Training Package
TP 19/16

Recent (2015) Incidents in the Gases Industry in Asia

AIGA *Asia Industrial Gases Association*

3 HarbourFront Place #09-04 HarbourFront Tower 2
Singapore 099254 Internet: http://www.asiaiga.org

Recent (2015) Incidents in the Gases Industry in Asia

Disclaimer

All publications of AIGA or bearing AIGA's name contain information, including Codes of Practice, safety procedures and other technical information that were obtained from sources believed by AIGA to be reliable and/ or based on technical information and experience currently available from members of AIGA and others at the date of the publication. As such, we do not make any representation or warranty nor accept any liability as to the accuracy, completeness or correctness of the information contained in these publications.

While AIGA recommends that its members refer to or use its publications, such reference to or use thereof by its members or third parties is purely voluntary and not binding.

AIGA or its members make no guarantee of the results and assume no liability or responsibility in connection with the reference to or use of information or suggestions contained in AIGA's publications.

AIGA has no control whatsoever as regards, performance or non performance, misinterpretation, proper or improper use of any information or suggestions contained in AIGA's publications by any person or entity (including AIGA members) and AIGA expressly disclaims any liability in connection thereto.

AIGA's publications are subject to periodic review and users are cautioned to obtain the latest edition.

Introduction

At the regular Safety Advisory Group (SAG) meetings, members exchange information on accidents/incidents that have occurred . Accident/Incident details discussed at the SAG remain confidential.

The SAG has decided to share the more notable accidents/incidents on a regular basis with the national associations and member companies via the Training Package publications.

These slides contain the summaries, pictures and other relevant information to highlight the root causes and lessons to be learned.

Further Information:

These Training Packages are posted only on the Members Page and are meant for distribution among Members only.

While the best effort is made to provide sufficient information on the accidents/incidents, please contact the SAG (through the Secretary General) if you need further clarifications.

Case 1
Product Vehicle Accident with helper Lost Time injury

What happened:

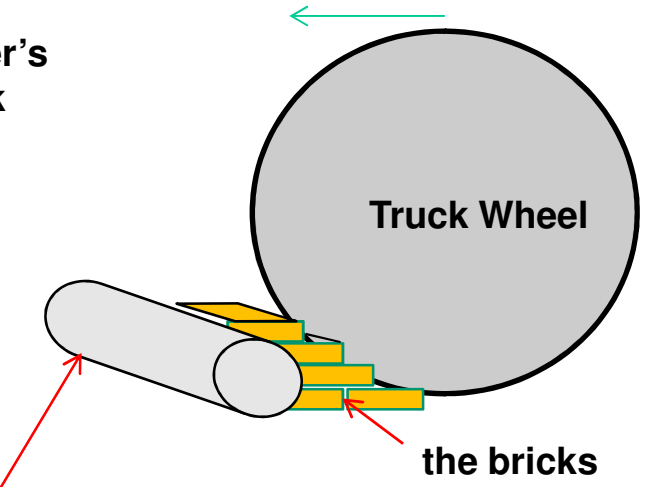
- In the morning, a tanker was delivering LOX to a customer. After the unloading was finished, the tanker left the site to get weighing done. The customer site was under construction and a 6 Meter-DN 80 steel pipe crossed on the road. The driver took several bricks to make a slope and tried to bridge the pipe. The helper stood at the right-front of the tanker to guide the movement. The bricks couldn't bear the weight of the tractor, and collapsed. The pipe shot toward the helper, and hit the helper on the right leg causing lost time injury (multiple fracture requiring corrective surgery).
- Low level of safety consciousness exhibited by both the driver and helper .

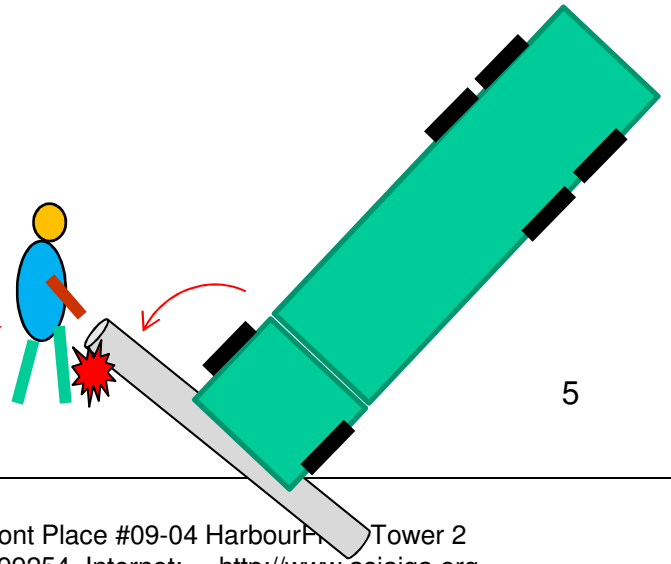
Incident Pictures

Customer's LOX tank

the pipe

the helper's location





AIGA *Asia Industrial Gases Association*

3 HarbourFront Place #09-04 HarbourFront Tower 2
Singapore 099254 Internet: http://www.asiaiga.org

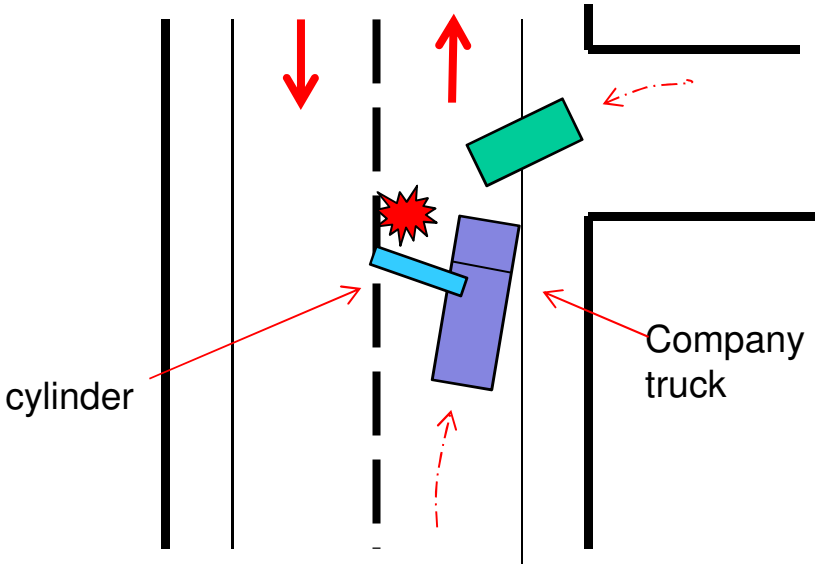
Case 2
Cylinder Fall from Truck

What happened:

- Around noon of Feb 5, a cylinder fell off from a transport truck to the ground and jumped on to the engine cover of a moving car causing damage to the car. At that time of the event the car was rushing into the main street from a side lane and tried to turn left. On seeing this, the truck driver applied an emergency brake and turned a little towards right. In the event, one of the cylinders slid from the truck and hit the car.
- The cylinders were not held or secured properly.
- No one was injured in the incident.

Incident Pictures

Cylinders stacked horizontally and above the level of truck side covers

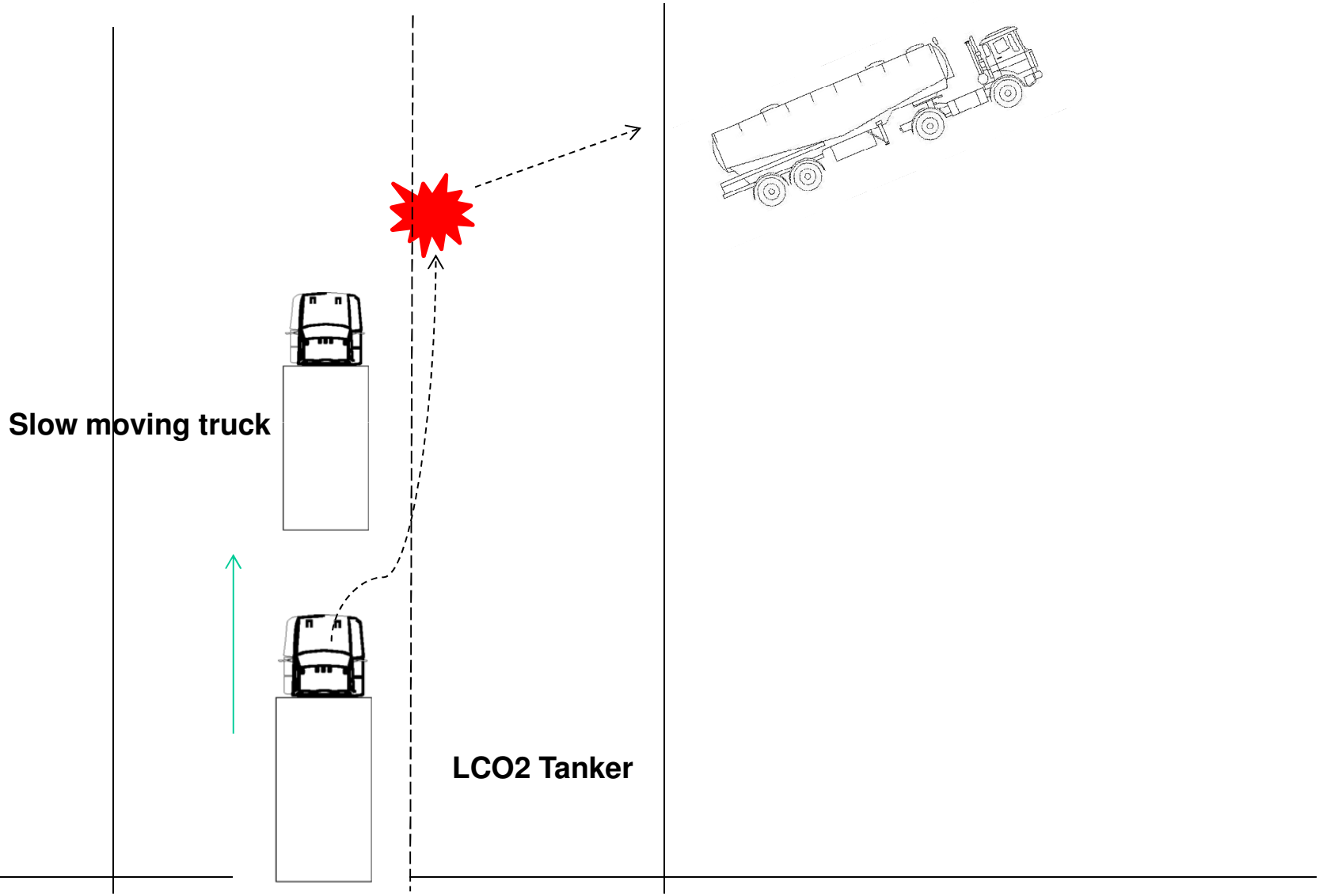


Case 3
Product Vehicle Roll over with Contractor's Driver Fatal Injury

What happened:

- A contractor driver was driving a road tanker carrying 16 tons of LCO2. He was travelling on a national highway towards a customer when the road tanker encountered a slow moving truck in front of him, on a straight stretch of road. The driver attempted to overtake the slow moving truck, but during overtaking, the front left tyre burst. The driver lost control of the tanker and it overturned on its right side.
- The contractor driver suffered head and neck injuries, died at the scene. It is believed that the driver did not strap on seat belt.
- The prime mover and tank were badly damaged.

Incident Pictures



Case 4:
Tractor Trailer Tyre Fire due brake jamming

What Happened:

- On way to deliver liquid nitrogen, driver of a trailer heard an explosion sound and found that the left side third rear axles' tyres have caught fire. He tried to put out the fire using on board fire extinguisher but was unsuccessful. He then contacted local Fire and Rescue Department and also lowered the trailer's landing gear and detached the prime mover. Local Fire & Rescue team arrived within 30 minutes and managed to extinguish the fire. Due to the fire spreading to the tanker and the gas panel cabin, outer vessel was damaged including loss of vacuum. This caused the LIN inside the tanker to be heated and pressurized, resulting in tanker safety valve blowing & bursting disc rupture. Eventually a dense cloud formed around the tanker.

- A detailed investigation showed that the coiled wires found inside the left brake drum probably activated the brake. This caused the tire to heat up and explode before catching fire. No injury was reported from this incident.

Incident Pictures

Damage to inner and outer shell

Wire from road getting coiled around the brake drum

Case 5
High Severity Vehicle Accident with Driver Injury

What Happened:

- A driver was on the highway on his way to deliver a full H2 tube trailer to a customer. There was another accident ahead of him (vehicle in fire) but he did not maintain safe distance. The in cab camera showed he was looking at his mobile phone just few seconds before the accident. The driver cabin hit a large trailer in front, causing a domino effect to hit other 2 vehicles in front. The driver cabin of the H2 tube trailer was smashed severely. However, the driver escaped with only small injury to his head, hands and leg.
- Lack of attention on road while driving and driver fatigue were found to be the main reasons for the accident.

Incident Pictures

Video showed driver was looking at Mobile Phone

Case 6
High Severity Vehicle Accident with Driver Injury

What Happened:

- On his way to deliver product at a hospital, a LOX trailer hit another truck which was stopped in front at a road junction. LOX trailer driver received multiple injuries. His rib was cracked and his left hand was injured requiring 16 stitches. The driver (his left leg) was stuck in the truck cabin for 30 min. His co-driver and 3rd party truck driver received no injury.

- Investigation revealed that the driver felt fatigue before the accident but didn't stop the vehicle.

Incident Pictures

Case 7
Contractor Driver Fatality due to Electrocution

What Happened:

- The accident happened at customer site when a tractor trailer was getting prepared for product delivery. The contractor driver was electrocuted thereby suffering a fatal injury.

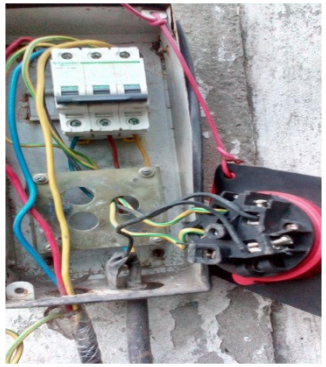
- Investigation team identified wrong wiring at female and male sockets (male socket altered by some other customer) which caused the tanker pump body and piping system to be electrically energised.

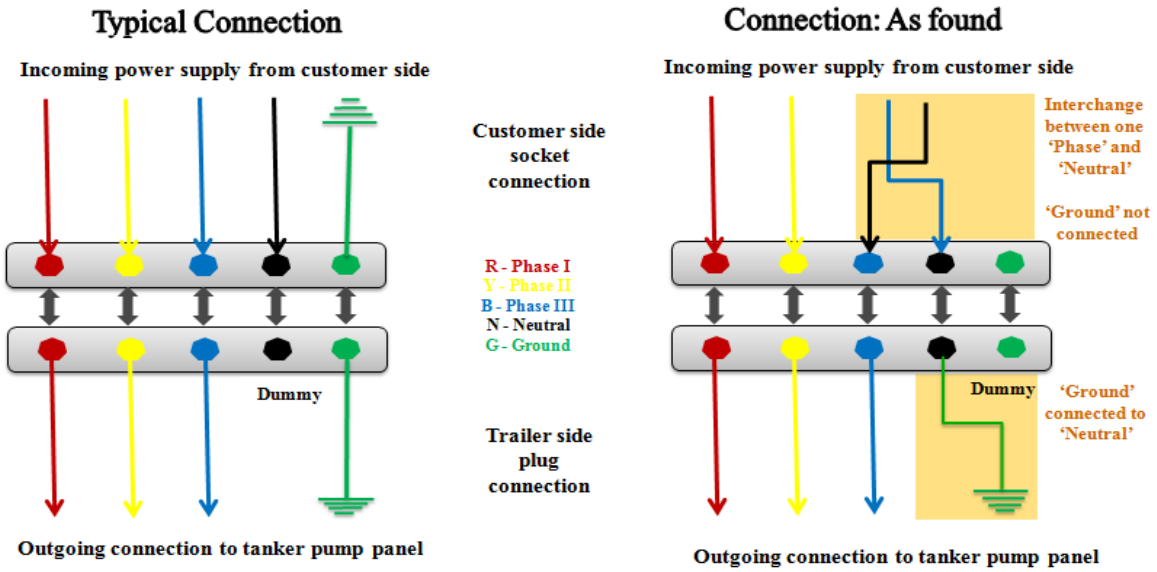
- Driver was informed of the abnormal condition but decided to continue with his activities.

Incident Pictures

Customer Electrical Panel

- Temporary connection
- No “Ground” connection
- No “Ground Fault Circuit Interrupter
- “Phase” wire interchanged with “Neutral” connection





Case 8
Lost Time Injury while coming down a ladder

What happened:

- After finishing the maintenance of a valve which belongs to LIN liquid buffer system, the chief operator went to site to restore the manual valve. While going down the ladder, he fell down to the ground from about one-meter high and injured his left heel. At a local hospital X ray photo showed that the bone of his left heel was slightly fractured and he had to stay in hospital for further treatment (Lost Time Injury).
- Ladder design had shortcoming as the rung was too slippery with diameter only 20 mm.
- Lack of operator concentration while doing the work also contributed to the cause of the accident.

Incident Pictures

Case 9
Silane Fire

What happened:

- Silane tie in activity was carried out at a Feed In Box (FIB) in a customer gas room when the fire incident occurred. The tie in work began after getting confirmation from the customer. The contractor wore the full PPE (fire retardant suit, face shield and fire gloves) and was supervised by the industrial gas company Project Engineer. After receiving confirmation that two isolation valves are closed and LOTO applied, the team proceeded to loosen the VCR (vacuum coupling radiation) cap of the spare isolation valve of the FIB. Upon cracking open the VCR cap, there was an immediate "pop" with uncontrolled release of Silane from the FIB. Immediately a fire broke out at the FIB, as Silane is a pyrophoric gas.

- Miscommunication with customer and lack of anticipation & risk assessment were observed to be the main reasons behind the event.

Incident Pictures

Case 10:
Fire during O2 supply skid commissioning - Lost Time Burn Injuries to multiple people

What happened:

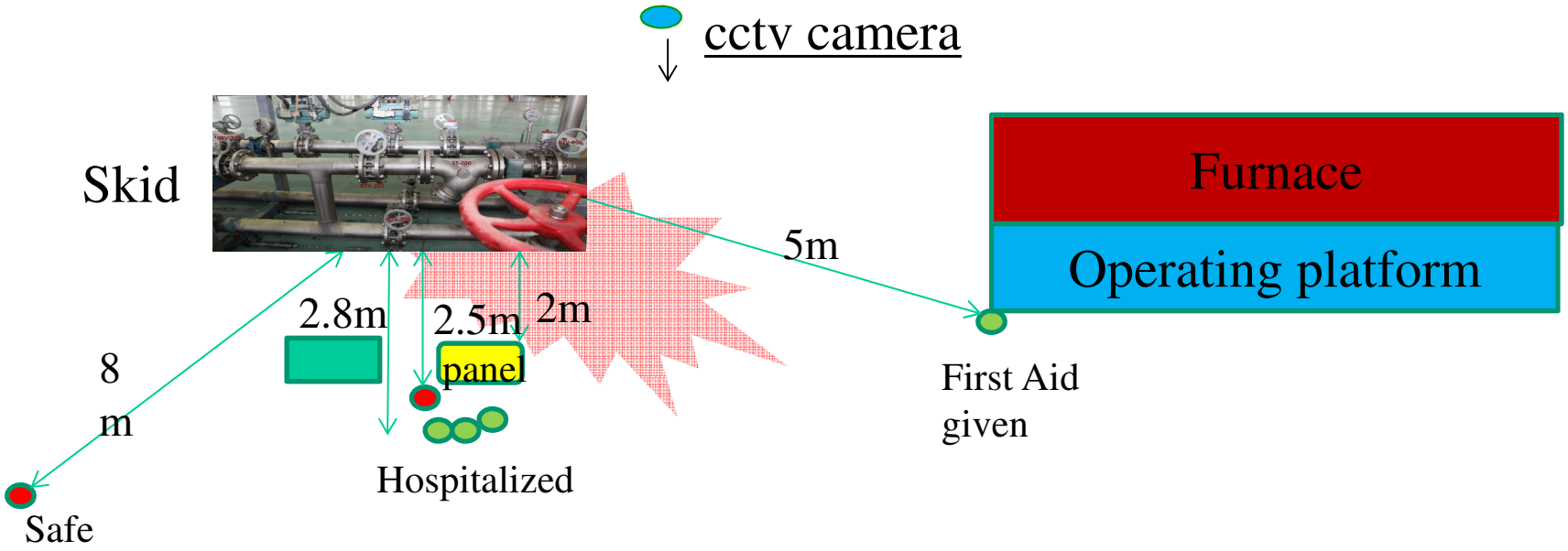
- Flame released from an Oxy- combustion skid caused burn injuries to the employee of an industrial gases company and 4 of the customer employees. This happened when Hydrocarbon based solvent was introduced upstream (by customer) into the oxygen skid that resulted in rapid combustion followed by fire, while the skid was being commissioned. At the time of the event the Engineer from the industrial gas company was providing training to 3 customer techs who were standing in front of a panel. This panel blocked the direct impact to the employees; otherwise their injuries would have been much more serious. Another engineer from the industrial gas company, reacted quickly to the incident and shut off O2 supply preventing further damage.
- Cleaning method deployed by the customer was found to be inappropriate and proper cleaning procedure was also not provided to customer. Flammable solvent was used by the customer in oxygen line for degreasing purpose. Verification of adequate cleaning was also not ensured before commissioning.

Incident Pictures

Skid condition and people nearby immediately before the fire

Scene at the time of fire

Incident Pictures



Note:

- Gas Company Employees
- Customer Employees

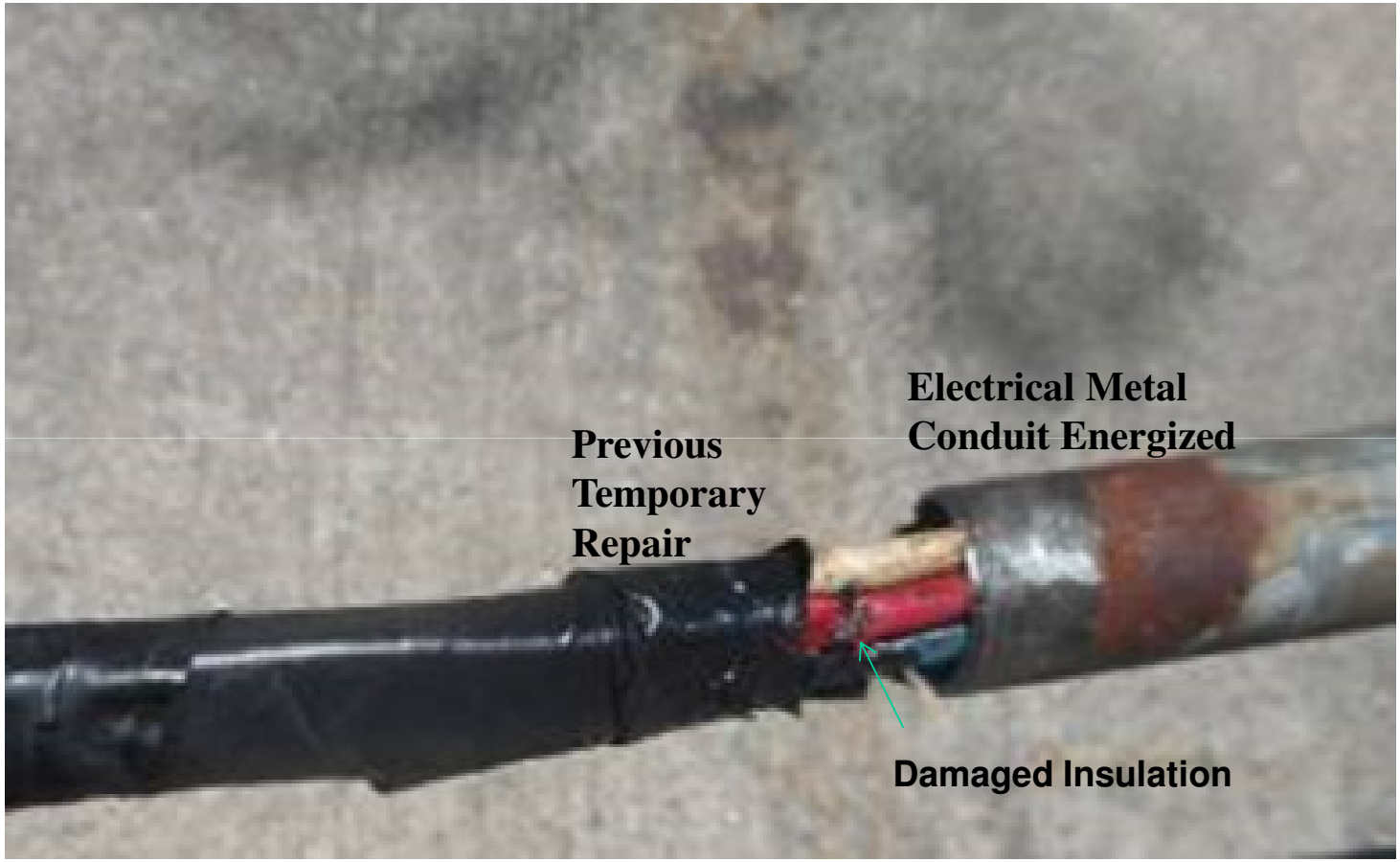
Fire Impact Scene with location of people

Case 11:
Contactor Fatal Electrocution on Maintenance Work

What happened:

- Contractor fatal electrocution happened whilst installing water pipe. The contractor was installing a polyethylene water pipe and was electrocuted whilst removing an electrical conduit to facilitate fitting of pipe supports. He became unconscious and was given cardiopulmonary resuscitation before being taken to hospital for treatment. He passed away from the injury few days later.
- Lack of personal responsibility for completion/follow up on previous temporary repair jobs
- Permit to Work(PTW) issuer and acceptor unaware of potential electrical hazard and underperformed the electrical isolation (no authorization).
- Failure of Management of Change(MOC) Compliance was also observed.

Incident Pictures

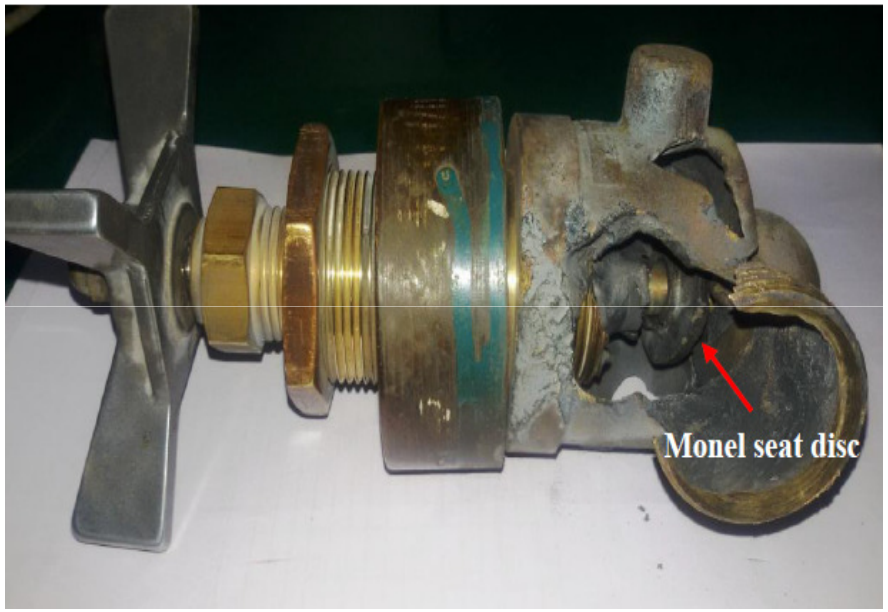


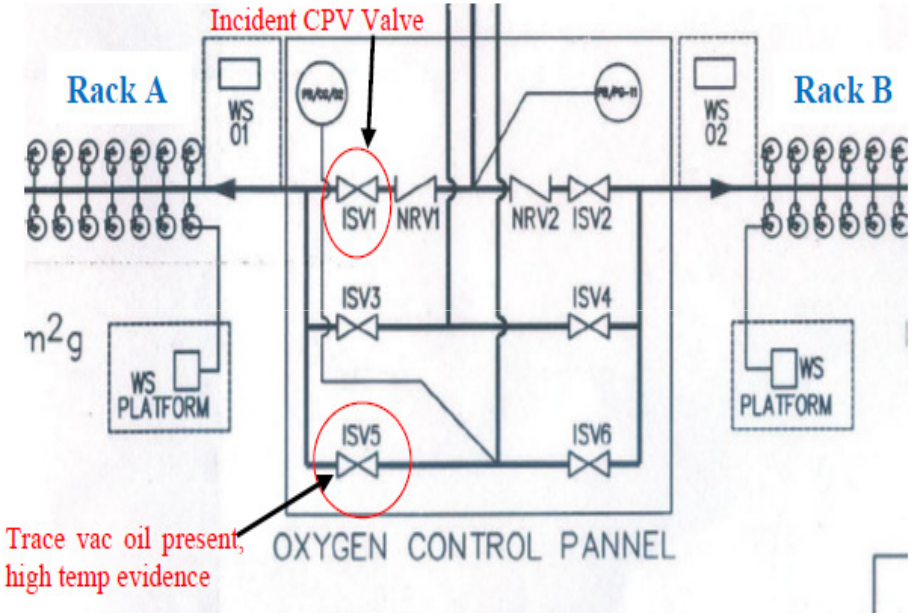
Case 12:
Energy release on O2 Cylinder Filling Panel Valve - Process Safety Event

What happened:

- Process Safety Incident involving energy release happened during rack change over at medical oxygen filling system. A fire occurred at the back of inlet valve (CPV) located on manifold panel which was being opened to change over. Some maintenance followed by degreasing was done on the valve two days back to correct passing of the valve.
- O2 Cleaning procedure was not strictly adhered to during the prior maintenance event.
- Laboratory analysis of the damaged parts from the valve revealed that Aluminium content present in isolation valves was higher that the allowable limits for use in high pressure oxygen system.

Incident Pictures





Key Lessons from the Incidents

- To enhance hazard identification capability and demonstrate safe behaviour
- Always apply defensive driving training
- Improve/change the method to secure the cylinders on the truck
- Do not apply excessive acceleration when over taking
- Pre-trip vehicle inspection including tyre checks
- Need for monitoring of on road driver behaviour & In-cab camera installation
- Be prepared for transport emergency and conduct periodic drills
- Focus on driver fatigue prevention and management
- Electrical system for truck mounted pumps should not be altered by unauthorised persons
- Safety in ladder design and use
- Review of risk assessment and SOPs for Critical Tasks

Key Lessons from the Incidents….continued

- Gap in Oxygen cleaning and safe management of activities at customer premise
- Managers /Supervisors to ensure effectiveness of PTW and e-MOC systems
- All risks and hazards associated with a modification jobs to be identified by PTW issuer
- Need for ensuring Contractor Management and selection of qualified contractors
- Must comply with Oxygen Cleaning procedure and adherence to material compatiblity of equipment / parts to be used on O2 service

Main AIGA documents related to the reported accidents

- AIGA 005/10: Fire Hazard of Oxygen Enriched Atmosphere
- AIGA 008/10: Safety Training for Employees
- AIGA 010/04: Management of Change
- AIGA 011/04: Work Permit System
- AIGA 012/04: Cleaning of Equipment for Oxygen Service
- AIGA 015/15: Safety Management of Contractors
- AIGA 039/06: Road Transport Emergency Preparedness
- AIGA 041/10: Defensive Driving

Thank you

website: http://www.asiaiga.org