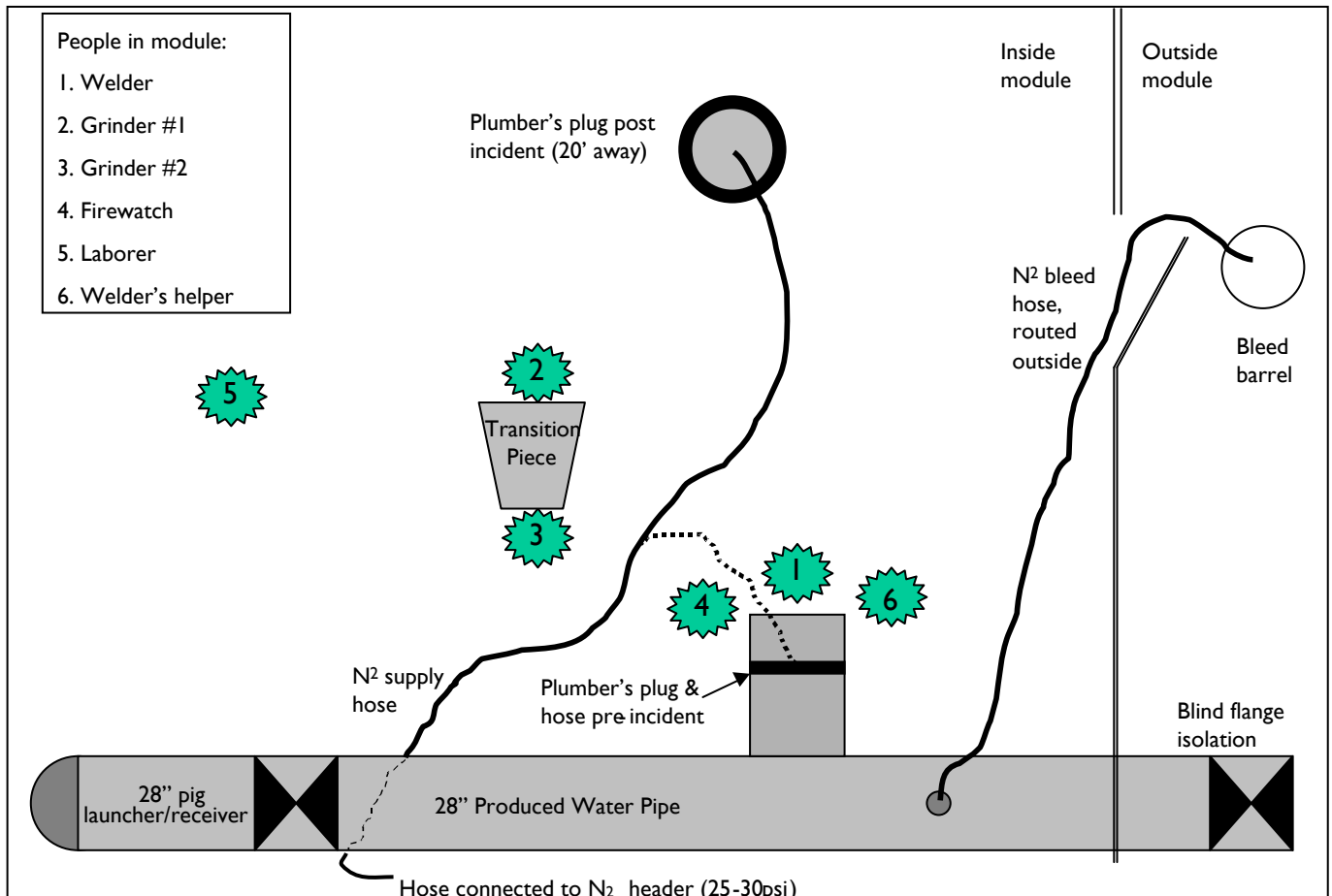
While freezing contributed to the blockage in this incident, it is not the only means by which pressure can build-up. Given the routine use of these types of plugs in production operations, all relevant personnel should be made aware of the events in this incident and a review of isolation plug procedures is encouraged.

The work in this incident involved a welding operation on the open end of a 28-inch produced water line that had residual water and hydrocarbons in it. A non-pressure-containing mechanical plug, known as a 'plumber's plug', had been installed about 12 inches inside the pipe, as a barrier against process fluids and purge gas. About three hours before the incident, a nitrogen purge was established through a fitting in the plug to inert the pipe area behind the plug. The nitrogen came from a nearby supply header operating at 25-30 psig. The purge gas was routed to the plug from the header via a ¾-inch flexible hose. Another ¾-inch hose was connected to the top of the pipe behind the plug and routed outside the module to vent the vapors. The ambient temperature was 0°F at the time of the incident. A hand valve was used to pinch the flow of purge gas from the nitrogen header. There was no pressure gauge, regulator, or secondary relief on the purge to allow pressure to be checked or to prevent pressure build-up. A job safety analysis (JSA) recognized the potential hazard of the purge line freezing. To mitigate the risk, the line was checked periodically for flow by placing a hand at the end of the vent hose. This check subsequently proved to be inadequate. When the vent line froze, the pressure build-up behind the plug caused the 63-pound plug to release suddenly, striking and killing the welder and inflicting minor injuries on two other workers.

The primary lesson learned is recognition of the risk associated with potential pressure build-up behind plugs that are not intended to hold pressure. When purging systems using such plugs, procedures should address the size of inlet and vent hoses, placement of vent hoses, use of regulators to control flow, use of secondary pressure relief to prevent overpressure, positioning of workers away from the plug, and work crew training and hazard awareness. Where possible, the best option is to design tie-ins so that isolation plugs between hot work and hydrocarbons are not needed. In addition to the 'plumber's plug', the company involved is evaluating alternative plug types when isolation is needed. These alternatives include double-sealing hydraulic plugs (Car-Ber type) and pressure rated plugs (Thaxton) that have the potential to be used with or without purging.

The investigation report also identified potential issues with JSA and lesson learned processes at the work site. While the JSA had identified the vent freeze-up hazard, the risk had not been properly mitigated. In addition, the crew doing the work was not directly involved in the JSA. A similar near-miss occurred earlier in the year when a 4-inch plug blew out due to a malfunction of the pressure regulator on the purge gas. Lessons from that event did not get incorporated into existing procedures.

The company is reviewing its JSA and lesson learned processes as described below and has sought examples of best practices and lessons learned from its employees' experiences with use of such plugs for wider sharing.



The company has provided the following summary of actions and lessons learned following the incident:

1 Contractor workgroup formed:

- ◆ Rigorous review by engineering and operations staff of mechanical plugs, including specifications and design criteria;
- ◆ Evaluation of alternative technologies (Car-Ber) to potentially reduce or eliminate the need for nitrogen purges;
- ◆ Revise procedures accordingly.

2 Hazard recognition addressed:

- ◆ Although the importance of monitoring the vent hose was known and noted in the hot work permit, no rigorous monitoring programme was used;
- ◆ Several hazards had not been identified during the JSA/STA process:
  - The N2 would absorb the water left in the 28" pipe;
  - The absorbed water would condense and freeze in the vent hose;
  - Very low pressure would exert large forces on a large diameter plug;
- ◆ A company standard is to be developed for hazard analysis for all work, including routine jobs, on its work permit task hazard checklist, including JSAs, STAs, JHAs, SETA cards, unit work permits, task hazard checklists and authority to proceed.

3 Effectiveness of lessons learned process reviewed:

- ◆ Learnings from an earlier 'near miss' (where a regulator had malfunctioned, leading to increased nitrogen pressure) had not been enough to prevent this incident;
- ◆ Although company procedures were updated periodically, relevant procedures are also to be reviewed whenever a report of lessons learned is issued. The company will use its own network to improve sharing of safety information among its global assets.

4 Purging, cold cutting and welding on process piping procedure updated:

- ◆ First choice to isolate piping so that a plug is not needed;

- ◆ Where a plug is needed, one not requiring the use of interting, such as a Car-Ber plug, is to be selected;
  - ◆ If only a plug requiring an inert purge is needed, a job-specific procedure is to be prepared, addressing:
    - the size and pressure rating of inlet and vent hoses;
    - the placement of vent hoses (inside/outside);
    - the use of low pressure gauges at the inlet of the plug and on the backside of the plug;
    - the use of regulators and pressure relief;
    - the positioning of workers away from mechanical plugs;
    - training and work plans for the crew involved, including assigning a crew member to continuously monitor pressures and inert gas flow rate;
  - ◆ Requirements to be clearly communicated through updated procedures.
- 5 Re-emphasising the importance of being safety-aware at all times, including before and during 'routine' tasks:
- ◆ Think hard about the risks of every task undertaken – even routine tasks!
  - ◆ Don't be complacent about risks, just because you've done a job lots of times
  - ◆ Every welding job is unique – you must stop, think and go!

### 3 Attempted Service to Microwave Results in Fatal Electrocutation

Keyword: Power

An experienced electrician (12 years with the company) opened up a microwave in order to service it, in spite of dire warnings not to do so. A warning label, prominently displayed on the machine, clearly indicated the potential for high voltage as follows:

*“Warning – High voltage and microwave energy. Do not remove any cover. Caution – Always disconnect the mains plug from the wall socket before servicing. The unit contains no user-serviceable parts. Refer servicing to authorised personnel. This unit contains dangerous voltages.”*

He put a tester across the disconnected leads with the power on (several thousand volts). The current went to the ground through his body, via the ice-making machine next to where he was working – burn marks confirm this. The incident resulted in a fatality.

To address this incident, the company has issued the following instruction to its personnel:

*“With immediate effect the on-site repair of domestic equipment which contains high voltage components is strictly prohibited (such equipment includes microwave ovens, television sets, PC monitors, electrical insect killers, etc). These types of equipment should be returned to an authorised vendor for repair.”*

### 4 Cracked Fuel Line Results in an Engine Fire

Keyword: Ignition

We have received a report of the following incident, whereby a vessel's fire detection system indicated fire in the engine room. Engine emergency shut down was initiated and all personnel proceeded to their relevant muster points. The fire alarm sounded and the local crew responded immediately to the fire. During this time, the mechanic had already shut down engine #1 and extinguished the fire, using the fire station's 30kg CO<sub>2</sub> extinguisher. The fire was extinguished without causing further damage.

The subsequent investigation noted a hairline (2mm) crack in the fuel line from the left hand fuel manifold to cylinder #3. The fuel had come into contact with heat from the exhaust manifold, where it had ignited and caused the fire.

It was found that there was had been a lack of inspections and maintenance on this equipment. The investigation also revealed an inadequate design.

To address this problem the company instructed personnel to:

- ◆ Examine the condition of all fuel lines daily;
- ◆ Visually inspect clamp rubbers and general condition;

- ◆ Check torque of connections and fuel line clamps;
- ◆ Install double-coated fuel line on all engines.

## 5 Exposure to CO<sub>2</sub> release from Dry Ice Storage

*Keyword: Gas*

IMCA has learned of the following incident whereby an unexpected hazard arose when stowing refrigerated stores. A vessel was in the process of mobilising for a prolonged spell offshore and had ordered a significant amount of food stores, which arrived in a non-refrigerated truck. Fresh vegetables and fresh milk had been loaded into the fridge, to be stored by a steward.

While storing the milk and vegetables, the steward began to feel unwell. He was relieved by the chief cook, who almost immediately detected a strange atmosphere and felt unwell as well. He left the fridge and was noticed by the first officer to be unsteady on his feet as he was climbing the stairs near the food stowage area. The first officer assisted the chief cook up the stairwell to an office, where the steward was still recovering from what was initially assumed to have been a cold operating environment. The steward received oxygen as a precaution. He was transported to a local medical care facility for further evaluation and released to full duty. The chief cook recovered immediately after leaving the area.

An 'all stop' was called and the area was evacuated. Ventilation and appropriate PPE were utilised to carry out an investigation. During early investigations it was found that the (fridge) area was oxygen deficient. At this time, the type and concentration of gas were undeterminable.

A refrigeration technician was requested and arrived on board later that day. He was able to confirm, with detection equipment, that the gas was carbon dioxide. The CO<sub>2</sub> was found to be emanating from solid CO<sub>2</sub> blocks used to pack the fresh milk. This had not been noticed as the stores had been loaded, but as it evaporated into the atmosphere in and around the stowage area, it had caused a build up of CO<sub>2</sub> which displaced the oxygen content.

All actions taken were analysed by using a job safety analysis process to identify all hazards and the appropriate steps to mitigate each. The two crew members entering the contaminated area used self-contained breathing apparatus (SCBA) and removed all packages of milk and the CO<sub>2</sub> blocks to outside the vessel, where the CO<sub>2</sub> would safely dissipate. The refrigeration unit was then restarted and the area was ventilated overnight to ensure complete discharge of the gas.

Historically, only frozen goods had come with dry ice packing which, in this instance, caused an unidentified hazard to be brought into the confined space stowage area by the galley crew.

The company involved has noted the following lessons learned:

- ◆ Confined or enclosed spaces may present hazards such as oxygen-deficient or enriched atmospheres, flammable atmospheres, toxics atmospheres, or a combination of these;
- ◆ When working in confined areas, it is extremely important that personnel maintain awareness of their environment and the problems that result when foreign substances are released into the atmosphere. In this case it was dry ice that caused the problem.
- ◆ Through the actions of the crew in evacuating, ventilating, conducting atmospheric testing, completing a JSA and using SCBA to remove the dry ice before re-entering the enclosed environment, a more serious scenario was avoided.

## 6 Lifeboat Davit Sheave Incident

*Keywords: Lifeboat*

A member has reported an incident involving a lifeboat davit sheave that occurred during routine planned maintenance.

On completion of tests, run according to the company's standard procedures, personnel had re-boarded the vessel using the lifeboat embarkation ladder and the operation to recover the lifeboat to deck was commenced. The boat reached approximately 1 metre above the deck when a loud noise was heard. The operation was stopped immediately.

Close inspection revealed that one of the davit sheaves had disintegrated around its perimeter (circumference) and that this, in turn, had caused the falls wire to jump clear of the sheave and become trapped between the sheave face and sheave bracket on the davit structure (see figure).

