Training Package
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Recent Incidents in the Gases Industry in Asia

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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
Cylinder truck roll-over

What happened

- A cylinder truck carrying 143 full cylinders collided into a third party three-wheel vehicle.

  The cylinder truck hit the rear of the three-wheel vehicle when trying to overtake it. The driver lost control of his vehicle which then left the road and rolled over.
- From investigation, the rear axle of the three-wheel vehicle had broken suddenly and caused it to swerve into the path of the cylinder truck.
- The driver of the three-wheel vehicle suffered head injury and was hospitalized for 7 days.
- Both the contracted driver and helper of the cylinder truck were wearing seatbelts and avoided injury.

Incident pictures

Cylinder truck's final position after the incident

Third party three-wheel vehicle with broken rear axle

Causes of incident

- The cylinder truck driver was not following the safe overtaking procedure.

Key lessons

- The driver did not have time to steer his vehicle to the right lane because he was keeping too close to the vehicle in front prior to overtaking.

Preventive Measures:

- If the driver was not maintaining an appropriate / safe distance, this would indicate that he should be trained in the correct driving technique. Programmes such as in rout inspections/observations should also be useful.

Case 2

Rollover of liquid oxygen tanker

What happened

A fully loaded liquid oxygen skid tank being hauled by a prime-mover on a trailer by an temporary contract driver was involved in **a single vehicle incident** in dark and wet conditions.

From investigation, the driver was trying to avoid collision with a car that had suddenly changed lane and cut in front of the prime-mover.
The car was apparently trying to avoid a pool of water on the road.
This caused the prime-mover driver to lose control of the vehicle which then skidded and rolled over.

The prime-mover and trailer veered off the road and landed 90 degree on its right side onto the fast lane of the road.

Local Emergency service and traffic police arrived later at the scene to assist. There was no product release.

The driver who was wearing seat belt avoided injury.
However, cab door and windscreen of the prime-mover were damaged.

Incident pictures

Trailer and skid tank's final position after the incident

Location of incident as seen during day time.

Causes of incident

- Driver was not following the speed limit.
- Driver did not adjust the speed to the road conditions (dark & wet).
- Driver tried to make a sudden recovery after his prime-over/trailer veered off the road.
- Unsafe behaviour of driver.
- Driver was not properly trained in defensive driving.

Key lessons

- Management need to reinforce the importance of following the speed limit.
- Following too close to the vehicle in front.
- Lack of defensive driving training/in-cab coaching for temporary contractors.

Case 3

A fatal accident involving elevated work

What happened

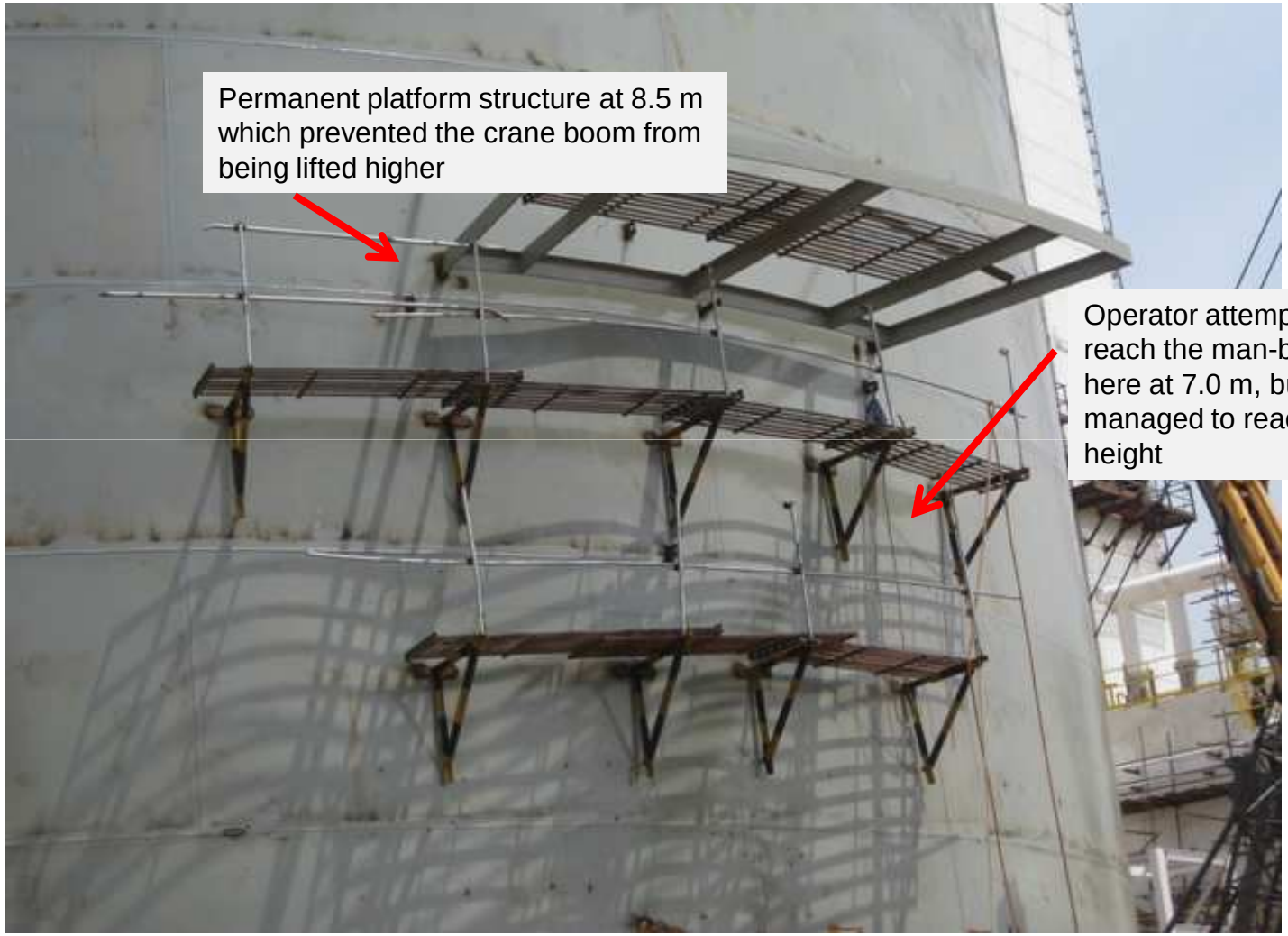
A construction contractor's rigger suffered a fatal accident while performing work from a crane hoisted man-basket at 5.3 meters above ground.

The man-basket along with the worker crashed onto the ground when the load line of the 12 MT crane gave way.

Subsequent to the fall, he was struck on his helmet clad head by the hook block weighing approximately 100 kg.

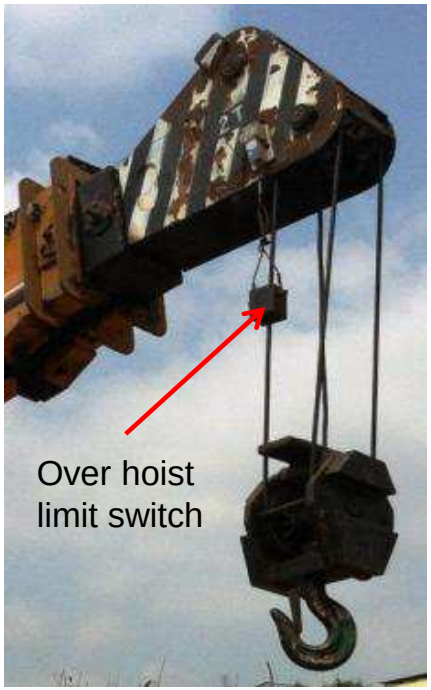
He was shifted to a medical facility in an ambulance, where the doctors pronounced him dead.

Incident picture showing platforms



Incident pictures with man-basket (illustration)

Man-basket fell here



Hook block of a similar crane

The Hydra crane involved in the accident is considered suitable for the task executed. All safety devices and cable were in good repair.

Incident pictures

Remaining end of the wire rope at boom's end

Electrical wire to the alarm was cut

The failed wire rope

Possible contributing causes

- It was found during investigation that the worker attempted to perform a task outside the scope of the assigned Work Permit by reaching at a platform at a 7m level.
- The location could not be reached as the permanent platform structure at 8.5 m level would prevent the boom from further hoisting. The crane operator tried to extend the boom and hoist so that the basket could come close to the far end of the temporary platform.
- However, this activated the over-hoist limit alarm as the hook block came close to the boom. The crane operator decided to disable the audible alarm by cutting the power supply wire.
  Supervisor was in attendance during the maneuver.
- Further hoisting caused the hook block to press against the boom which led to the failure of the load line due to excess tension and the man basket fell uncontrollably to the ground.

Corrective actions

Immediate correction actions taken:

- Removed concerned crane operator and supervisors from site
- Re-assessed safety orientations/operation discipline for contractor's other supervisors at site and replace if required.
- Added one safety supervisor and one field supervisor of contractor to ensure full time supervision for remainder of work.
- Added one safety engineer, one safety watcher and a mechanical construction engineer dedicated to construction project in order to enhance supervision and contractor's safety compliance.
- Conducted a site review /walk about before activities resumed.

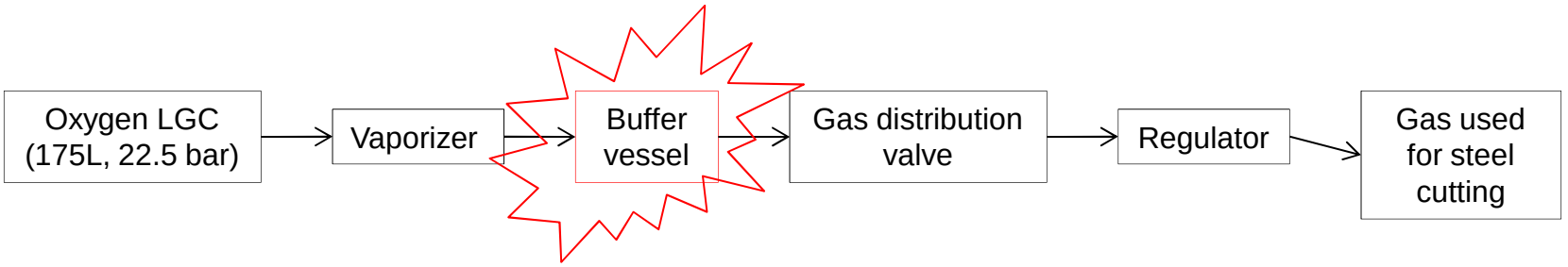
Key lessons and preventive measures

- Communicate that any change in work plan, scope or hazard must require work to stop and shall be reviewed by the work permit issuer before restarting.
- Cranes shall undergo re-inspection.
- Highlight lessons to be learned.

Case 4
Rupture of buffer tank made from outer shell of defunct liquid cylinder

What happened

- A newly fabricated gaseous oxygen buffer vessel ruptured during filling up with oxygen. An operator in the vicinity was hit by the ruptured shell and died.
  - The new buffer vessel provided by the gas supplier was modified from the outer shell of a defunct 175L Liquid Gas Cylinder (LGC) with a pressure rating of around 2 bar.
  - The flow diagram for the use of the buffer tank is shown below:



  - Vaporizer outlet not installed with thermo relief valve, safety valve or regulator .

Incident pictures

Liquid oxygen supply source (LGC)

Roof damaged by fragments from ruptured vessel

Ruptured buffer vessel viewed from different angles, pictures 1 - 4

1

2

3

4

Causes of incident

- Improper design for buffer vessel
- The buffer vessel was over-pressurized.
- No safety device was installed on the buffer vessel

  (Such as pressure relief valve, thermo relief valve or regulator in vaporizer outlet)

Other contributing causes

- Lack of understanding on the vessel's design requirements for the working pressure.
- No pressure test for buffer vessel after modification was carried out.
- Lack of Risk Management Analysis - Management of Change (MOC) process, Job Hazard Analysis(JHA) and Risk Assessment (RA).

Key Lessons

- Design and fabrication of pressure vessels should be carried out only by competent or authorised persons.
- Testing of the gas receiver after fabrication against its proposed designed working pressure was not carried out according to the report when it is a requirement for a pressure vessel.
- Modification made without appropriate Risk Management Analysis
- Contractor and customers should follow proper codes of practice or design standards for oxygen gas system.