

INCIDENT SHARING – FIRE AND EXPLOSION CASES

Case 1: Two workers killed by jet fire during purging operation

During a shutdown maintenance, two operators were tasked to purge a flammable gas pipeline by connecting a nitrogen hose. However, the pressure of the flammable gas in the pipeline was too high, rupturing the hose shortly after connection. The sudden release of pressurised flammable gases resulted in a jet fire. Both operators were unable to escape in time, sustaining burn injuries which subsequently lead to their deaths. Investigations revealed that the pipeline was not cleared of flammable gases before purging.



Ruptured
hose

Scene of the incident.

Recommendations

Before carrying out purging, workers should:

- Ask to know the contents in the pipelines;
- Ensure that you have been briefed about the work methods and risks involved with the job;
- Ensure that you are aware of emergency procedures, including firefighting provisions and safe escape routes;
- Confirm that the flammable gas pipeline is fully depressurised (e.g. by checking local pressure gauge or checking with the panelman/boardman in the control room). Stop and report if any of the gauges show a pressure reading;
- Ask your supervisor if:
 - A non-return valve is required to be installed, to prevent backflow from the flammable gas pipeline into the purging gas system (e.g. nitrogen).
 - Fixed piping for purging operations could be used instead of flexible hoses, where possible.
- If flexible hoses are used, check that the hoses have been regularly inspected and in a good condition. If possible, choose a reinforced hose for the purging operation; and
- Properly secure the hose and attach a whip arrestor where available.

Case 2: Flash fire injures four workers

Four workers were troubleshooting a pipeline blockage when they proceeded to open a drain valve. A solid substance suddenly fell out from the valve, followed by flammable liquid and subsequently, a flash fire occurred. All four workers suffered burn injuries as a result.



Scene of the accident.

Recommendations

Before opening a drain valve, workers should:

- Make sure you have been trained for the work;
- Confirm with your supervisor that the pipeline has been isolated and purged;
- Obtain and follow the safe work procedures, even for non-routine activities;
- Identify whether the pipeline contains residual content. Understand the hazardous properties of the residual content (if any), and conduct a risk assessment;
- Put on personal protective equipment for the task (e.g. safety helmet, safety goggles, face shield, fire retardant clothing, gloves, personal gas detector and safety shoes);
- Familiarise yourself with the emergency procedures, including firefighting procedure, spill clean-up procedure and escape route(s); and
- Stop work whenever you think it is unsafe and report to your supervisor.

Case 3: Flash fire during transfer of flammable liquid

A worker was using a flexible metallic hose to transfer flammable liquid into a plastic Intermediate Bulk Container (IBC), when a flash fire broke out at the top. The fire spread to the floor and subsequently into the drains, causing large drain fires around the workplace.

Electrostatic discharge, or the release of static electricity buildup, is believed to have ignited the flammable vapours which had accumulated at the top of the IBC during the liquid transfer process.

Further investigations revealed that the plastic IBC used by the company was not suitable for handling flammable liquids as it could not dissipate the electrostatic charges generated during the liquid transfer process.



Aerial view of the damage caused by the fire.



Flash fire at the top of the IBC

Scene of the incident.

Recommendations

For transfer of flammable liquid, it is important to:

- Confirm with your supervisor that a suitable container (for example metal IBC) will be used for transferring the flammable liquid before you proceed with the work;
- Use only conductive hoses for transferring flammable liquids;
- Ground and bond all conductive components, the source container as well as the hose before transferring the flammable liquid;
- Ensure that firefighting equipment are readily available around the vicinity where flammable liquid transfers are being carried out;
- Ensure that warning labels on the IBC, such as GHS labels, are clearly visible. Report any missing, damaged, or difficult-to-read labels; and
- Be trained on spill clean-up procedures and clean up any spill immediately.

Case 4: Flash fire while cleaning an intermediate bulk container (IBC)

A worker was cleaning an IBC using flammable solvent and a high-pressure water spray when a flash fire occurred, causing burn injuries on the worker.



Cleaning the inside of an IBC using a water gun.

Recommendations

In general, when working with an IBC and a flammable substance, you should:

- Be familiar with the hazards posed by the flammable substance;
- Be aware that plastic IBCs cannot dissipate the electrostatic charges that may be generated and thus should eliminate the use of the flammable substance where possible e.g., by replacing it with a non-flammable substance;
- Work in an area away from heat and ignition sources;
- Work in well-ventilated area or under a local exhaust ventilation system that can remove flammable vapours effectively;
- Equip yourself with a personal flammable gas detector;
- Wear suitable personal protection equipment such as a face shield, fire-retardant coveralls, respirator, gloves, and safety boots, to protect yourself against fire and contact with the flammable substance; and
- Be familiar with the emergency procedures, including firefighting procedure, and escape routes.

This write-up is part of a series of incident sharing for workers brought to you by the Workplace Safety and Health Council and the Ministry of Manpower.