

Source : CNN.COM, U.S. NEWS, JUNE 22, 2000, (<http://www.cnn.com>).

Location : Texas, USA

Injured : 0 Dead : 0

Abstract

Two window cleaners were left hanging approximately 100 feet in the air when scaffolding they were using collapsed. Fortunately no one was hurt in the incident.

[cleaning]

Lessons

[None Reported]

1097415 May 2000

Source : CHEMICAL SAFETY AND HAZARD INVESTIGATION BOARD, 15 MAY, 2000, (<http://www.chemsafety.gov>)

Location : Cheshire, UK

Injured : 2 **Dead** : 1

Abstract

One worker was killed and two others injured when scaffolding collapsed whilst they were working inside an incinerator tower.

The workers were carrying out maintenance inside the tower 40 metres up when the platform collapsed beneath them.

[fatality, fall, injury]

Lessons

[None Reported]

Source : CNN.COM, U.S. NEWS, 12 MARCH, 2000, (<http://www.cnn.com>).
CHEMICAL SAFETY AND HAZARD INVESTIGATION BOARD, MARCH 21, 2000,
(<http://www.chemsafety.gov>).

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Location : Krasnodon, UKRAINE

Injured : 6+ **Dead :** 81+

Abstract

A coal dust explosion occurred at 2,191 feet underground killing 81 miners and injuring 6.

It is thought that coal dust and methane may have caused the explosion.

An investigation into the incident found that the cause might have been due to a faulty cutting torch, which released a stream of oxygen and caused coal dust to explode.

[fatality, safety procedures inadequate, injury, mining]

Lessons

[None Reported]

1219410 February 2000

Source : CNN.COM, U.S. NEWS, FEBRUARY 10, 2000. (<http://www.cnn.com>).

Location : Philadelphia, USA

Injured : 13+ Dead : 0

Abstract

Tonnes of freshly poured concrete with reinforcing rods and forms collapsed at a construction site, injuring at least 13 workers

It is thought that the injured fell approximately 30 feet and were covered in concrete, scaffolding and a steel reinforcing bar.

Two of the injured were reported to be in a serious condition.

[fall, injury]

Lessons

[None Reported]

11884December 1998

Source : CHEMICAL HAZARDS IN INDUSTRY, SEPTEMBER 1999.

Location : Pennsylvania, USA

Injured : 0 **Dead** : 2

Abstract

Workers were using a welding/cutting torch in an aerial lift when flammable materials seeped out of a pipe and were ignited by the torch. Two workers died.

[leak, fire - consequence, fatality]

Lessons

[None Reported]

Source : ICHEME

Location : ,

Injured : 1 Dead : 1

Abstract

An explosion and flash fire occurred on the a drilling rig while drilling a well. The explosion on the drilling floor caused one injury and one fatality, both employees of the drilling contractor.

The investigation revealed that gas which broke out from the drilling mud collected in the enclosed space between the drill floor and the pollution pan used to prevent accidental discharge of oil based mud to sea. The gas was ignited by either stray currents or frictional sparks caused by metal parts from the floor covers and supports rubbing together.

It would appear that the basic cause of this incident was a failure in the design to recognise that by installing the collection pan, and thus creating a confined space, there was potential for gas to accumulate below the floor when the rotary motor was not operating providing ventilation for the enclosure.

There is no practical way to prevent gas breakout in the immediate vicinity of the pollution pan.

The rig is designed so that mud returns which do not immediately divert to the mud return line are captured here and drain to the return system.

[fire - consequence, fatality, design or procedure error, injury]

Lessons

The following recommendations from the report focus on preventing gas accumulation, and guarding against ignition possibilities:

1. Ensure that there is adequate ventilation below the drill floor to prevent gas accumulation during all operations.
 2. Install gas detectors with visual and audible alarms to monitor gas below the drill floor.
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123791998

Source : CHEMICAL HAZARDS IN INDUSTRY, MARCH 2000.; RESPONSIBLE CARE REPORTS, DEC 1999, (17), 5.

Location : , USA

Injured : 0 Dead : 1

Abstract

A process plant operator was killed after falling 10m through the fragile roof of the tank area of a site's distillation plant.

The incident occurred when the operator walked onto the roof from an extension recently added to a scaffold on the inside of the plant. The extension to the scaffold, through a nearby window, had been added as possible means of access to both the roof and vent pipe.

Erection of the scaffold and its extension were not included in the permit to work system.

The operator was showing an engineer the arrangement for measuring fumes from the vent pipe, which opens to atmosphere 40 cm outside the plant wall.

It is not known why the operator approached the vent via the roof, rather than from the scaffold inside the distillation plant as intended.

[fatality, scaffolding, permit to work system inadequate, fatality]

Lessons

[None Reported]

Source : LOSS CONTROL NEWSLETTER, 1997.

Location : , INDONESIA

Injured : 0 **Dead :** 0

Abstract

Mud burst from the ground near an onshore crude oil well after an explosion. Eruptions followed the withdrawal of the drill from the well which then caused a leak. Natural gas leaked from 11 different spots. 200 houses nearby were damaged as a result of the explosion and 1400 people were evacuated.
[exploration, evacuation, gas / vapour release, damage to equipment]

Lessons

[None Reported]

Source : LOSS CONTROL NEWSLETTER, 1997.

Location : , BANGLADESH

Injured : 4 **Dead :** 0

Abstract

A fire broke out after drilling operation hit trapped gas. The drilling rig and all equipment were destroyed. It took approximately 1 month to extinguish the blaze. Thousand of villagers were evacuated from the area. Total losses as a result of the fire were approximately US\$50 million (1997).
[drilling/digging/ploughing vehicles, damage to equipment, evacuation, fire - consequence, exploration, product loss, drill, injury]

Lessons

[None Reported]

Source : LOSS CONTROL NEWSLETTER, 1997.

Location : , GULF OF MEXICO

Injured : 0 **Dead :** 0

Abstract

Blowout at gas well while drilling. The drill string broke above water and release of natural gas occurred. Thirty nine people were evacuated from the rig.
[offshore, gas / vapour release, evacuation]

Lessons

[None Reported]

Source : ICHEME

Location : , SINGAPORE

Injured : 1 Dead : 0

Abstract

A refinery reactor incident. An inspector was working from a rope ladder. He slipped from the rope ladder, falling 4-5 m to the stainless steel bottom head. The refinery's emergency medical team arrived in about 10 minutes, by which time the man had lost quite a lot of blood. (The injured man had a two and a half inch cut behind his left temple.) The emergency team applied first aid to slow the bleeding. The man showed clear signs of dizziness. They decided that the local Civil Defence Force (CDF) was required to remove the injured man from the reactor, as they are specifically trained to rescue victims. With the help of CDF it was 2 hours before he was out of the reactor.

The whole incident occurred in the middle of the night, which possibly added to the delays which were encountered. At the hospital it was determined that the injured man had a hairline fracture of the skull and a severe concussion. Additionally, he had a severely broken thumb, a somewhat smashed foot, various bruises, and scrapes and cuts. He had not been wearing a safety harness for this inspection, which was being carried out from a rope ladder. A standby man had been in attendance, and was the one who summoned help.

It is now mandatory that those working at height from non-rigid, non-railed platforms or ladders are attached to a proper safety harness, secured tight with a fall arrestor to an appropriate anchor point.

[safety procedures inadequate, reactors and reaction equipment, injury]

Lessons

The following recommendations were made:

1. People working at height on non-rigid non handrailed platform or ladders must wear a safety harness with a fall arrestor attached to a secure anchor point.
 2. It is essential to have the correct rescue equipment available on site for foreseeable incidents.
 3. It is necessary to train rescue teams in the difficult process of removing injured people through vessel manways.
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Source : ICHEME

Location : , UK

Injured : 1 Dead : 0

Abstract

A contractor was removing a scaffold in the boiler house collapsed from heat stress and fell whilst working above an access well in the turbine room. The temperature was 42 degrees C (107 degrees F). The contractor fell a distance of approximately 5 m, sustaining serious facial injuries.

The incident occurred when at 7:45 am on April 3 ,1997, three contract scaffolders signed on in the boiler house control room to remove scaffolding, work that had begun the day before. The scaffold had been erected around the whole of the perimeter of the turbine floor in order to safely install cabling for the evacuation alarm system and it was in two layers. The top layer had been removed the day before. The lower layer crossed a brick wall well that contained steam lines to the desuperheater. The well was covered with non-bearing beams made up of lagging/insulation materials. The injured scaffolder had been working for 45 minutes removing scaffold directly above a 125 psi lagged steam line when he fell into the well section and onto the non-load bearing beams. The structure collapsed with a loud noise, and he fell a further 3 m to the floor in an avalanche of debris.

The investigating team felt that not enough consideration had been given to the special hazards associated with this job, especially the high temperature of 42 degrees C encountered, and the height. Hazards associated with this work had been considered and recorded as low risk. The completed risk assessment form notes that some consideration had been given to the prevailing heat and noise, and a verbal briefing had been given by the chargehand reminding those involved to take a "break when necessary." The investigating team concluded from the documents that the hazards were not picked up because there was very little, if any, communication between those doing the job and the local operations personnel. The work environment and heat stress contributed significantly, and the investigating team felt that there is probably a low level of understanding of the consequences of each. The potential for this incident to have been a fatality is obvious. The investigating team checked for the possible presence of amine in the atmosphere but concluded this was not possible.

The following action was taken:

1. Review the risk assessment process to ensure the appropriate knowledgeable people are involved at all levels.
2. Communicate the effects of heat stress to all staff.
3. Introduce the use of fall arresting equipment and support, with appropriate training, for all unprotected work areas above 2 m.
4. Improve the quality of tool box talks by turning every significant incident into a briefing to help communicate, and measure that this is done by signed returns and audits.
5. Provide clearer guidance for what an investigation should achieve, and how quickly.
6. Any non-load bearing area should be clearly marked so that it is not missed.

[scaffolding, fall, people, maintenance, safety procedures inadequate, management system inadequate, design or procedure error, injury]

Lessons

1. Always involve people familiar with the working area when assessing risks.
2. Assess the potential for heat stress during maintenance work.
3. Use fall arrestors for all unprotected tasks at heights above 2 m.
4. Ensure all information on the work permit is communicated to and fully understood by those performing the job.

Source : LOSS PREVENTION BULLETIN, 136, 26.

Location : ,

Injured : 1 **Dead :** 0

Abstract

A company has been fined and ordered to pay costs totalling almost £4,000 (1997) after a barrel containing hazardous fumes exploded and injured an employee. The incident occurred when an employee was removing the tops of barrels with a flame cutter. The employee had removed the tops of three barrels, which had once contained a polyester resin, with no problems. But when he applied the torch to a fourth, which still contained styrene vapour, there was a loud bang. The top of the 205-litre drum, measuring about two feet in diameter and weighing about 2.7 kilos, was ejected and flew past the employee, landing 70 m away on top of a house. The employee suffered minor burns but was wearing suitable protective clothing.

[explosion, drums, safety procedures inadequate, hot work, injury]

Lessons

[None Reported]

Source : CHEMICAL HAZARDS IN INDUSTRY, 1997, SEP.

Location : Ohio, USA

Injured : 0 Dead : 1

Abstract

A worker died whilst painting an auger conveyor system. The worker was standing on a ladder wearing a safety harness with a lanyard attached. At some point the lanyard got caught in the machinery and pulled the worker into the auger. The machine was operational while maintenance was being carried out. [safety procedures inadequate, fatality]

Lessons

[None Reported]

9020 December 1996

Source : CHEMICAL HAZARDS IN INDUSTRY, 1997, SEP.

Location :

Injured : 2 Dead : 0

Abstract

An explosion occurred when sparks from a cutting torch ignited vapours emitted from a barrel of scrap metal injuring two workers.

[hot work, vapour cloud explosion, gas / vapour release, flammable chemical, injury]

Lessons

[None Reported]

Source : ICHEME

Location : ,

Injured : 1 Dead : 0

Abstract

A rigger working for subcontractors installing pipework during a plant shutdown fell from adjacent pipework whilst carrying out preparatory work. Adequate scaffolding had been provided for the job currently in progress, but during a short interruption to the job in hand, the rigger and an associate decided to carry out the additional work, using improper access and working methods.
[maintenance, fall, safety procedures inadequate]

Lessons

1. A risk assessment would have identified the possibility that riggers would move between jobs in this way, and have recommended the provision and use of safety harnesses.
 2. A permit to work system (none was in use) would have helped to ensure that appropriate precautions were observed by the contractors.
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10409May 1996

Source : LOSS PREVENTION BULLETIN, 139, 23-24.; HEALTH, SAFETY AND ENVIRONMENT BULLETIN, 264, DECEMBER 1997.; HEALTH AND SAFETY AT WORK, DECEMBER 1997.

Location : , UK

Injured : 2 **Dead** : 0

Abstract

A loosely-bound bundle of fifty scaffold tubes was being lifted from an adjacent street, over a building under construction and lowered onto scaffolding. Although a two sling chain was suspended by simply wrapping the chain once around the bundle. As the bundle was lowered, it caught on a scaffolding upstand, the chain slackened and the tubes fell into the street below. Two members of the public were slightly hurt when the taxi they were in was pierced by the falling poles.

[scaffolding, near miss, design or procedure error]

Lessons

[None Reported]

Source : LOSS PREVENTION BULLETIN, 136, 26.

Location : West Sussex, UK

Injured : 1 **Dead** : 0

Abstract

A company has been fined £6,000 (1996) and ordered to pay costs of £1,043 (1996), after an employee was injured when a mobile tower scaffold overturned.

The incident occurred on a railway bridge in West Sussex, in which an employee was thrown from the scaffold onto the road.

[scaffolding, safety procedures inadequate, injury]

Lessons

[None Reported]

Source : LOSS PREVENTION BULLETIN, 139, 24.; HEALTH, SAFETY AND ENVIRONMENT BULLETIN, 264, DECEMBER 1997.**Location :** , UK**Injured :** 1 **Dead :** 0

Abstract

A rail transportation incident. An engineering train rammed scaffolding, injuring three workers.

The incident occurred when two tower scaffolds were erected on the railway lines to allow repairs to the station footbridge.

The line was closed to passenger services during the weekend and the scaffolding should have been removed to allow engineering trains to pass through.

The first engineering train passed through the station without incident. But a second train started out after a shift change and its guide was not told about the repairs. As the station was sited on a curve, the guide was unable to see the scaffolding in time despite braking, the train hit the scaffolding at 30 mph. Two workers scrambled to safety onto the footbridge, a third man fell onto the tracks and suffered a broken leg and severe lacerations to his head and had to be airlifted to hospital.

[rail transport, maintenance, human causes, fall, injury]

Lessons

[None Reported]

Source : ICHEME

Location : , UK

Injured : 1 Dead : 0

Abstract

A process operator fell from a ladder causing injuring to himself. He was climbing a typical chemical plant cat-ladder attached to an access platform when he approached the top and took hold of the safety gate. The gate came off its hinges and he let go. The gate fell forward onto the access platform. He jumped back off the ladder and fell to the ground. His hard hat prevented his head striking the ground. He sustained minor injury to his ankles.
[fall, processing, design inadequate]

Lessons

The design of safety gates used at the top of ladders was faulty. The design allowed the gate to be lifted off the vertical support pin. A welded cap should be fitted above the hinge to ensure it cannot be removed. A number of 'standard' drawings for safety gates were in use on Site, some of which would have prevented this incident. No single standard was being enforced across all plants.

Source : LOSS PREVENTION BULLETIN, 118, 16.

Location : ,

Injured : 0 Dead : 0

Abstract

A plant carpenter working in the main shop was preparing to sand a piece of wood with an electric sander when he received an electric shock. With his left hand on the portable sander's support handle and his right hand on the tool's plastic trigger handle, he pulled the steel trigger. At that instant the carpenter felt an electric shock run from his trigger finger, through his right arm, across his chest, and out of his left hand. The carpenter was spared electrocution by the use of the ground fault circuit interrupter (GFCI) receptacle he had plugged into, which functioned as intended. The employee felt a temporary electric shock for approximately 2/3 second at which point the GFCI tripped the power off. He was given an electrocardiogram at the medical department and found not to have been physically affected.

The following actions were taken after the incident:

1. The tool room will be purged of older tools and replacement will be determined on an as-needed basis.
2. A tool tester has been ordered.
3. A preventative maintenance plan will be written for all the remaining power tools, included will be a test to ensure the tool's insulation integrity
4. The tool in question has been destroyed.

[operational activities]

Lessons

The following are based on UK Health & Safety Executive guidance and British Standards:

1. portable tools should be inspected at least twice a year and records maintained.
2. cable inspection should be made before use to ensure that it is fit for the purpose.
3. cables should be protected from chafing and damage.
4. the issue of apparatus should be controlled.
5. a register of all electrical tools/equipment should be made including location information.
6. flexible cable supplying a 110 volt appliance should be as short as is reasonably practicable.
7. 110 volt apparatus should be of double insulated or all insulated construction, with no provision for earthing, and affixed with recognised symbol.
8. plugs should be to British Standard 4343.
9. any extension cables used should be of three core type and comply with BS 6500 (1975)

Source : ICHEME

Location : , UK

Injured : 1 Dead : 0

Abstract

A technician working under a permit to work to inspect scaffolds on a waste heat boiler plant fell backwards down the plant staircase. The technician lost his footing and fell backwards, head over heels landing on a pillar. He sustained injuries to his back and head. The technician was holding the bottom handrail with his left hand and the handrail with his right hand his centre of gravity whilst ascending was such that he fell down rather than up the stairs. The staircase was inspected and found to be in good condition, with good tread and was not considered a slipping hazard. The technicians footwear was also found to be sound. The staircase was unusually steep (68 degrees) but had not caused any problems over 25 years of installation. Normal stair inclines on site were limited to 45 degrees.

[scaffolding, fal, inspection, injury]

Lessons

Two staircases were aligned in such a way as it was possible to fall down two flights. This is not good design practice and should be avoided.

Source : ICHEME

Location : ,

Injured : 0 Dead : 0

Abstract

Fire in out-of-service tank at a refinery. While maintenance crews were cutting a 6' by 9' access door into the tank with a torch, a fire broke out. The tank's primary seal was damaged as was the panel board of sludge processing unit which was located outside the tank, nearby. The immediate cause was failure to secure the job site for the tasks to be performed and failure in the implementation of the work permit system. Contributing to the incident was the separation of the primary and secondary seals from the tank wall, conditions were changed significantly enough to invite a fire. Subsequent inspection of the seal area between the primary and secondary seal revealed an accumulation of oily material.

The basic cause was inadequate planning, and a lack of adequate training and experience, the hazards involved with the tasks had not been recognized, and supervision and accountabilities for the job were not clearly defined.

[fire - consequence, damage to equipment, management system inadequate, refining]

Lessons

1. Cleanliness of equipment must be ascertained by both visual inspection and gas testing before issue of hot work permits.
 2. Care must be taken to ensure that "trapped" pockets of oil, sludge, scale, which cannot be determined by gas testing alone, are not vaporized by hot work to give a flammable mixture with air leading to fires/explosions.
 3. Strict observance of well established safe procedures (e.g., API 2015 "Safe Entry and Cleaning of Petroleum Storage Tanks") for cleaning equipment is essential, paying extra attention to recesses, the area behind linings, and other trapped areas.
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Source : SEDGWICK LOSS CONTROL NEWSLETTER, 1ST QUARTER, 1993.

Location : Bruce; North Sea, UK

Injured : 2 **Dead** : 0

Abstract

During construction of an offshore facility, scaffolding collapse caused 2 personnel to fall into sea. They were not wearing life jackets but swam to safety.

Lessons

[None Reported]

5784 18 September 1992

Source : HAZARDOUS CARGO BULLETIN INCIDENT LOG, 1992, NOV.

Location : Piraeus, GREECE

Injured : 0 **Dead** : 2

Abstract

An explosion in a marine tanker when cleaning squad with torch tried to enter cofferdam between No's 1 and 2 tank. Substances involved: white spirit and hexane. Fatality.

Lessons

[None Reported]

Source : ICHEME

Location : , UK

Injured : 0 Dead : 1

Abstract

A scaffolder was erecting an extension to a scaffold on a roof as part of a three man team. He stepped out onto a fragile roof to get a fitting and fell 30 ft through a plastic skylight. He was transferred unconscious to hospital and died 26 hours later.

The main cause was failure to prevent the fall by means of a suitable barrier or cover the scaffolder stepping outside his safe working area, and lack of a written procedure specifying the method of work. The team had no specific permit to work for this activity but had been working on the roof previously. It was thought that all team members were aware of the position of the skylight.

[scaffolding, maintenance, fall, fatality, design or procedure error, permit to work system inadequate]

Lessons

[None Reported]

Source : ICHEME

Location : ,

Injured : 1 Dead : 0

Abstract

An operator went to carry out a gas test at the feedline on a tower. The feedline discharged into a low pressure flare gas header.

The gas test was required to allow a hot work permit to be issued so that flash assisted pictures could be taken of the flange facings of the lines connected to feedline. The pictures were required for investigation of an incident which occurred earlier in the day at the same location. There was scaffolded access platform beneath the safety valve.

A work permit issued by the chief operator of the unit to maintenance to remove the safety valve, required that air supplied breathing apparatus be worn for this job. Two maintenance contractor's pipefitters were on the scaffolding with air supplied breathing apparatus had removed the safety valve.

The operator climbed the scaffolding to take the gas test, he was not wearing air supplied breathing apparatus. Before he could fully perform the test he was overcome by gas, suspected to be nitrogen emanating from the open flare line. He backed away, turned and slumped to his knees.

He was disoriented and briefly lost consciousness.

One of the pipefitters grabbed the operator to prevent him falling under the scaffold guardrail. After one to two minutes the operator felt better and was assisted to ground-level by maintenance personnel.

He was forcibly given fresh air, later oxygen, and taken to the nurse's station. Shortly afterward he was taken to hospital for examination. He was released and sent home that evening.

Conclusion:

1. The gassing of the operator was due to inhalation of low pressure gas, primarily nitrogen, which had entered the section of flare system involved inadvertently.

2. The operator should have been aware and followed permit restriction regarding requirements. further, he did not use sound judgement in entering a potentially hazardous area with only minimum protection.

[testing, safety procedures inadequate, people]

Lessons

[None Reported]

108551992

Source : ICHEME

Location : ,

Injured : - Dead : -

Abstract

A contractor was working on a 12 ft scaffold, applying fire proofing to pipe supports. It became necessary to free up a kink in the hose, and, when contractor was returning to his task, he fell through a gap in the scaffolding platform.

An investigation into the immediate cause found that the use of defective equipment was to blame. The platform was incomplete, boards were missing at various places. Also there were inadequate equipment guards, no rails had been installed at the gaps.

[fall, safety procedures inadequate, design or procedure error]

Lessons

[None Reported]

108541992

Source : ICHEME

Location : ,

Injured : 1 Dead : 0

Abstract

A contractor was assisting with the setting of a transformer. He properly set up a 10 ft ladder to help guide the transformer into its place. The contractor went to push against transformer; and, as he did so, the ladder kicked out from under him.

The contractor fell to a lower level, approximately 6 ft. He sustained a fractured hip.

Since proper procedures for setting the ladder had been followed, weather conditions have been determined to have been the immediate cause/factor, as it had been raining and snowing and the ground surface was wet. Because of the weather conditions, the ladder became an inadequate tool.

[fall, weather effects]

Lessons

Always check to ensure ladder is secure before ascending. If ladder cannot be secured, determine if more appropriate equipment should be used.

Source : ICHEME

Location : , FRANCE

Injured : 0 Dead : 1

Abstract

A firm of contractors was employed to carry out repair work on the roof of a building. A work permit was prepared, and access was to be via stairs and a platform inside the building. However it was necessary to place boards on the roof to provide safe access from the outside. One worker was sent to fetch these boards. He appears to have taken the boards up to the roof via some unused scaffolding and a ladder outside the building (rather than via the inside stairs). He seems to have fallen through a transparent panel in the roof whilst carrying the boards. He fell about 10 metres and was found dead.

[maintenance, fall, fatality, training inadequate, safety procedures inadequate]

Lessons

Immediate local actions included strengthening the roofs and reinforcing the ban on walking on roofs. The contractor concerned was banned from the site for 6 months.

More fundamental recommendations were:

1. Review of work permit system.
 2. Contractors' foremen to be tested for ability to read and understand French.
 3. Manuals and training for contractors to be reviewed.
 4. A safety competition to be organised.
 5. Company to commission an external safety audit.
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Source : ICHEME

Location : , UK

Injured : 1 Dead : 0

Abstract

A fitter fell 15 feet from a ladder and had to attend hospital to attend to his (unspecified) injuries. The fitter had been attempting to lift a jack (approx 30 kg) up the ladder using a loop of rope slung over the top of the ladder. The rope snapped and he lost his balance and toppled over the handrail round the platform. An enquiry concluded that the cause of the accident was intended method of lifting was unsuitable for such a heavy piece of equipment and that the rope used was not fit for the job.

[fall, safety procedures inadequate, injury]

Lessons

1. Handlines should be withdrawn from all areas of the site, visually inspected and discarded where necessary.
 2. There should be a review of the type of handlines used and controls put in place to cover their purchase, issue, storage and inspection.
 3. Manual handling training and re-training should be set up and documented.
 4. Contractors should be made aware of site guidelines on use/control of ropes/handlines.
 5. Calls for emergency services should request attendance at the main door of the building, where details of the exact location can be given
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Source : HAZARDOUS CARGO BULLETIN INCIDENT LOG, 1990, NOV.

Location : New Orleans; Louisiana, USA

Injured : 0 **Dead** : 0

Abstract

A fire destroyed wharf and warehouse containing coffee, 500 tonnes of rubber and aluminium ingots. A propane torch used to shrink wrap plastic suspected.
[warehousing, fire - consequence]

Lessons

[None Reported]

4980 11 May 1990

Source : HAZARDOUS CARGO BULLETIN INCIDENT LOG, 1990, AUG.

Location : Houston Ship Channel, USA

Injured : 0 **Dead** : 0

Abstract

A marine transportation incident. Cargo residues spilled from a marine tanker moored for tank cleaning and ignited by a welding torch from ship repairers at an adjacent berth.

[fire - consequence]

Lessons

[None Reported]

4852 19 January 1990

Source : SEDGWICK LOSS CONTROL NEWSLETTER, FIRST QUARTER, 1990.

Location : Cadereyta, MEXICO

Injured : 0 **Dead** : 4

Abstract

A fire occurred in a storage tank probably caused by spark from welding torch. About 8 000 barrels of oil burnt. Fatality.

[fire - consequence, storage tanks]

Lessons

[None Reported]

Source : ICHEME

Location : ,

Injured : 0 Dead : 1

Abstract

A painter died after falling 40 feet when a scaffold suspension rope broke.

The victim was a member of a three-man crew engaged in the abrasive blasting and painting of the interior of a 48ft h x 30ft d steel water tank.

Three separate two-point suspension scaffolds were used to reach the interior walls of the tank. The scaffolds abutted each other in a U-shaped configuration. The centre scaffold platform was overlapped by one end of each of the other two scaffolds. Suspension ropes were located at each ends of the centre platform and at the outer ends of the two other platforms. The platform unit was raised by alternately raising each suspension point a few feet at a time. Two men were involved in this operation when the incident occurred. The victim was standing on an outer end of the platform and was pulling on the suspension rope to raise that end of the scaffold. He fell when the rope broke and his end of the platform dropped to a vertical position. The victim was not using fall protection equipment although it was available and being used by the second painter. Investigation revealed that the 5/8 inch nylon hoist rope had broken at a point where it had been burned some time before the incident.

[scaffolding, maintenance, material of construction failure, safety procedures inadequate, fatality]

Lessons

[None Reported]

1090321 October 1989

Source : ICHEME

Location : ,

Injured : 0 Dead : 1

Abstract

A painter died when the platform he was working from fell 65 feet inside a municipal water storage tank. The victim was a member of a three-man crew that was using an improvised suspension scaffold to paint the interior of the 68ft h x 32ft d tank.

The scaffold consisted of an aluminium ladder used as a platform and secured to steel "stirrups" made of steel stock bar bent into shape and attached to each end of the ladder. Wire cables from each stirrup ran to a common tie-off point. A cable from this common tie-off was rigged to a block and tackle used from ground level to raise and lower the platform. The block and tackle supporting the system was secured to a vertical steel pipe on top of the tank with a cable that was fashioned into a loop by U-bolting the dead ends of a piece of wire.

The victim had been painting from one end of this scaffold while wearing a safety belt and lanyard attached to an independent lifeline. When the victim finished painting, he unhooked his lanyard from his lifeline and moved along the ladder platform to a position where he could hand his paint spray gun to the foreman (who was at the top of the tank). As the foreman took the spray gun, he heard a "pop" and saw the scaffold and the victim fall 65 feet to the floor of the tank. Investigation of the incident revealed that the two U-bolts on the loop of the cable supporting the block and tackle had loosened enough to allow the cable ends to slip through, causing the scaffold to fall. This rig had been used without incident every day for 2 weeks preceding this fatal fall.

[maintenance, storage tanks, fatality, scaffolding, fall, personal protective equipment, mechanical equipment failure, safety procedures inadequate]

Lessons

[None Reported]

4580 17 May 1989

Source : HAZARDOUS CARGO BULLETIN INCIDENT LOG, 1989, AUG.

Location : Immingham; Humberside, UK

Injured : 0 **Dead** : 0

Abstract

A marine transportation incident. Fire in marine tanker when residual jet fuel leaked through vacuum valve and ignited by cutting torch.
[fire - consequence, hot work]

Lessons

[None Reported]

Source : ICHEME

Location : ,

Injured : 0 Dead : 1

Abstract

A caulking mechanic died when the scaffold on which he was working failed and caused him to fall 60 feet to the ground. The victim and a co-worker were caulking the exterior skin plate joints and windows of a new seven-story building. Most of the work on the lower levels of the building had previously been completed using a personnel hoist. The upper floors of the building could not be reached with this device, so the crew brought a suspension scaffold to the site on the day of the incident.

On arrival, the crew found that workers from a window-washing firm had already rigged a two-point suspension scaffold on the building. An arrangement was made for one crew of a worker from each company to work from the caulker's manlift, while a second crew worked from the window-washer's two point suspension scaffold. The victim and one worker from the window-washing firm then ascended the building using the two-point suspension scaffold and began work at the sixth floor.

Although the victim and his co-worker had brought safety belts and lifelines to the site, they had been left in the company truck. None of the four workers were using fall protection equipment.

When work was completed at the sixth floor, the men began their descent. Suddenly, the victim's end of the scaffold dropped to the vertical position, causing him to fall. The second man on the scaffold managed to cling to the scaffold and a nearby window ledge until he could be rescued.

Inspection of the scaffold hoist revealed a defect in a centrifugal safety brake. This defect and the victim's possible failure to release the parking brake before beginning his descent caused one end of the scaffold to drop.

[scaffolding, maintenance, mechanical equipment failure, safety procedures inadequate, fatality]

Lessons

[None Reported]

1211912 January 1989

Source : ICHEME

Location : ,

Injured : 0 Dead : 1

Abstract

Whilst working on the demolition of a cooling tower, a contractor was fatally injured when he fell from a working platform.

An investigation into the incident concluded that the contractor had fallen while attempting to cross a gap between two working platforms. There were no witnesses, however circumstantial evidence indicated that the contractor had fallen when a poor quality scaffold board bridging the gap gave way under his weight.

[fall, scaffolding, fatality, safety procedures inadequate]

Lessons

[None Reported]

Source : COMMUNITY DOCUMENTATION CENTRE ON INDUSTRIAL RISK, MAJOR ACCIDENT REPORTING SYSTEM LESSONS LEARNT FROM ACCIDENTS NOTIFIED, INSTITUTE FOR SYSTEMS ENGINEERING AND INFORMATICS, COMMISSION OF THE EUROPEAN COMMUNITIES JOINT RESEARCH CENTRE, 1991, ISBN 9282622894.

Location : ,

Injured : 3 **Dead :** 1

Abstract

During maintenance work of the fire fighting system of a storage tank, the operation of which was due to change from styrene to benzene, an explosion occurred when an operator attempted to light a torch for welding flanges onto the cut foam pipes. The subsequent fire was quickly extinguished by application of suitable foam already available in the establishment. The tank was destroyed. Investigations revealed that maintenance was in progress though the tank had been filled with benzene and that the glass membrane of the foam chamber was missing, which allowed benzene vapour into the foam pipes. The work permit had been co-signed by the operation department though it was known that this maintenance work had to be performed on an empty tank. The maintenance department responsible for the execution of these works had not been informed that the tank was filled with benzene. Furthermore, benzene was stored in an atmospheric fixed roof tank without inert blanketing and there was no weak roof-to-shell seam.

[storage tanks, fire - consequence, spark]

Lessons

1. Compilation of written maintenance procedures; introduction of a quality assurance procedure for maintenance work, use of nitrogen blanketing in fixed roof tanks storing highly flammable liquids.
 2. Use of weak roof-to-shell seam.
 3. The last two points will become mandatory for critical atmospheric tanks.
-

123841989

Source : ICHEME

Location : ,

Injured : 0 Dead : 2

Abstract

Two workers were killed during work to dismantle scaffolding.

The incident occurred after maintenance had been carried out on a 50 metre high distillation column when the workers were dismantling the scaffolding. For this work a construction lift was being used. After several days without warning, the platform collapsed with the two workers on it.

An investigation into the cause revealed that the driving shaft in the brake system was broken, leaving the platform without any braking device.

[operational activities, mechanical equipment failure, fall, fatality, safety procedures inadequate, lifting equipment]

Lessons

The report stated the following lesson learned:

The importance of regular inspections, aimed at vulnerable parts.

Source : ICHEME

Location : ,

Injured : 0 Dead : 1

Abstract

A cement finisher died when he fell from a suspension scaffold and his safety lanyard snapped. The victim and a co-worker were dismantling suspended scaffolding at a 160-foot level inside a concrete silo. Both men were wearing safety belts with nylon rope lanyards secured to independent lifelines.

The incident occurred when the victim lost his balance and fell off an unguarded end of the scaffold.

His co-worker stated that he saw the victim fall and jerk upwards as the lanyard caught him. When

the victim's weight dropped back on the lanyard, it snapped, and he fell to the concrete floor.

Examination of the lanyard after the event showed burn damage at several places, including the point of failure. The employer did not control inspection or distribution of this fall protection equipment.

The equipment was kept in a common supply bin where the workers could readily obtain it when needed and return it when work was completed. The lanyard

had probably been damaged earlier during cutting and welding operations.

[scaffolding, personal protective equipment, fall, safety procedures inadequate, material of construction failure, fatality, maintenance]

Lessons

[None Reported]

4175 26 May 1988

Source : HAZARDOUS CARGO BULLETIN INCIDENT LOG, 1988, SEP.

Location : Newtown; Ohio, USA

Injured : 0 Dead : 1

Abstract

An explosion occurred after welding a safety device onto a metal ladder on the outside of a tank. Fatality.
[personal protective equipment]

Lessons

[None Reported]

1099006 October 1987

Source : ABERDEEN PRESS AND JOURNAL, OCT 7, 1987.

Location : , UK, OFFSHORE

Injured : 0 Dead : 1

Abstract

A mechanical technician died after falling from scaffolding on an offshore platform. He received multiple injuries and despite being air lifted to hospital, died a couple of days later.

[fatality]

Lessons

[None Reported]

9987 29 May 1987

Source : ICHEME

Location : , UK

Injured : 1 Dead : 0

Abstract

A contract technician employed to carry out NDT inspection work fell from a ladder, whilst carrying a radioactive source. Although the fall was over 12 feet, it was not as serious as it could have been, as he received only minor injury.
[training inadequate, injury]

Lessons

Such loads should be hauled by rope leaving hands free.

Source : ICHEME**Location :** ,**Injured :** 1 **Dead :** 0

Abstract

A fitter was struck by falling scaffolding poles. The poles fell from a load of scaffolding material which was being lifted by a crane up to an elevated walkway during a major overhaul. The fitter received severe bruising to his right elbow.

In order to perform a modification to instrumentation a scaffolding platform had to be constructed adjacent to an elevated walkway (30ft above ground) at fin-fan headers. All scaffolding required for the overhaul was being handled by a contractor and a foreman arranged for the use of a crane working in the area lifting heat exchangers to lift scaffolding tubes and boards up to the fin-fan walkway. In all four scaffolding boards and ten poles were required to build the scaffold.

When the crane became available to make the lift a rigger went in search of short slings as those already on the crane were too long and too highly rated for the lift and he doubted if they would be able to "bite" the scaffolding adequately. Whilst he was searching for the correct slings he noticed that the scaffolding gear had started to be lifted as a single bundle.

It transpired that while the rigger was away two of the scaffolders and a supervisor had rigged the scaffolding equipment as a single load using one of the long slings already on the crane hook with half hitches at the end of the load.

The load was lifted having checked for stability but the crane jib was too short to be able to land the load on the walkway.

While the crane driver was lowering the load for re-rigging it hit the underside of the walkway. This tilted the load and the scaffold poles fell vertically. The fitter working underneath, who was unaware of the lift, ran clear of the area when he heard a "clanging sound" from above. Nevertheless he was hit directly on the elbow from a falling pole and received glancing blows on the head and buttock from other falling poles. A scaffold board on which he had been working was pierced through by a falling pole.

The following conclusions were made:

1. The load was inadequately rigged.
2. The wrong types of slings were used both to allow the lift to be successfully completed and to bind all the equipment tightly.
3. Two slings should have been used.
4. Scaffold boards and poles should not be lifted together.
5. Lifting both allow the boards to assume a diamond arrangement or other similar patterns to be set up in the load which prevents the poles being held tightly.
6. Checks to ensure that all personnel were away from the area were not carried out.
7. The rigger who was designated to carry out the work was overstepped by other personnel, who used equipment which the trained rigger had deemed unsuitable.

[maintenance, safety procedures inadequate]

Lessons

The following recommendations were made:

1. Only suitably qualified and identified personnel must be allowed to rig materials for lifting.
 2. Scaffold boards and poles must not be lifted together.
 3. Areas below lifts must be thoroughly checked to ensure they are evacuated.
-

Source : ICHEME

Location : ,

Injured : - **Dead :** -

Abstract

An incident occurred during the erection of scaffolding to the top walkway of a furnace when the scaffold suddenly tilted forward resulting in workers falling to the ground.

Both workers were wearing safety harnesses, which had been attached to the north side vertical scaffolding poles. When the platform pivoted, the slings slipped off the now downward pointing poles.

An investigation into the incident found that the scaffolding was secured only to the walkway railing. The two north side vertical poles should have been fastened to the furnace structural beam before the actual work started.

The only resistance against the pivoting movement created by the weight of the two workers, was the friction exerted by the clamps attaching the south side vertical poles to the walkway railing.

[fall, construction, safety procedures inadequate, design or procedure error]

Lessons

[None Reported]

11265October 1986

Source : THE SAFETY PRACTITIONER, OCT, 1986.

Location : , UK

Injured : 0 Dead : 1

Abstract

A man died after his clothing burst into flames as a result of oxygen enrichment.

An oxy-acetylene cutting torch had been left inside a railway tank wagon for about 70 hours over a weekend. Although the valves of the cutting torch were closed, the main supply valves were left open and oxygen leaked past the valve on the torch so enriching the atmosphere inside the tank wagon. When the man entered the tank, oxygen permeated his overalls so that when he started to grind the weld the sparks ignited his overalls causing his death.

Although a permit to work had been issued on the Friday it was only valid for 24 hours and no such permit was issued on the Monday when the incident occurred. At the subsequent investigation several employees said that they had never been instructed not to leave cutting equipment inside tanks and that they had received no information about the dangers of this practice.

[welding, human causes, fire - consequence, fatality, rail transport]

Lessons

The following recommendations were made:

1. Where oxygen or flammable gas has been used inside confined spaces it is essential that the equipment is removed as soon as practicable and is never left inside when work is finished for the day.
 2. If such equipment is inadvertently left inside a tank overnight the tank should be well ventilated and tested for the presence of flammable gas or excess oxygen before entry is permitted.
-

Source : ICHEME

Location : , BELGIUM

Injured : 0 Dead : 1

Abstract

An operator was fatally injured in a fall from a ladder. The operator had been asked to commission a recently installed water flush to a desalter level transmitter. In order to do this he had to open an isolating valve on the existing desalter water system. This was a high point vent valve which was located about 4 metres above ground. It required the use of a portable ladder in order to reach it since no permanent access was available. Scaffolding used during the installation of the new water flush system had been removed some hours previously.

Instead of obtaining a ladder of suitable length from the refinery stock, the operator took a ladder from adjacent scaffolding in order to gain access to the valve. Unfortunately, the 6 metre length ladder was too long and could only be positioned at about 49 degrees horizontal. While the operator was on the ladder, it slipped and he fell on to a 1.2 metre high instrument support column sustaining severe internal injuries from which he died some six hours later. Fatality. [commissioning]

Lessons

Correct use of ladders:

Persons required to use portable ladders during their work should be thoroughly trained on the basis of this advice. One idea worthy of merit is to provide such personnel with a check list card itemising the safety aspects of the use of ladders.

In this case two incorrect practices are immediately apparent:

1. The ladder was positioned at too small an angle to the horizontal; the recommended value being the horizontal distance between the foot of the ladder and a line drawn vertically down from the top support of the ladder should be a quarter of the distance between the ladder's base and top contact points.
2. The ladder should have been secured at the top or bottom, or in the case where it was only needed for a short period involving a single operation a second person should have been positioned at the bottom to prevent slippage.
3. Modification review procedures. Although the valve in question was an existing facility its use as an isolation valve for the new water flush constitutes a change of use. It is important when carrying out any plant modification that all aspects of safety are reviewed including access requirements to overhead equipment. Obviously, permanent access ladders and platforms cannot be made available to all overhead valves.

However, each case should be considered on its merits and a conscious effort made during such a review to:

1. Establish the anticipated use of such valves.
2. Determine the appropriate access requirements or whether repositioning of the valve to allow operation from grade is the best option.
3. Check that, where required, appropriate access facilities are available at the site and that personnel having to use them are properly trained in their use.

Source : ICHEME

Location : , HOLLAND

Injured : 0 Dead : 0

Abstract

During a major Fluid Catalytic Cracker Unit (FCCU) overhaul, a four level platform scaffold inside the regenerator vessel collapsed. Although five persons were working on the top platform at the time of the collapse nobody was injured.

The scaffold had been built to allow removal of refractory in the base of the regenerator.

It was meant to be used by five refractory workers and had, accordingly, been designed to a loading of 150kg/m² (about 1200kg in total). A central dump tube was incorporated into the scaffolding to facilitate removal of refractory debris.

At the same time as the refractory was being removed, a group of 15 workers began to remove sleeves from the regenerator standpipes which entered the regenerator vessels immediately above the scaffold. They used the scaffold for access and to support the standpipe sleeves, weighing about 2500kg before they were lifted free of the regenerator. Because the scaffolding platforms were not a close fit against the regenerator wall, displaced refractory was able to fall down and collect on the lower platforms. In any case removal of the standpipe sleeves prevented access to the central dump nozzle.

Some thirteen hours after work began the scaffold collapsed.

This was despite the fact the several persons noticed that some scaffolding tubes had bent during the period between commencement of work and the time of collapse.

It is clear that the scaffold became overloaded by virtue of it having been used to support heavy standpipe sleeves twice the weight of the scaffold design loading plus most of the removed refractory.

[cleaning, reaction vessel, maintenance, safety procedures inadequate, fluid cracker]

Lessons

Overloading of scaffolding is something which can have extremely serious consequences.

It is important that the contractor's supervisors are made fully aware of the dangers of overloading scaffolding and have sufficient scaffolding inspectors to monitor work on scaffolds.

Any departure from the normal, however apparently insignificant, should be immediately reported to supervisors.

Source : ICHEME

Location : , UK

Injured : 1 Dead : 0

Abstract

A scaffolder entered the plenum chamber of a finned fan heat exchanger of a plant after being issued with a handover certificate (cold work permit) and an entry permit for the confined space. While the scaffolder was placing boards over the air aperture the steel deck plate on which he was standing gave way and he fell 37 feet on to the hardcore ground. No bones were broken, but the scaffolder was hospitalised.

The following conclusions were made:

The accident was a case where initial design weaknesses coupled with a deteriorating condition resulted in the deck plates becoming unsafe for use as a walkway. Access to the area was infrequent and was controlled by an Entry Permit. The hazard had gradually worsened due to adverse operating conditions.

[entry into confined space, fall, design inadequate, safety procedures inadequate, scaffolding]

Lessons

1. All activities in plenum chambers, ducting etc. which utilise the deck plates as a walkway should be reviewed to ensure that the design is adequate and that the condition of the deck plates, etc. makes for safe entry and where not suitable, appropriate alternative methods are made available and warning notices employed.
 2. Consideration should be given at the design stage to improvements of chamber, plenums and ducts, either to avoid the need for entry or where necessary, to ensure incorporation into the structure.
 3. Review site practices with respect to checking the structural condition of walkways/access ways before the issue of Entry Permits.
-

Source : ICHEME

Location : ,

Injured : 1 Dead : 0

Abstract

A contractor's employee fell a distance of about 15 feet between scaffolding levels whilst working inside a ground flare, sustaining two broken ribs. The man, who works for a refractory lining contractor, fell between the scaffold and the internal vertical walls of the flare box structure. Scaffolding had been built around the walls to allow access for both boilermakers to weld "sprigs" on to the metal wall of the flare structure and refractory workers to subsequently erect shuttering and pour a refractory lining. However, these two jobs require different access requirements, the first very near to the wall and the second with the access sufficiently distant from the wall to allow the erection of shuttering. The scaffold had been built with these requirements in mind, incorporating transoms on the wall side which could be removed after the first stage of the work. It was after the scaffolding had been modified that the man fell through an 18 inch wide gap between scaffold and flare structure wall.

The work was covered by valid work permits and the scaffolding had been inspected and pronounced safe for use.

[fall]

Lessons

[None Reported]

Source : ICHEME

Location : ,

Injured : 1 Dead : 0

Abstract

An employee of a civil engineering contractor was setting steel pins in the bottom of a trench. Whilst tapping a pin in using a claw hammer he met some resistance, but concluded that he had met a stone or other obstruction. He picked up a piece of reinforcing bar with a sharp point and drove it in with a hammer to clear the obstruction. There was a violent explosion which threw him out of the trench and covered him with debris. He was seen by another employee who took him for medical attention: he sustained no lasting injuries.

It was subsequently realised that he had struck and pierced a 3.3 kV armoured power cable. The incident caused a plant shutdown.

The presence of power cables at this point was known to the contractors - they had been located and uncovered some 6 weeks earlier but work had then stopped. Water in the trench had also disguised the presence of the cables.

There was a Permit to Work in force, but although site personnel were aware of the presence of cables, this Permit did not specifically draw attention to this hazard.

[construction, tools and access equipment, cable, hand tools, injury, plant shutdown, permit to work system inadequate, training inadequate, human causes, damage to equipment, excavation damage, injury]

Lessons

1. An immediate ban was imposed on the driving of steel pins into the ground without specific prior permission.
 2. Retraining was carried out on the danger of live cables
 3. Marker posts were erected at each cable location
 4. An additional Safety Engineer was appointed by the contractors
 5. The site Permit to Work system was tightened up.
-

Source : ICHEME

Location : , UK

Injured : 0 Dead : 0

Abstract

A redundant heat exchanger was being cut up as part of a demolition programme, using oxy-propane burning equipment. The exchanger was titanium-tubed and some of the tubes caught fire. The fire was doused with water. This is a potentially very hazardous procedure, as burning titanium can react with steam, to evolve hydrogen, with possible ignition and explosion consequences. It would appear from the incident report, that this had not been appreciated prior to the incident. An explosion followed the fire.

[torch, fire - consequence, design or procedure error, maintenance]

Lessons

The main recommendation for future work of this kind, was to "cold cut" the exchangers.

In the event of fire, an alternative to water as the quenching material must be used, although the report did not mention this.

Source : ICHEME

Location : , UK

Injured : 1 Dead : 0

Abstract

An incident occurred when a bulk cargo operator fell from the top of a ship-shore access ladder on to a deck of a vessel. The operator received injuries to his leg and ankle. The use of an access ladder is usual practice but questions relating to the safety of the access ladder are posed. The ladder had been 'lashed at the bottom', had a fixed hand-rail at 20.5 inches in height along the whole length, but did not have non-skid feet. There were no witnesses to this accident. It would appear that as the operator stepped onto the ladder he was hindered by the safety net that was provided by the ship to prevent entry into the water between the ship and the jetty. The cause of the accident was that the feet of the ladder slowly slid away due slack lashing.

The Master and owner of the ship were responsible for providing safe access between ship and shore. The specifications of ladders includes ladders to have non-skid shoes, to be constructed to specific British Standards and for all ladders to have a Manufacturer's Certificate which shows that it has undergone three stringent performance tests. The ladder involved did not meet these regulations.

[container ship, equipment misalignment, safety equipment failure, safety procedures inadequate, marine transport, fall, injury]

Lessons

1. Access ladders should conform to regulations. However the type of ladder should be reviewed.
 2. All ladders should be inspected and repaired where necessary.
 3. Access ladders should be securely lashed to prevent side-ways movement. However, alternative means of preventing side-ways movement should be investigated.
 4. Procedures to securing safe access and any checking protocols should be reviewed.
-

Source : ICHEME

Location : ,

Injured : 0 Dead : 0

Abstract

During the overhaul of an Alkylolation Unit, a contractor's lorry was delivering scaffolding materials to the plant. Materials on the back of the lorry were unloaded by the driver using a hydraulic articulated crane fitted to the lorry itself. On completion of unloading the lorry was driven out of the plant without the jib/arm of the crane having been properly stowed. The jib/arm struck the bottom of a scaffold which had been suspended from an overhead pipetrack causing damage to the scaffold. Fortunately, two men working from the scaffold were not injured.

[damage to equipment, unloading, human causes]

Lessons

It was fortunate that this incident did not result in injury to the men working on the scaffold or others in the general area if the scaffold had collapsed. While scaffolding is perfectly satisfactory and acceptable for sustaining vertical loads it is not, unless specifically designed, capable of withstanding lateral or shock loadings. It is extremely important, therefore, to recognise this aspect in overhaul planning and to mark vulnerable sections of scaffolding accordingly with warning signs, coloured tape etc.

1264016 July 1985

Source : LLOYDS LIST, JULY 18, 1985.

Location : Iowa, USA

Injured : 0 Dead : 0

Abstract

A fire occurred at an abandoned sewage plant spewing clouds of toxic smoke and forcing more than 10,000 people from their nearby homes. A worker torch may have caused the fire.

The fire was confined to the plant but caused the styrofoam-filled roof to collapse and burn.

The fire released hydrogen chloride, a toxic chemical that causes nausea and headaches and irritates the eyes and throat.

[fire - consequence, gas / vapour release, hot surface]

Lessons

[None Reported]

9679 13 January 1985

Source : ICHEME

Location : , NETHERLANDS

Injured : 1 Dead : 0

Abstract

A contact scaffolder sustained head injuries from a fall whilst erecting scaffolding inside the Fluid Catalytic Cracker Unit (FCCU) regenerator. An investigation by the local factory inspector followed. It was found that all procedures and precautions had been carried out.
[maintenance, injury]

Lessons

[None Reported]

Source : SEDGWICK LOSS CONTROL NEWSLETTER

Location : , JEBEL ALI

Injured : 0 Dead : 0

Abstract

Drilling rig fire. Onshore drilling.

[fire - consequence]

Lessons

[None Reported]

Source : SEDGWICK LOSS CONTROL NEWSLETTER

Location : , JAVA

Injured : 0 Dead : 0

Abstract

Onshore drill well. Drill bit broke through shale section and sparked a fire. Rig collapsed in 10 min. 2 relief wells to be drilled.

[fire - consequence]

Lessons

[None Reported]

Source : SEDGWICK LOSS CONTROL NEWSLETTER

Location : , JAVA

Injured : 0 Dead : 5

Abstract

Explosion at a refinery destroyed a gasoline tank. Accident occurred when a subcontractor started work to replace a nozzle on the tank which was not properly drained. A welding torch ignited the gasoline. Spark. Fatality.
[refining]

Lessons

[None Reported]

2872 02 January 1984

Source : DAILY TELEGRAPH, 1984, 3 JAN.

Location : Scunthorpe, UK

Injured : 2 Dead : 2

Abstract

An entry into confined space incident.

A man dropped his torch into a tank and went to retrieve it. He got into difficulties, three people tried to assist. Two people were found dead due to asphyxiation.

The tank was used to store recycled water. Investigators believe that a hydraulic lubricant - phosphate ester, had combined with water during the production process to give off toxic fumes in the tank. Fatality.

Lessons

[None Reported]

2790 02 November 1983

Source : INSTITUTE OF INSURERS

Location : Mizushima, JAPAN

Injured : 3 Dead : 1

Abstract

Explosion in tank caused by welding work. Torch. Fatality.

Lessons

[None Reported]

2780 25 October 1983

Source : RICHES P.A, AFTER PIPER ALPHA - THE INSURANCE ASPECTS, IN: OFFSHORE OPERATIONS POST PIPER ALPHA SYMPOSIUM, 6-8 FEBRUARY 1991, LONDON, INSTITUTE OF MARINE ENGINEERS, 1991, 2/1-2/9.

Location : South Of Hainan Island, SOUTH CHINA SEA

Injured : 0 **Dead :** 81

Abstract

A marine transportation incident. Drill ship sank in typhoon lex.
[exploration, sunken vessel, offshore, fatality]

Lessons

[None Reported]

2646 July 1983

Source : DAILY TELEGRAPH, 1984, 6 MAY.

Location : Nottingham, UK

Injured : 0 Dead : 2

Abstract

An oil road tanker explosion occurred when welding torch was used to cut off a bolt on a valve. Fatality.
[spark]

Lessons

[None Reported]

2532 15 March 1983

Source : PIPELINE ACCIDENT REPORT MID-AMERICA PIPELINE SYSTEM LIQUEFIED PETROLEUM GAS PIPELINE SYSTEM, NATIONAL TRANSPORTATION SAFETY BOARD, WASHINGTON D.C, USA, REPORT NUMBER NTSB-PAR-84-1, 1984.

Location : West Odessa; Texas, USA

Injured : 5 **Dead :** 5

Abstract

An 8 inch diameter LPG pipeline was damaged by a rotating drill used to drill holes for tree planting. The pipeline ruptured, LPG escaped and was ignited. The probable cause was the reduction in pipe wall thickness and failure of the operator to recognise the presence of the pipeline. Fatality. Explosion and fire. Leak.

[fire - consequence, damage to equipment]

Lessons

[None Reported]

2511 16 February 1983

Source : BERLINGSKE TIDENDE, 1983, 18 FEB.

Location : Jutland, DENMARK

Injured : 0 **Dead :** 0

Abstract

A marine transportation incident. A spark from a welding torch ignited polyurethane foam in 350 ton trawler being radically rebuilt.
[fire - consequence]

Lessons

[None Reported]

Source : NFPA REPORT

Location : Homer; New York, USA

Injured : 0 **Dead** : 1

Abstract

Asphalt explosion killed worker who was using welding torch on the roof of the tank. Fatality.
[spark]

Lessons

[None Reported]

Source : LLOYDS LIST, AUG 14, 1982.

Location : , HUNGARY

Injured : 0 Dead : 0

Abstract

An explosion occurred after a gas jet blew off its top from under a 30 m drilling rig causing gas to gush forth a 300 atmospheric pressures, this caused a 40 m high blazing gas column.

Initial efforts to remove the rig from the site to avert the risk of gas catching fire failed as collapsing steel parts set off a spark and set the gas alight.

[exploration, fire - consequence]

Lessons

[None Reported]

Source : RICHES P.A, AFTER PIPER ALPHA - THE INSURANCE ASPECTS, IN: OFFSHORE OPERATIONS POST PIPER ALPHA SYMPOSIUM, 6-8 FEBRUARY 1991, LONDON, INSTITUTE OF MARINE ENGINEERS, 1991, 2/1-2/9.

Location : Lake Maracaibo; Venezuela, VENEZUELA

Injured : 0 **Dead** : 5

Abstract

Marine transportation. Drill barge caught fire. Offshore. Fatality.
[exploration, fire - consequence]

Lessons

[None Reported]

Source : ICHEME

Location : , UK

Injured : 0 Dead : 0

Abstract

Construction workers were working on a hydrocarbon recovery plant reported that fibrous material resembling blue asbestos was present in two proprietary flexible ducting connections and that their work had released some of the material.

A fitter was engaged on preparatory work prior to installing one of the proprietary fittings. This preparatory work involved drilling out to suit the bolting of the ducting and the re-circulation blower flanges. The fitter drew the attention of the project manager to the proprietary item and in particular to its blue coloration.

The project manager observed that as a result of the drilling work there had been some scattering of blue coloured fibrous material onto the ground and onto plant equipment adjacent to the drilling area. The blue coloration was quite intense, leading the project manager to believe that the colour stemmed from a pigment used in impregnating P.T.F.E. However, he instructed the fitter to stop work on the fitting and requested the material to be examined and arranged for the sample to be taken to the laboratory.

A sample of the material was taken and analysed qualitatively by the works laboratory. This analysis indicated that up to 20% blue asbestos appeared to be present.

[spill]

Lessons

[None Reported]

2260 27 September 1981

Source : PIPELINE ACCIDENT REPORT, NATIONAL TRANSPORTATION SAFETY BOARD, WASHINGTON D.C, USA, REPORT NUMBER, NTSB PAR-82-2, 1982.

Location : Ackerly; Texas, USA

Injured : 0 **Dead :** 4

Abstract

A refined petroleum 12 inch pipeline was damaged by a drilling machine. The wall of the pipeline was damaged and ruptured under the 1100 psig pressure. The LPG mixture, ethane and propane, escaped and was ignited by the drilling rig engine. The oil company failed to determine the existence of the pipeline before drilling operations began. Leak. Fatality.

[fire - consequence, refining, drill, design or procedure error]

Lessons

[None Reported]

2250 25 August 1981

Source : PIPELINE ACCIDENT REPORT NATURAL GAS PIPELINE PUNCTURE, NATIONAL TRANSPORTATION SAFETY BOARD, WASHINGTON D.C, USA, REPORT NUMBER NTSB-PAR-82-1, 1982; HAZARDOUS MATERIALS INTELLIGENCE REPORT, 1982, 2 APR.

Location : San Francisco; California, USA

Injured : 0 **Dead :** 0

Abstract

An excavator's drill ruptured a 16 inch natural gas pipeline, causing a release of polychlorinated biphenyls (PCBs). PCB contaminated gas continued to escape for nine hours whilst workers searched through out of date records to locate an emergency valve that had been paved over and attempted to close another emergency valve that was malfunctioning because of inadequate maintenance. Thousands evacuated. The puncture of the pipeline was due to failure of the general contractor to comply fully with the terms of the excavation permit which required him to verify the location of underground facilities that might be affected by the project. Contributing to the accident was the failure of the subcontractor, who knew of the existence of the gas pipeline, but not its exact location, to ascertain that the gas company had been notified before commencing excavation. 30,000 evacuated.

[contamination, operation inadequate, contractor error, evacuation]

Lessons

[None Reported]

1266213 August 1981

Source : ICHEME

Location : ,

Injured : 0 Dead : 0

Abstract

A fire occurred on a marine tanker during loading operations.

The incident occurred during inspection of a tank containing gasoil when a torch caused the tank to flash this in turn ignited an open hatch nearby. The operator carrying the torch threw himself onto the deck then immediately jumped up, closed the valve on the hatch and activated the emergency closing device, then jumped ashore.

The fire was eventually extinguished.

[fire - consequence, gas oil]

Lessons

[None Reported]

Source : ICHEME

Location : ,

Injured : 0 Dead : 2

Abstract

In order to replace the gasket of a road vehicle tank manhole, the driver and a mechanic were attempting to remove the manhole cover. Considerable force, which may have involved a hammer, was apparently applied to loosen one of the retaining bolts. At this moment an explosion took place inside the tank compartment which killed both men, destroyed the vehicle, extensively damaged the workshop and shattered windows in nearby offices. Apparently the tank, which had previously carried gasoline, had not been cleaned or gas freed since no 'hot' work was to be done.

[inadequate cleaning, operation omitted, cleaning procedure incorrect, damage to equipment, fatality]

Lessons

This incident was unusual as research has shown that the hand held tools used were not capable of creating an incendive spark when impacting steel. It is however possible that there may have been a chip of silica or some other hard material such as flint embedded in the head of the hammer which caused the friction spark. Vehicles should be gas freed before any maintenance is carried out on the tank involving the use of major force.

2109 21 December 1980

Source : ICHEME

Location : , VENEZUELA

Injured : 0 Dead : 0

Abstract

Blowout at a production gas well involving a drilling rig and natural gas (NG).

Lessons

[None Reported]

Source : LLOYDS LIST, OCT 10, 1980.

Location : Frankenthal West, GERMANY

Injured : 0 Dead : 0

Abstract

Drilling was in progress to create a new underground storage cavity for natural gas when an existing pressurised cavity was breached. Technicians attempted to pump water into the drill hole to prevent the escape of gas, but this was unsuccessful. Gas leaked through the drill pipes and escaped to atmosphere, causing a significant explosion risk. 7 million cubic metres of gas were lost, valued at 3 million Deutsche Marks (1980). The drill pipes were eventually capped.

[excavation, gas / vapour release, near miss, natural gas, operation inadequate]

Lessons

Precise controls are required when drilling in the vicinity of existing cavities, especially when they contain pressurised hazardous materials.

Source : ICHEME

Location : ,

Injured : 0 Dead : 0

Abstract

A grinding wheel became loose and detached from a hand held grinding machine.

Lessons

Unless they are properly lubricated, air driven motors can decelerate faster than friction locking nuts on grinding wheels.

Source : ICHEME

Location : , UK

Injured : 0 Dead : 0

Abstract

Traffolyte labels were being fitted to the covers of a miniature circuit breaker that housed busbars (440 volts and 160 amps). The equipment was "live". A prior check, as to the clearance between the circuit breaker cover and the "live" equipment had been made but, nevertheless, the screw holes for the labels were being drilled through the covers with the busbars "live". The drill bit contacted the busbar causing an electrical fuse failure and bang/flash. Nobody was hurt.

[maintenance, safety procedures inadequate, damage to equipment]

Lessons

The method employed was inherently unsafe. Several alternative methods existed, eg. use of adhesives to fix the label to the cover or isolating the electric power before drilling. The incident might easily have resulted in a fatality had other circumstances e.g. earthing not been adequate.

Source : ICHEME

Location : Wales, UK

Injured : 1 Dead : 0

Abstract

A painter was de-scaling a tank which he had accessed from scaffolding. He fell through untied boards on the scaffold and injured his back. How far he fell is not stated, but he injured his back and needed hospital examination before returning to work. Scaffolding erection was not complete at the time of the accident, though it had been in use for about five days before the accident. No formal request for erection of scaffolding had been raised. The scaffold had been (partially) erected under the terms of a request raised about three weeks before the accident for examination of corrosion underneath lagging.

[maintenance, scaffolding, fall, safety procedures inadequate, injury]

Lessons

Procedure, and supervisory, shortcomings were the main contributory causes of the accident.

1. Contributors were not fully familiar with maintenance procedures.

2. Formal

Source : ICHEME

Location : ,

Injured : 0 Dead : 0

Abstract

An o-xylene splitter column had been scaffolded over its entire height [in excess of 250 feet (76 m)] to allow the column to be painted. Scaffolding was erected while the unit was running with the temperature of the column at approximately 465 degrees F (240 degrees C).

The Unit was shut-down over a weekend and after the column temperature had cooled to ambient it was observed that column contraction had been sufficient to affect the scaffold. Standards (vertical supporting tube members) which were resting on column platforms were noted to be 2-3 inches clear of the platforms, and ledgers (tubes spanning horizontally and tying a scaffold longitudinally) on one side of the scaffold were showing a downward deflection also of 2-3 inches.

The scaffold was constructed on all sides of the column and this, along with the request from the refinery Scaffolding Inspector for 7ft. spacing between standards instead of the intended 9ft., provided sufficient support to prevent any major instability which might otherwise have resulted in an accident.

[near miss]

Lessons

1. The expansion of tall vessels at high operating temperatures must be taken into account prior to de-commissioning.
 2. Contraction effects should be taken into consideration when any major pre-shutdown scaffolding is undertaken.
-

Source : ICHEME

Location : ,

Injured : 1 Dead : 0

Abstract

Two operators were using torches to light the pilot on the crude and heaters which were being purged with steam.

Kerosene was drawn from a sample point into a pot and two torches were soaked and lighted.

After the pilots were lit, the torches were extinguished with a steam hose and dumped into the pot which immediately ignited.

While attempting to remove the torches, the pot fell over and the operator's trouser leg caught fire.

Other operators extinguished the clothing fire with the aid of a fire blanket. Fortunately the operator was not badly burned.

[fire - consequence, competency lacking, burns]

Lessons

Do not use torches for lighting pilots and burners. Use a portable electrical ignitor. Where pilot burners are not fitted, the same ignitor can be used to directly light main gas burners. Heavy fuel oil normally requires more ignition energy than is provided by this type of ignitor and so a portable propane flame torch can be used.

Dry powder extinguishers provide the most effective means of dealing with a person whose clothing is on fire.

Source : ICHEME

Location : ,

Injured : 1 Dead : 0

Abstract

Many compressors are fitted with hollow pistons and special precautionary measures should be taken before hot work is permitted.

Hollow pistons are sometimes fitted with breather holes. Any gas inside the piston can diffuse out and burn, or if there is a flammable mixture inside the piston, an explosion could occur.

The worst incidents seem to have involved pistons that are not fitted with breather holes. A man was drilling a hole in the hollow piston of a steam engine.

When the drill penetrated the shell a flame 3 feet long shot out and injured him. The outside of the piston had corroded and hydrogen had diffused through the inside. The hydrogen had been produced by corrosion as atomic hydrogen which can diffuse through metal.

[burns, injury]

Lessons

Carefully vent hollow pistons before cutting or heating them.

Source : ICHEME

Location : ,

Injured : 1 **Dead :** 0

Abstract

An incident occurred when welding had to be carried out on the hollow aluminium piston of a compressor. It was realised that there might be some gas inside and it was decided to vent the piston by drilling a hole through it. As the electric drill broke through to the inside gas escaped and caught fire. The man holding the drill suffered second degree burns to his hands.

[fire - consequence]

Lessons

Carefully vent hollow pistons before cutting or heating them.

Source : ICHEME

Location : ,

Injured : 1 Dead : 0

Abstract

A man who worked at a scrap yard received serious hand injuries when a 45 gallon metal drum exploded. He was cutting the drum with a welding torch when the explosion occurred and the force of the blast sent the drum lid flying 20 yards through the air. Eighteen years ago on the same premises a man had been killed in a similar accident when he was using a torch on a petrol container.

[safety procedures inadequate, gasoline, injury]

Lessons

All equipment sent for scrap should be free from flammable and toxic material. If it is not reasonably practicable to certify that the equipment to be removed from site is free from flammable, corrosive and toxic substances, then prior agreement and precautions must be agreed with the recipient and the donor site should be satisfied with the recipient's system of work to guard against similar incidents.

Source : ICHEME

Location : ,

Injured : 0 **Dead :** 1

Abstract

Scaffolding was being erected by the contractor around an LPG sphere in order to provide a safe access for engineers to inspect welds on the vessel. The scaffold was partially built when a fatal accident occurred.

No one witnessed the fall but investigations suggest that the contractor slipped on loose scaffold tubes whilst climbing down from an incomplete platform (handrails had not been installed at this time) at a height of 11 M. Fatality.

[inspection]

Lessons

[None Reported]

Source : ICHEME

Location : ,

Injured : 1 **Dead :** 0

Abstract

A fitter was saved from almost certain death because he was wearing his safety helmet. He was working in a domed tank at a chemical plant when a rigger accidentally dropped a shackle and eyebolt weighing about 7 kg through an opening in the roof of the tank. The fitter was working on scaffolding above the bottom of the tank and below an opening. The force of the blow sent him sprawling onto his stomach on the scaffold. His neck was badly jarred and he was dazed but he was still alive.

[personal protective equipment, near miss]

Lessons

[None Reported]

Source : ICHEME

Location : , UK

Injured : 0 Dead : 0

Abstract

A crane overturned whilst unloading scaffolding boards and tubes from an articulated lorry to a rigging compound. The crane was being operated by a Rigger/HED Improver. The outriggers were not extended at the time of the incident, and as a result the crane overturned when the load and radius exceeded the safe limits for "free duties". The incident was the result of driver error. Although the Rigger/HED Improver had completed a formal crane driving programme and had experience of driving the crane, officially he should have been supervised by an experienced Rigger/HED.

Lessons

The following recommendations were made:

All Rigger/HEDs should be reminded that they must not increase the radius of the load on a crane even by the smallest amount, once the warning bell has sounded to indicate an overload condition. The rules for training of Rigger/HED Improvers must be adhered to.

Source : ICHEME

Location : , UK

Injured : 0 Dead : 0

Abstract

A fire occurred inside a naphtha feed tank whilst repair was being carried out to the floating roof drain. The floating roof tank had been gas freed in June prior to issuing the relevant permits. The fire occurred when flanges on the roof drain line were broken and liquid spilled from the open end and was ignited by the welder's torch. Investigation showed that the drain, although designed to be free draining, had a low point due to sagging of the tank roof. This low point acted as a trap for some naphtha which must have leaked into the drain during normal operation of the tank. This sagging is likely in many tanks that have been in service for a number of years.

[fire - consequence]

Lessons

The following recommendations were made:

1. The roof draining system on floating roof tanks should not be assumed to be completely free draining. Gas freeing procedures for such tanks should be reviewed and amended to ensure:-
 - a. Drain pipe is thoroughly flushed.
 - b. Flanges on the drain pipe should only be broken by cold cutting methods.
 2. The design of floating roof tank drains should be reconsidered in the light of the potential low point trap created by sagging tank floors.
-

9212 25 April 1978

Source : DEPARTMENT OF TRANSPORTATION REPORT, 8050536. HAZARDOUS MATERIALS INCIDENT REPORT.

Location : Nebraska, USA

Injured : 1 Dead : 0

Abstract

A leak occurred on a "T" fitting during material transfer. After investigations it was found that the driver had hooked up in preparation and started to unload into consignee bulk storage facilities. A leak was noted on off-side "T" fitting, the driver then placed the pump into neutral and stopped the engine. Apparently the driver then struck the cap fitting with a hammer. The cap was either loose or was cross threaded as it blew off under the pressure. The cap was found 10 feet away and the hammer approximately 20 feet. After approximately one and three quarters of an hour, the cargo pump destroyed itself, falling to the ground. [human causes, damage to equipment, spill, overpressurisation]

Lessons

[None Reported]

4090 10 January 1978

Source : ICHEME

Location : ,

Injured : 0 Dead : 0

Abstract

During preparation for maintenance of a drain on a steam line, a static electricity discharge was generated between scaffolding and a ladder which was in the steam leak.

[near miss]

Lessons

Re-emphasise the knowledge about static build-up from steam leaks, and the preventative measures available. (Training inadequate)

Source : ICHEME

Location : ,

Injured : 0 Dead : 0

Abstract

No. 1 stack on a boiler house was taken out of commission for repairs to its top section. To facilitate these repairs scaffold was erected around the top section of the stack by a contractor.

A strong wind was blowing and consequently no one was working at the top of the stack. At approximately 11.50 hours, a scaffolding plank, size 10' x 1", fell approximately 280' from the scaffolding, and landed in a car park 75 feet from the base of the stack. The plank broke into two main pieces on impact, but fortunately there was no injury to persons or equipment.

[strong winds, near miss]

Lessons

[None Reported]

Source : ICHEME**Location :** ,**Injured :** 0 **Dead :** 0

Abstract

A 30 foot stand of aluminium 'sip-up' light weight scaffolding was pushed by a group of workshop personnel into the live 415 volt bare conductors of the workshop's gantry crane, blowing all three of the 200 amp fuses in the circuit.

The burn marks on the scaffolding showed that all three conductors were contacted. There was no apparent discharge to earth through the scaffolding, and the workers who were wearing rubber soled safety boots were not injured. One of the group who had his bare hand on the scaffolding at the time of contact stated that he did not feel anything.

The scaffolding had been erected two days previously for use in dismantling the gantry crane auxiliary hoist motor. The bare conductors were isolated at this time. The scaffolding was then moved to another section of the workshop, away from the conductors. On the day of the incident an instruction was given to repair damaged sheeting (situated some 15 feet from the ground), in the corner of the workshop where the bare conductors are located at a height of 30 feet above ground. Repairs were attempted from a ladder, but this did not give safe access. There were no riggers or scaffolders in the workshops, so advantage was taken of the already erected mobile scaffolding.

Site recommendations to avoid a recurrence of this incident include protection of the bare cable runs against contact by either personnel, scaffolding, or by the various wheeled vehicles that enter the workshops. A number of pictogram signs are also to be fitted on the wall standards warning of the presence of the electrical cables. These signs will carry a supplementary warning message written in English, Arabic and Urdu.

[maintenance, scaffolding, mobile, inadequate guarding, near miss

Lessons

A number of refinery workshops and stores contain overhead cranes, and usually the pick up of electrical power is from bare conductors rather than from a trailing cable system. There are proprietary guarding systems available for shielding bare conductors which allow contact through a narrow slot for the crane electric motors to pick up the electrical current. Home made methods of guarding are sometimes less effective and often it is forgotten to guard the top of the cable leaving a gap through which a man, say on a ladder, may still touch the cables with his hand. In stores areas the storage racks should not be built above a height where contact of bare conductors by a man standing on the racks is possible in any foreseeable manner, eg holding a long length of metal tubing in his hands.

Source : ICHEME

Location : ,

Injured : 0 Dead : 1

Abstract

A fitter was killed whilst removing an isolating spade from a 2-inch line connected to the bottom of a vessel.

There were no witnesses to the incident.

It seems that the fitter fell from scaffolding erected at a height of approximately 3.7 meters.

An investigation into the incident was carried out and the following found:

1. Inspection of the scaffolding platform showed that planking had been provided only directly under each of the two elevated despadding positions with a width of approximately 2½ feet at each end. There was a gap of 4½ feet in the platform between these two-planked sections.
2. After the accident a small escape of gas was seen to be coming from above the loosened spade in the 2 inch flange. When subsequently tested, the gas indicated a concentration of 350 ppm hydrogen sulphide (H₂S). The fitter had worn no breathing apparatus.
3. The shutdown procedure for the system of which the vessel formed an integral part involved depressuring to the fuel-gas system, venting via a 1 inch vent to a safe location into the atmosphere. No work had to be done on this vessel proper, so that it had not been gas-freed. After venting and draining of the vessel, the 2 inch spade was inserted without incident.
4. A check showed that, at the time of the accident, the 1 inch vent on vessel was closed.
5. At the time of the accident the vessel was exposed to the sun, so that some rise in pressure was to be expected, particularly with the vent closed.

[fall, fatality, maintenance, safety procedures inadequate]

Lessons

[None Reported]

1117616 March 1974

Source : ICHEME

Location : ,

Injured : 0 **Dead :** 0

Abstract

An operator fell into the water while attempting to board a fully laden barge at a jetty. He was immediately rescued by other operators and, after changing his clothes, resumed work.

The operator was boarding the loaded barge via a ladder held by two operators to take samples because the barge was some metres below the level of the jetty deck, the ships gangway could not be used. Unfortunately a gust of wind twisted the ladder and the operator fell into the water.

The risk of falling into the water at this part of the jetty had been recognised and the installation of a fixed ladder at the jetty was recently approved and a work order issued the day prior to the incident.

[testing, marine transport, ladder, design or procedure error, fall]

Lessons

[None Reported]

Source : ICHEME

Location : ,

Injured : 1 Dead : 0

Abstract

A cooling water line had been cut to enable a pair of flanges to be installed, and during the chamfering of the cut ends by means of a flame cutter, a minor explosion occurred. In hastily leaving the scaffolding one of the contractor's employees fell and was severely injured. Although the line was declared gas free before hot work commenced, subsequent investigations showed that a high concentration of combustible gas was present in that section of water line.

This incident emphasises the need for competent gas testing and that during the training of personnel it is vital to provide instruction in the identification of a rich mixture. Failure to detect the initial flick of the pointer can be disastrous since this single movement is followed by null readings. Sufficient attention to this important aspect of gas testing is not always given.

[hot work, line, testing inadequate, explosion, fall, injury]

Lessons

The incident also illustrates the importance of ensuring the absence of combustibles whenever hot work is to be carried out on service lines (e.g. air, water, inert gas, condensate).

Source : ICHEME

Location : ,

Injured : 0 Dead : 0

Abstract

A tapered plug was being removed from one end of a tube bundle (U-tubes) by tapping with a hammer when the plug was ejected from the tube with sufficient force to penetrate a 14 gauge steel sheet screen and continue travelling a further 20 feet. The tube bundle operated in the desulphuriser effluent condenser on a catalytic reformer, with desulphuriser reactor effluent through the tubes and salt water on the shell side.

The tube bundle had been washed and pressure jetted externally in the special area allocated for this duty. Upon examination of the bundle, it was recommended that seventeen tubes which had been plugged in February 1971 following signs of external wastage of the tubes, should be removed to allow further inspection of the tubes deeper into the tube nest.

To do this, it was necessary to remove the plugs with the result described above. The remaining plugs were ejected in the same manner but under controlled safe conditions.

Analysis of the liquid ejected from the tube showed it to be water with 1300 ppm of sodium chloride.

There were no traces of organic material.

[tube failure, processing]

Lessons

Tubes which have not failed and are plugged off should be deliberately punctured beforehand.

Source : ICHEME

Location : ,

Injured : 1 Dead : 0

Abstract

On 19th January, a contractor's employee was operating a jackhammer to excavate for the installation of a new pump bed on the No. 1 Crude Unit. Whilst squaring off the excavation the drill slipped and penetrated the grouting on top of a cable trench, piercing a 3,300 volt cable. The jackhammer operator sustained only a slight shock.

A pump bed already existed, but to allow the installation of a larger pump, this bed had to be removed and another, bigger one, made. The work was being done by contractors, who had already installed a similar bed on the No. 2 Crude Unit.

The contractor arrived on site at 08.00 hours and enquired if an excavation permit was available.

Finding that the permit had not yet been issued he contacted the construction supervisor, who arrived very shortly with the 'permit'. The contractor witnessed the signing of the Site Acceptance by the supervisor, who then took the contractor to the job and explained what was to be done, and the precautions to be taken. The contractor marked out three sides of the excavation, but not the fourth side (the south side) which was the side on which the jackhammer was working when the 'near miss' occurred. The contractor remained on site until the bulk of the excavation was completed and told his employees that there was no need to go any nearer the cable trench, as sufficient paving had been broken out. The contractor then left the refinery. The jackhammer operator decided then to square off the corners of the excavation, and whilst he was doing this the drill slipped, and penetrated the cable trench and the cable. When the drill hit the cable it tripped the pump being supplied by the cable. Unit operating personnel immediately investigated, stopped work on the excavation, and had the pump isolated at the sub-station. Repairs were made and only a marginal loss of production resulted.

An investigation was completed it was found that:

1. The recognised procedures, both in the issue of the 'permit' and drawing, and the subsequent briefing of the contractor by the Construction Supervisor had been followed.
2. Adequate drawings had been supplied to the contractor.

[excavation damage, operator error, construction]

Lessons

The following recommendations were made:

1. The use of a jackhammer in close proximity to electric cables is strongly not recommended, because precise control is not possible with this tool.
2. The grouting above the cable trench was sub-standard and should have been replaced when this was known.
3. The 'permit' should have been more detailed.
4. Where concrete is broken in close proximity to electric cables the machine should be capable of precise control.
5. 'Permits' require to state in more detail the hazards associated with the job, and the limitations to be imposed because of these hazards. Contractors' employees should be permitted to read the 'permit' when supervision by the contractor is not continuous.
6. Cable trenches should be protected with timber in the vicinity of the excavation.

Source : ICHEME

Location : ,

Injured : 0 Dead : 0

Abstract

As a welder attempted to light the torch of an oxy-acetylene welding set in an oil storage depot, a flame flashed to the neck of the bottle. The flame, which was approximately 8ft in length, was too fierce to permit the valve of the cylinder to be closed. The fire alarm was sounded and the depot fire brigade cooled the cylinder with water spray from two hoses. When the municipal fire brigade arrived, they continued cooling the cylinder for a further hour before extinguishing the flame. They then removed the cylinder to a safe place in the open air where it was immersed in a bath of water and allowed to remain there for 24 hours, venting to atmosphere through the water.

The leakage of gas was from a defective seal below the main valve.

[seal failure]

Lessons

This incident underlines the importance of good maintenance for this type of equipment.

Acetylene is an extremely unstable compound and there is a danger of the cylinder exploding.

The action taken by the fire brigade illustrates how this situation should be handled. The emphasis however, that sprays and not jets should be used, as the sudden contraction of the metal caused by a jet may cause the cylinder to rupture.

Source : ICHEME

Location : ,

Injured : 3 Dead : 1

Abstract

During the overhaul of a crude distillation unit a worker was killed and three others received severe injuries.

The workers were working in or around the top heat exchanger in a bank of two about nine feet above the ground. The shell cover was the usual dish shape with rim flange about 40 inches in diameter and weighing 885 lbs, clearance between the shell cover and the floating tube sheet was sufficient under normal circumstances to permit movement of the tube sheet within the enclosing shell cover as required by the expansion and contraction of the exchanger tubes. All the bolts holding this cover had been removed before the accident and various means were being used in an attempt to remove the shell cover on the day of the accident as well as the two previous shifts. The chamber block was attached above the cover to support its weight as it came free from the exchanger shell and wedges had been driven between the shell cover flanges to help prise the cover loose. Coffing hoists, hydraulic jacks and other means had been used but none of these had been successful.

Sometime during the evening shift of the previous day, a steam hose was connected to a 3/4 inch tapped vent opening in the shell cover and 125 psig steam was admitted behind the cover for the purpose of heating and loosening the coke which it was thought was helping to hold the cover in place. Prior to this, an outlet for the steam was provided by removing the valve and pipe nipple from a 3/4 inch tapped opening in the bottom shell nozzle and, when steam was introduced into the shell cover there was evidence of some flow from this opening.

On the day of the accident the workmen had returned from lunch and were on the scaffold at the end of the exchanger. One of them was preparing to strike one of the wedges when without warning the cover blew off with great force striking the men. It was evident afterwards that steam under pressure had been trapped inside the shell cover resulting in the violence in which the cover separated. Fatality.

[overpressurisation, maintenance, injury]

Lessons

Recommendations made after the enquiry were mainly mechanical in nature:

1. Scalloping of the tube sheet for better circulation and the possibility of less coking.
 2. Leaving sufficient retaining bolts in the cover to withstand the maximum possible steam pressure so that when the cover is freed, it will be impossible for it to fly off.
 3. Low pressure steam should be used in preference to high pressure steam since it is the heat effect which is the main benefit in removing coke and gummy deposits.
-

Source : ICHEME

Location : , UK

Injured : 1 Dead : 0

Abstract

Work was being carried out in the vinyl chloride monomer (VCM) storage area. Vessels were being pressurised with nitrogen and a soap test being made of all flanges to determine leaks. The maintenance department were in the process of tightening down flanges which were known to be leaking.

On worker climbed onto the scaffolding to tighten down the bursting disc flanges. On pulling up on the bolts, the spanner slipped off and he stumbled backwards. There was only a single tube handrail without toeboards, the man passed under the rail and fell 23 feet to the ground. The works emergency services were called and the worker taken to hospital to receive medical treatment for his injuries, which included rupture to his spleen and stomach.

[fall, scaffolding, inadequate guarding, maintenance inadequate, testing, injury]

Lessons

The investigation concluded that all scaffolding erected should be of the correct standard and that it is inspected prior to use.

Source : ICHEME

Location : ,

Injured : 0 Dead : 0

Abstract

A road tanker arrived with 4 tonnes of propylene oxide to get ethylene oxide for a mixed load. The ethylene oxide started leaking from a coupling which had not been pressure tested. The leak was washed with water but when trying to tighten the coupling the spanner fell to the ground and ignited the ethylene oxide. The fire was quickly extinguished. Two threads of the coupling were found in poor condition.
[fire - consequence, mechanical spark]

Lessons

[None Reported]

Source : ICHEME

Location : ,

Injured : 30 Dead : 2

Abstract

An explosion occurred in the reactor system of the acetic acid plant during shutdown. The explosion occurred when using an abrasive wheel on a waste heat condensables line and just when the line was perforated. The dome of the reactor which was being unbolted at the time was lifted off. After investigation, it was found that the abrasive wheel was capable of generating red heat inside the pipe of a sufficiently high temperature at the cutting point to provide a source of ignition. The procedure for shutting down the plant did not intend to make the system free of flammable gases. Fatality.

[modification procedures inadequate, operation activities, reactors and reaction equipment]

Lessons

1. Revised routine procedures for preparing the reactor system for engineering work should be adopted.
 2. The existing procedures for preparing plants or individual sections of plants for engineering work or entry should be examined in accordance with the revised routine procedures.
 3. As far as is practicable, the introduction of sources of ignition into areas where there may be flammable material should be avoided. Where their use is necessary, each situation must be treated as one of an extraordinary nature demanding special attention.
 4. Within the general principles of the existing permit-to-work system, a review should be carried out to bring the system up-to-date. In particular, this review should cover the following points:
 - a. An improvement of the current definition of sources of ignition.
 - b. Consideration of the additional hazards involved when a number of men are working, in a confined area, on different jobs, often covered by different types of permit.
 - c. Consideration of the case for instituting separate hot work and entry permits.
 - d. A further examination of the precautions required before entry into a confined space is permitted.
 5. The programming of engineering work should include arrangements for the provision of appropriate permits-to-work, and this should be an important feature in the consideration of the work lists by production and engineering personnel.
 6. Improved training of permit signatories, highlighting the hazards involved on particular plants and with particular engineering equipment, is required. Refresher courses for permit signatories should be carried out annually and should provide a critical review of the system.
 7. An effective monitoring of the operation of the permit-to-work system should be instituted.
-

Source : GUGAN K, UNCONFINED VAPOUR CLOUD EXPLOSIONS, ICHEME, 1979; LOSS PREVENTION BULLETIN 006, LOSS PREVENTION BULLETIN 042, LOSS PREVENTION BULLETIN 077, 1-9 LOSS PREVENTION BULLETIN 080; HAZARDOUS CARGO BULLETIN, 1985, JAN, 33-35; FIRE INTERNATIONAL, 1966, 12, 17-21.

Location : Feyzin, FRANCE

Injured : 52 **Dead** : 21

Abstract

An incident occurred at a refinery in part of an LPG storage facility containing: four spherical pressure vessels used for propane, 4 spherical pressure vessels used for butane, 2 horizontal bullet pressure vessels used for propane and butane and 10 floating roof tanks used for the storage of finished grades. The 8 spherical LPG storage vessels were built inside a bund, each were provided with fixed watersprays, on top of each was a three-way valve beneath two identical pressure relief valves and all had fireproofed supports. Samples were taken regularly from the spheres and a sampling procedure had been set up because of valve freezing problems. On the day of the incident an operator was draining water from a propane sphere but failed to follow the correct procedure. The resulting vapour cloud spread until it was ignited by a car on an adjoining road. The pool of propane in the bund caused the storage sphere to be engulfed in flames. The vessel became overheated and eventually a BLEVE (Boiling Liquid Expanding Vapour Explosion) occurred when the sphere ruptured. This resulted in a fireball which killed and injured firemen and spectators. Flying missiles broke the legs of an adjacent sphere which later BLEVE'd. Three further spheres toppled due to the collapse of support legs which were not adequately fireproofed. These vessels ruptured but did not explode. The cause of the propane leak was the operational fault of the plant operator (human error). This fault was made easier by the difficult access to the valves and the lack of permanent valves. Fatality.

[operator error, storage tanks, vapour cloud explosion, injury]

Lessons

The incident was the worst which had occurred in petroleum and petrochemical plants in Western Europe, prior to 1974. Since then, many pressurised tanks containing liquefied gases have BLEVE'd. The hazards are now better understood and storage spheres are protected from fire engulfment by better design. However, so many firemen and emergency servicemen have been killed while trying to control large fires that the cautious philosophy is to evacuate and take shelter until the material burns itself out. BLEVE's produce intense thermal radiation from the fireball. This and blast damage from the bursting pressure vessel are relatively localised compared with unconfined vapour cloud explosions. Therefore, evacuation of up to 0.5 km will usually ensure the safety of people. Burning hydrocarbon storage vessels are very spectacular but unpredictable. Therefore, newsmen and sightseers must be kept well away for their own safety.

Source : LOSS PREVENTION, VOL. 3.

Location : ,

Injured : 0 Dead : 0

Abstract

Ethylene decomposed in the high pressure cylinder of a compressor in a process polyethylene plant. A leak in a three quarter inch diameter line resulted, a torch fire impinged on an adjacent unit causing the line to rupture explosively. The shock loosened the roof and a fire burned for some time in the vegetable fibre insulation on top of the light weight concrete roof decking. Sprinklers kept damage to a minimum.
[decomposition, explosion, fire - consequence, damage to equipment]

Lessons

[None Reported]

Source : ICHEME

Location : ,

Injured : 1 Dead : 1

Abstract

One man entered a vessel which had contained recovered butadiene to remove some sticky white-ish rubbery residue from the vessel bottom prior to inspection of the vessel. While removing some of the residue with a beryllium-copper shovel there was a flash and both the man inside the vessel and the one standing by outside were burnt. Investigations showed that the most likely cause of the explosion was the presence of a small but concentrated amount of butadiene peroxide held in a pocket of the residue on the floor of the tank. When disturbed by the shovel it spontaneously ignited, either by contact with the air, or because of the shock received from the shovel hitting it. This caused a mild explosion and the flash ignited the two men's latex contaminated clothing. Fatality.

[cleaning, entry into a confined space, cleaning inadequate, hand tools, burns]

Lessons

As a result of the investigation into this accident, and the analytical report, the following recommendations have been made to prevent a similar formation of butadiene peroxide occurring.

1. The inhibitor concentration (tert. butyl catechol) in recovered butadiene should be maintained at not less than 200 ppm. The maximum permissible concentration of oxygen in the recovery system to be set at 2000 ppm. and this must not be exceeded.
 2. All vessels and other containment places in the recovery system in which butadiene peroxide may form should be boiled out with water, the temperature being raised at a rate not greater than 0.5c/min. and held at boiling point for at least 12 hours once every 12 months. If experience shows that butadiene peroxide may have formed at an increased rate more frequent boiling out of these vessels should be done.
 3. Before any person enters any vessel which has contained butadiene the vessel should be boiled out as recommended.
 4. If, after this treatment any residue is found, a sample should be taken (preferably by a grab method) and tested by the hot plate test to observe how the residue decomposes. Where this test indicates rapid decomposition the vessel should be further treated by boiling out with a suitable alkaline solution.
 5. That trials to be carried out with known fire resistant clothing and with available methods of laundering contaminated clothing.
-

9558 09 July 1957

Source : ICHEME

Location : , UK

Injured : 0 Dead : 0

Abstract

A fitter burning the last bolt to remove a manhole cover from a 5m³ ammonia liquor filter drum. Torch about one inch away ignited the gas coming out of the drum. The explosion blew cover off.

[drums, hot work, hot surface]

Lessons

[None Reported]

4809 Date Unknown

Source : LOSS PREVENTION BULLETIN, 024, 161-162.

Location : ,

Injured : 0 **Dead :** 0

Abstract

A clearance certificate was made out for electrical work on an overhead crane. The intended job required good primary isolations, whereas the job description on the certificate was taken to mean that secondary isolations would be satisfactory and these were carried out.

The man who accepted the certificate did not read it thoroughly, beyond noting that the section on electrical isolations had been completed. Consequently he started work on the live side of the isolations and only discovered his danger when he had exposed the cable connections and found they were live. The tradesman did not have his test lamp readily available, so after making a visual check of the relevant switch gear he earthed the terminals with a screwdriver.

Fortunately, the resulting flash did not cause any burns.

[isolation inadequate, preparation for maintenance]

Lessons

[None Reported]

Source : LOSS PREVENTION BULLETIN, 131, 8-9.

Location : ,

Injured : 1 Dead : 1

Abstract

During an operation to weld an access ladder on the side of a surge tank, an explosion occurred. After the explosion the resultant fire in the tank was extinguished within 20 minutes through foam application by the local fire department. Fatality.
[fire - consequence, welding]

Lessons

The following conclusions and recommendations were made:

1. Each unit should carefully review their work practices and training for handling maintenance/operational situations involving closed systems containing hydrocarbon/air mixtures.
 2. Consideration should be given to either removing all flammable materials, or applying inert atmospheres in such situations.
 3. The results of this investigation should be communicates to all operations throughout the company.
 4. The unit involved should review with all operations and maintenance personnel the necessity to isolate equipment from all energy sources prior to the commencement of work. Whilst not a probable contributing factor in this incident, locking out the tank prior to the commencement of work was not considered.
-

Source : LOSS PREVENTION BULLETIN, 107, 27**Location :** ,**Injured :** 1 **Dead :** 0

Abstract

Valve failure causes injury. A 1.8 m diameter butterfly valve operated pneumatically providing a rough pressure control in a pipeline carrying gas to gas coolers. Occasionally the valve and line were liable to blockages due to scale build up and these were usually cleared by spraying hot water onto the line and valve. It was sometimes necessary to free the blockage by applying the pneumatic pressure from the controlling cylinder and striking the valve with a hammer. On the occasion of the accident, the usual methods had been employed to clear a major blockage without success. The senior plant controller decided to isolate the power cylinder, remove the pivot pin from the linkage and attempt to manually force the valve through its complete operating range. The pivot pin having been removed by a colleague, the valve suddenly freed and swung in a clockwise direction trapping the controllers right hand and arm between the butterfly valve arm and the piston linkage causing lacerations to his fingers and a double fracture to his wrist.

It was thought that the unexpected weight of scale on the valve combined with the valves own momentum resulted in a load too great for one man to hold.

[flow restriction, injury]

Lessons

[None Reported]

2094 Date Unknown

Source : ICHEME

Location : ,

Injured : 0 Dead : 0

Abstract

A minor explosion occurred when a contractor was flamecutting an old cooling coil in this scrap- metal yard.

The coil had contained naphthalene and although it had been steam cleaned, this had not completely removed all the hydrocarbon which had re-solidified and blocked the lower turns of the coil.

The probable cause of the explosion was either trapped water or naphthalene vapour in the pipe which was heated up by the cutting torch.

The company that had scrapped the coil provided a safety certificate following a visual inspection of the coil and before it was allowed to be removed from the site by the contractor. The authorised signatory however, had not witnessed the actual cleaning operation.

Lessons

[None Reported]

Source : ICHEME

Location : ,

Injured : 1 Dead : 0

Abstract

A maintenance contractor fell off a mobile scaffold and fractured his skull when he decided to climb down after feeling unwell during the repair of a leaking valve gland. He was working with a colleague repairing leaks on an amine unit prior to start-up. Although he was wearing a half mask air-line breathing apparatus, investigations have indicated that he had been exposed to hydrogen sulphide (H₂S). His colleague who was wearing a full face mask air-line breathing apparatus was unaffected.

The amine plant was being prepared for start-up following a scheduled overhaul. Isolation blanks had been removed and equipment and pipework had been purged with nitrogen and pressurised to 1.5 bar and left to 'float' on the flare system. A number of leaking flanges were found and these had been tightened up after the system had again been purged with nitrogen. A small purge of nitrogen was kept on the unit during this maintenance work to prevent backflow from the flare system since the unit could not be positively isolated from the flare header without shutting down the whole plant.

Two maintenance contractors were allocated to rectify the leaks and a cold work permit was issued by the Operations Department and accepted by a contractor's chargehand who had been authorised to accept permits to-work. The permit stipulated that air-line masks must be worn and that the unit would be purged with nitrogen while work was in progress. The work had proceeded without any problems for two days prior to the day of the accident. On the third day, the contractors were attending to a leaking valve gland on the top of the regenerator reboiler approximately 3.5 metres above ground level. To get to the valve, the contractors put up a mobile scaffold from where they could climb onto the reboiler top to reach the valve which was sited on a branch approximately 1 metre from the end of the vessel. When they had loosened the bottom flange bolts to remove the valve for repair, gas came out and so they decided to consult with the operating staff before proceeding further. Both men were wearing air-line breathing apparatus taken from the same nearby air supply. One man wore a half mask and the other a full face mask, and neither could smell any H₂S.

A fireman nearby noticed a strong smell of H₂S and carried out some gas checks. He found that the explosimeter gave a full scale deflection at the leaking flange and the Draeger tubes detected 150-200 ppm H₂S about 1 metre from the flange. The flange was tightened up by the contractors (wearing breathing apparatus) and the job was discontinued. Operating staff gave permission to proceed with the removal of the valve after the unit had been thoroughly purged with nitrogen again.

The valve was then completely removed from the pipework. One contractor worked on the valve on the scaffold platform wearing a half mask while the other contractor wearing a full face mask worked on the pipe flanges, cleaning the surfaces. During this period the contractor's chargehand not wearing breathing apparatus, inspected the flanges and approved the installation of the valve. There was a strong smell of H₂S but not to an extent that disturbed him. While the valve was being fitted back into the pipework, the contractor wearing the half mask began to feel unwell and signalled to the other man that he was climbing down. As he began to climb down the scaffold, he took off his half mask breathing apparatus and at the same time fell and landed on a concrete slab fracturing his skull.

After investigation it was found that;

1. Checks carried out 15 minutes after the incident showed the level of H₂S at the branch pipe on the reboiler to be 20-40 ppm, and 5 ppm approximately 1.5 metres away.
2. Medical examinations carried out at the hospital after the accident to determine whether either contractor had been exposed to H₂S proved negative.
3. The breathing apparatus and air supply were thoroughly examined after the accident and no defects were found.
4. The contractor who suffered injury was wearing a half mask which was not fitted correctly but constant air-flow should have prevented any in-leakage of H₂S. He stated that he inhaled gas just before the accident and then felt sleepy and unwell.
5. The mobile scaffold had been constructed by the contractor in his workshop. It did not meet legal requirements and was banned from further use by the Factory Inspector after the accident (A large gap in the flooring, no toeboard, poor access etc.).
6. The contractor's men had never received any formal training in the use of breathing apparatus.
7. A contributory factor may have been reduced level of contractor and refinery maintenance supervision in the field.

[fall, scaffolding, repair, injury]

Lessons

The following recommendations were made;

1. The procedures for preparing plant for maintenance are to be made more stringent so that, if at all practicable, work on piping systems will not be permitted until the section has been isolated with blanks.
2. Before starting work on pipework that has contained H₂S, gas checks will be done to ensure that adequate purging has been carried out.
3. Training of contractors in the use of breathing apparatus will be reviewed.
4. Only full face breathing apparatus masks will be issued in future because it is more difficult to achieve a good fit with a half mask.
5. All flange connections on pipework containing more than 0.5% vol. H₂S in gas streams (0.5% wt in liquid streams) should be marked, e.g. with yellow paint.
6. All air-line breathing air outlets should be regularly inspected.
7. Responsibility for checking and maintaining scaffolds will be reviewed and new regulations will be issued.
8. Co-ordination procedures between contractors and refinery personnel will be reviewed in respect of legal liabilities so that areas of responsibility for supervision are clearly defined.
9. The issue of permits-to-work involving breathing apparatus will be reviewed.

7065 Date Unknown

Source : LOSS PREVENTION BULLETIN, 021, 83.

Location : ,

Injured : 1 **Dead :** 0

Abstract

A pair of steps was positioned by a fitter near an invisible steam leak. As soon as they were in a position the fitter climbed them and started to prepare for the rectification of the leak.

Before the job was started, i.e. within a minute or two of the steps being positioned, the maintenance supervisor approached the fitter and touched the steps. He drew a bright spark and received a bad shock.

The steps were equipped with nylon sledge runners rather than wheels and were consequently well insulated.

The incident illustrates the ease with which static electricity is generated and the desirability of earthing all hardware. Fortunately it occurred in a safe area, there being no risk of a spark ignited fire.

[electric shock, lack of earthing, ladder]

Lessons

[None Reported]

6976 Date Unknown

Source : LOSS PREVENTION BULLETIN, 012, 3.

Location : ,

Injured : 0 **Dead :** 0

Abstract

A minor fire occurred during the cleaning of a storage drum which had contained sour propane. Scaffolding planks just outside the manhead were ignited by pyrophoric scale which had been removed from the vessel.

[spontaneous combustion, fire - consequence]

Lessons

[None Reported]

Source : UNUSUAL INCIDENTS AT GAS WORKS AND THEIR LESSONS (PART III), COMMUNICATION NO. 564; TRANS. INST. GAS ENG.**Location :** , UK**Injured :** 0 **Dead :** 1**Abstract**

A gasholder was fitted with a "Davey" ladder. Users dislike this type of ladder because it has loose rungs that do not feel secure. A gang of painters had been working on the crown for some time, and whilst descending one man fell 80ft to his death when the top rung pulled clean out of the vertical stringer it was mounted in. The rung appeared to be in good shape and not unduly corroded. Force was needed to replace it in its slots. Nonetheless it came out without any apparent misuse.

[fall, fatality, design or procedure error, maintenance]

Lessons

Ladders of this type should be replaced by those with fixed rungs. Toehold should be maximised, and should preferably be more than 4 inches.

Breaks in ladders on spiral-guided holders can be difficult to negotiate, and can be improved by adding extra footholds.

Where straight, unbroken vertical ladders are used, these are tiring to climb, and small rest platforms should be provided at intervals not exceeding 30 inches.

Where back-guards cannot be provided, half-guards, open on the holder side, will give a degree of security.

Any work at height is of a hazardous nature, and, whenever possible, handrails should be provided.

Provision of safe access to all points of a holder will not only prevent accidents but will facilitate maintenance.

Source : LOSS PREVENTION BULLETIN, 018, 14.

Location : ,

Injured : 0 Dead : 0

Abstract

Whilst climbing down a ladder on an oil storage tank, an operator missed his hand hold and fell twenty feet to the ground sustaining a fractured leg. The cause of the incident was attributed to working at an unsafe speed with consequent inattention, and to the oily condition of the runners. It was recognised that he was required to operate an unsafe system of work, i.e. climb onto the top of the tank in order to gauge the fluid level (sight glasses were not fitted). [fall, safety procedures inadequate]

Lessons

Although not a commissioning accident, this is very typical of the kind of accident that can occur during commissioning, two important factors being hurried activity and an inherently unsafe system of work.

11462Date Unknown

Source : UNUSUAL INCIDENTS AT GAS WORKS AND THEIR LESSONS (PART III), COMMUNICATION NO. 564; TRANS. INST. GAS ENG.

Location : , UK

Injured : 4 Dead : 0

Abstract

A gang of contractors under a chargehand thought to be competent were required to paint an end wall of a high gable in a building. A scaffold was rigged with the following features:

1. A long ladder of 23 rungs and 4 inch side stringers was extended by lashing on a nine-rung ladder with 2 inch stringers. The top of the ladder was not secured.
2. A trestle was standing on a permanent platform.
3. Two planks, about 10ft and 15ft above floor level, were the working platforms for four men.

After some time, the extended ladder shifted and the whole scaffold fell away from the wall. All four men were injured.

[scaffolding, contractor error, safety procedures inadequate, people, maintenance, collapse, installation inadequate, injury]

Lessons

[None Reported]

Source : ICHEME

Location : ,

Injured : 1 Dead : 0

Abstract

An operator was severely injured when he fell from scaffolding after a minor explosion during the chamfering of the cut ends of a cooling water line with a flame cutter. Investigation showed that although the line had been tested and declared gas free before this work had been started, a high concentration of combustible gas had in fact been present.

[fall, testing inadequate, maintenance, injury]

Lessons

Personnel to be trained how to accurately detect the presence of gas before starting such work. In particular, they should be trained to identify that an initial flick of a pointer followed by a null reading does indicate the presence of a rich mixture. The incident illustrates the importance of ensuring the absence of combustibles before hot work is carried out on service lines.

1738 Date Unknown

Source : LOSS PREVENTION BULLETIN 026, 44.

Location : ,

Injured : 1 Dead : 0

Abstract

A piping contractor had to carry out a hydrostatic test on a new 6 inch diameter pipeline at 230 p.s.i.g. The man carrying out the test told his foreman that he could not get above 200 on the gauge using a hand pump. The foreman told him to pump harder and he did so, blowing the end off the pipeline. A fitter working on another job was blown from the pipe bridge and received serious facial injuries.

The pressure gauge was calibrated in (atmospheres) (200 ats = 2940 psia) and not in pounds per square inch (p.s.i.g). The word was written in small letters and the man carrying out the test did not notice it.

[operator error, testing, injury]

Lessons

[None Reported]

12691Date Unknown

Source : ICHEME

Location : ,

Injured : 1 Dead : 0

Abstract

An operator was injured when hydrocarbon and hydrogen sulphide gas was released. The incident occurred as a pump was being returned to service after repairs. The discharge valve was open and the pump pressures up. The injured was standing on a platform ladder when the pump bleeder thawed out and released hydrocarbon and hydrogen sulphide gas. The injured passed out and fell from the ladder. The incident occurred due to the bleeder valve being left open.

[gas / vapour release, fall, maintenance, maintenance inadequate, injury]

Lessons

[None Reported]

Source : ICHEME

Location : ,

Injured : 0 Dead : 0

Abstract

A fire occurred due to an uncontrolled gas kick that resulted in a sour gas and crude contaminating the atmosphere and ignited.

The subsequent fire destroyed drill rig and severely damaged six well platforms. In addition, once relief wells had been completed, repair work had to consider H2S precautions.

[fire - consequence, gas / vapour release, leak, damage to equipment]

Lessons

1. During relief well drilling the sour gas was purposely flared to reduce the H2S hazard.
 2. Proper installation maintenance and operation have been re-emphasized.
-

12880Date Unknown

Source : ICHEME

Location : ,

Injured : 0 Dead : 0

Abstract

A near miss incident. A carpenter was toe-nailing a scaffold kick plate when the nail flipped up as it contacted a knot after the hammer grazed the head. The flying nail struck his safety glasses, piercing half an inch through; fortunately it did not come into contact with his eye.
[personal protective equipment]

Lessons

This incident illustrates the importance of wearing safety glasses whether at work or at home.

10023Date Unknown

Source : ICHEME

Location : ,

Injured : 0 Dead : 2

Abstract

In order to replace the gasket of a road vehicle tank manhole, the driver and a mechanic were attempting to remove the manhole cover. Considerable force, which may have involved a hammer, was apparently applied to loosen one of the retaining bolts. At this moment an explosion took place inside the tank compartment which killed both men, destroyed the vehicle, extensively damaged the workshop and shattered windows in nearby offices. Apparently the tank, which had previously carried gasoline, had not been cleaned or gas freed since no 'hot' work was to be done.

[cleaning inadequate, friction spark, gasoline, road tanker, operation omitted, explosion, fatality]

Lessons

This incident was unusual as research has shown that the hand held tools used were not capable of creating an incendive spark when impacting steel.

However, it is possible that there may have been a chip of silica or some other hard material such as flint embedded in the head of the hammer which caused the friction spark.

Vehicles to be gas freed before any maintenance is carried out on the tank involving the use of major force.

7686 Date Unknown

Source : HUMAN ERROR, ICHEME, TRAINING PACKAGE, 008, 35.

Location : ,

Injured : 1 Dead : 0

Abstract

A man was using a shovel to remove a small amount of gravel. He injured his back.

[injury]

Lessons

The following recommendation was made:

Many back injuries, at home and at work, are due to the use of wrong methods. Training in kinetic handling is needed.

9689 Date Unknown

Source : ICHEME

Location : , UK

Injured : 1 Dead : 0

Abstract

During demolition of a tank a workman was about to start cutting the floor of a fuel tank with a burning torch, when a wide section of the tank shell was forced inwards by a gust of wind striking him on the back, sustaining a fractured pelvis.

[strong winds]

Lessons

[None Reported]

Source : LOSS PREVENTION BULLETIN, 141, 16-17.

Location : ,

Injured : 0 **Dead :** 0

Abstract

The radioactive source concerned, Cobalt-60, was used to detect the liquid level inside a caustic soda tank. This tank was to be emptied and cleaned prior to inspection. In order to do this, it was first necessary to remove the source. This was done and a plug was placed in the source output. A positive check that the plug was in place was made and the source container placed on the scaffolding that was used for access to the tank top. The tank was then opened up and cleaned.

During inspection the next day, the Inspector picked up the source container, noticed that the plug was missing and replaced the container on the scaffolding. On the next day, a fitter and colleague noticed the plug lying on the floor under the tank. They reported this to their supervisor who arranged for the plug to be replaced. At this stage, it fell out again, thus indicating that it was not a 'tight fit'. It was estimated that the plug had been out for about 24-48 hours. At this point, concern about possible effects of radioactivity were expressed. Calculations were carried out and it was concluded that, in fact, no harm had occurred because the radioactivity levels to which personnel were actually exposed, were very low, due to the age of the source material.

Investigation of the incident:

It is worth stating at this point that this incident occurred nearly twenty years ago. Thus, many perhaps all of the recommended actions will be standard practice today. Nevertheless, it is useful to reiterate them as a guide to good practice in an area with such high potential for serious injury.

[cleaning, entry into confined space, near miss]

Lessons

The recommendations fell into three broad categories: organisational, procedural, and systems.

Organisationally it was recommended that:

1. The site formally recognise and define a post of Radiological Safety Officer (R.S.O.);
2. Responsibility for all radioactive sources - fixed and mobile - be under the R.S.O;
3. Responsibility for compliance with the Radioactive Substances Act - then 1960, now 1993 - be under the R.S.O.

Procedurally it was recommended that:

1. Permits to work on vessels that incorporate radioactive sources must include reference to such sources and to the person(s) with responsibility for supervision of work on them.
2. Plant operating and maintenance procedures must contain appropriate reference to requirements for work involving the source.
3. All relevant operating and maintenance personnel receive appropriate training and instruction regarding sources.
4. Definitions for reporting radioactive incidents be incorporated into reporting procedures. With regards to systems - equipment - it was recommended that:
5. The source might be surrounded by a mesh cage to prevent unauthorised or accidental access during operation.
6. A suitable locking mechanism for the plug be installed.
7. A safe storage place be provided, away from the work area, for source storage when out of use for maintenance.
8. Appropriate equipment for safe transport to and from this storage place be provided.

In addition to all of the above and further to the investigation itself, it is essential to comply with all statutory and advisory requirements regarding the use of radioactive sources. Systems for achieving this can range from the provision of a full-time in-house Health Physics Advisory Service interacting with national advisory and regulatory authorities, principally the National Radiological Protection Board and the Nuclear Installations Inspectorate, to direct contact with these authorities via a small number of persons with defined responsibilities for such matters. Appointment of an R.S.O. as recommended in this case, would be an example of the latter.

Source : ICHEME

Location : , UK

Injured : 1 Dead : 0

Abstract

Marine transport. Whilst alongside the port, a supply vessel was having her foremast painted by a deck hand. The working practice adopted involved standing on the fixed mast ladder, holding the ladder with one hand whilst painting the mast using the other. A safety harness was worn with a lanyard attached to a ladder rung. Whilst working downwards, the deck hand periodically transferred the lanyard clip to a lower, more suitable ladder rung. At a height of approximately 20 feet above the deck, whilst transferring the lanyard clip, the deck hand fell from the ladder in which he sustained serious injury. [maintenance, fall]

Lessons

1. Although the deck hand was wearing a safety harness with an attached lanyard in accordance with "code of safe working practices for merchant seamen", the accident could have been avoided if the safety harness had incorporated two lanyards, such that while transferring one lanyard to a lower rung the harness would have still been attached to a secure lanyard.
 2. An alternative means of protection from falling when using a fixed ladder is the provision of a vertical rail system. The rail is attached to the inside of the ladder and is used in conjunction with a safety harness, lanyard and internal clamp device.
-

Source : ICHEME

Location : ,

Injured : 0 Dead : 0

Abstract

A fitter received an acid burn to his left arm whilst spading a 1" sulphuric acid line.

During maintenance work the fitter was fitting a spade to the downstream sides of the ball valves. He inserted the spade and commenced to tighten the joints.

As he was lining up the bolts his spanner slipped and he knocked the handle on the top of the valve. Sulphuric Acid sprayed out and down his outstretched left arm between his gloves and coverall suit sleeve burning his arm.

[burns]

Lessons

Removal of the ball valve handle is considered the most practicable solution in rendering the valve inoperable during similar maintenance activities.

Source : ICHEME

Location : ,

Injured : 1 Dead : 0

Abstract

During isolation of a sulphur recovery unit at a refinery in preparation for major maintenance work.

A fitter was instructed to swing a spectacle blind at a valve on a depressured sour gas line about 6m above ground level. There was a permanent platform giving access to the blind, however this was severely obstructed by scaffolding erected to provide access to other blinding points at a higher level.

The fitter, wearing self-contained breathing apparatus (B.A.), opened up the flanges and turned the blind. He then tightened up the flanges on four bolts only. He removed his B.A. and intended to continue replacing the remaining bolts. As he bent over the flanges he noticed that one of the gaskets was not properly seated and he detected a smell of hydrogen sulphide. As the normal route away from the blinding point was obstructed with scaffolding, in order to escape, he climbed over the handrail of the permanent platform he was on and stepped on to some pipework intending to reach another adjacent platform. Before he reached the platform he lost consciousness and fell 6m to the concrete floor sustaining severe injuries.

On reviewing the circumstances of the incident the refinery were concerned that the scaffolding erected for other work had blocked the fitter's safe route away from the job. This had also made working conditions at the flanges very cramped. In future, planning of the work and erection of scaffolding will be looked at more critically. An instruction has also been given that before B.A. is discarded on similar work the equipment must be checked as gas tight by operating personnel also wearing B.A.

[blind/spade/slip plate, fall, slip plate insertion/removal, safety procedures inadequate, injury]

Lessons

The layout of scaffolding should take account of the additional problems associated with emergency evacuation by persons wearing B.A. and also the recovery of persons requiring assistance.

Source : ICHEME

Location : , UK

Injured : 0 Dead : 0

Abstract

A property damage accident occurred involving a welding set.

A technician whilst coupling the Tig pipe union to the shield gas union on the welding set inadvertently applied too much pressure on the spanner. This caused the body of the shield gas solenoid valve (located inside the set) to turn and at the same time tightening two interconnecting cables between the solenoid valve and printed circuit of the controller.

The short circuit that followed caused considerable damage to the internal wiring looms.

[damage to equipment]

Lessons

Users of this equipment are advised to take the necessary steps to prevent excess force being applied when connecting this particular union.

In this case the company concerned approached the manufacturer of this equipment with a view to providing a modification in the form of a support bracket to shield the gas solenoid valve.

Source : LOSS PREVENTION BULLETIN, 090, 9.

Location : ,

Injured : 0 Dead : 0

Abstract

Problems were encountered with the discharge from a pilot plant, batch operated centrifuge containing an internal filter cloth. To check that it was running true, a fitter, therefore, disarmed the microswitch on the lid and leaned over to observe rotation of the basket. Whilst so doing he accidentally dropped a spanner into the basket necessitating a crash shut down.

[maintenance, plant shutdown]

Lessons

Equipment and pipelines should be thoroughly decontaminated before outside personnel are allowed to work on them. Only properly secured access equipment should be used and climbing on pipework, plant fittings, etc. should be prohibited. In addition to any protective gear required to guard against exposure to materials handled, personal protection should include appropriate foot and head wear. A strict standard of housekeeping is of paramount importance, hoses should be coiled and replaced immediately after use and never left trailing across part of the floor. Regular facility inspections are crucial as a means of monitoring compliance with company policy and codes.

Source : DUST EXPLOSION HAZARDS, ICHEME, TRAINING PACKAGES, 022, 4.42.

Location : ,

Injured : 0 Dead : 0

Abstract

Explosion in metal pulverising plant. During cleaning with aluminium shovels, an explosion occurred resulting in a fireball and fine manganese dust being emitted from the ball mill return chute. Vent panels 3 and 4 opened at the top of the elevator with an expulsion of flames. Although the maintenance crew were enveloped in a cloud of dust, fortunately this did not ignite and nobody was injured in the incident.

Although the bucket elevator was protected by pressure relief panels, mechanical damage was sustained at the top section.

[solids processing equipment, damage to equipment]

Lessons

Test needed:

1. MIE (minimum ignition energy) to evaluate electrostatic risk.
2. MIT (minimum ignition temperature) to determine sensitivity of dust cloud.
3. 20 litter sphere test for explosion relief design.
4. Train firing tests is not necessary as finely divided materials are known to be pyrophoric when moist.

The potential for thermite sparking in the presence of MnO and MnO₂ also needs to be considered.

10900Date Unknown

Source : ICHEME

Location : ,

Injured : 0 Dead : 2

Abstract

A painting foreman and a painter died when the scaffold from which they were working collapsed, and they fell nearly 48 ft to the ground. The men were painting the exterior sides of a 48ft h x 56ft d tank, from a two point suspension scaffold supported by two steel outriggers.

The scaffold manufacturer specified 600 lbs. of counterweight for this scaffold and load, but the painters had rigged the scaffold using only 200 lbs. of counterweight (100 lbs. per outrigger). The outriggers were not tied off or otherwise secured - no personal fall protection equipment was being used by either worker. While the two men were working on the scaffold, their weight caused the outrigger to slip, and the scaffolding, rigging and victims fell to the ground.

[scaffolding, design or procedure error, maintenance, fatality]

Lessons

[None Reported]

Source : HUMAN ERROR, ICHEME, TRAINING PACKAGE, 008, 39-41.

Location :

Injured : 1 Dead : 0

Abstract

A worker went up a ladder and onto a walkway alongside a fragile roof. There were handrails between the walkway and a roof notice gave clear warning that the roof was fragile. The man dropped a torch onto the roof and climbed over the handrails onto the roof to retrieve it. He tried to balance on the cross-girders but fell-through the roof and was injured.

[fall, operator error, injury]

Lessons

[None Reported]

Source : INSTITUTION OF GAS ENGINEERS JOURNAL, MARCH 1970.

Location : , UK

Injured : 0 Dead : 0

Abstract

A 84,000 cu.m.(3 million cu.ft.) four lift water sealed gasholder had been shut off about 2 sheets from full, to allow an electrical antifreeze element to be suspended from the tank balcony. One cold, but sunny, morning an electrician was completing the drilling of the necessary holes in the tank balcony, using an electric drill. The heat of the sun had caused expansion of the gas in the holder, which was observed to be about to blow. The electrician was told to stop work until stock in the holder had been reduced. However, he had only one more hole to drill

and decided to do this before knocking off. The holder blew, the gas was ignited by the drill, the heat of the resultant fire caused further expansion of the gas, and led to flames 6 to 9 metres high burning around the holder shell. Failure of riveted joints and burning of the jointing tape allowed further gas to escape, intensifying the fire further, so that it was a considerable time before the fire could be extinguished, with the controlled evacuation of the contents of the holder while the Fire Brigade kept the upper lifts of the holder cool.

Damage to the gasholder necessitated resheeting of about 60% of the bottom lift, some re-riveting of the third lift, and total repainting of the entire structure. A claim was subsequently made for the death of 4 cows, alleged to have been due to eating sheets of paint carried by the wind into an adjacent field.

[storage equipment, fire - consequence, leak, maintenance]

Lessons

The report stated the following recommendations:

1. Specific personnel working in the vicinity of gasholders should be familiar with the possibility of the holder blowing due to rapid rises in temperature, and the risk of leaking gas becoming ignited.
2. General-appropriate precautions should be taken to avoid the ignition of flammable substances during maintenance and similar work and personnel involved should be adequately trained in the risks and the correct procedures.

Source : LOSS PREVENTION BULLETIN, 091, 13.

Location : ,

Injured : 1 Dead : 0

Abstract

A fitter's mate lost an eye when a piece of metal flew into it while trying to remove a steel sprocket by hitting it with a heavy hammer. This was due to his own failure to wear safety glasses.

[personal protective equipment, maintenance]

Lessons

[None Reported]

Source : LOSS PREVENTION BULLETIN, 102, 22,; QUARTERLY SAFETY SUMMARY, 1977, VOL.47, NO.188.

Location : ,

Injured : 1 Dead : 0

Abstract

An electrical craft assistant was cleaning the top of a battery, which was on charge, using a screwdriver wrapped with cloth. The screwdriver blade "bridged" two terminals causing an arc which ignited an explosive mixture in one cell. The cover and base of the cell were shattered. The craft assistant was struck in the face by flying debris and suffered serious eye injuries.

[explosion, safety procedures inadequate, injury]

Lessons

The following recommendations were made:

1. Battery tops should only be cleaned using non-conducting tools.
 2. Goggles should be worn at all times when working on batteries.
 3. Insulating caps should be fitted to fork lift truck battery terminals.
-

Source : LOSS PREVENTION BULLETIN, 102, 21.

Location : ,

Injured : 0 Dead : 0

Abstract

The batteries of a flameproof pocket torch were changed from the original batteries to those of a different manufacturer. After some time in the "on" position the torch was so hot that smoke was seen to be coming from it.

It appears that the new batteries have too small an isolation lid (0.5 mm) and the earth string connected the two poles causing a short circuit.

Lessons

Check your batteries so that they are fully compatible before changing them.

Source : ICHEME

Location : , USA

Injured : 3 Dead : 0

Abstract

An internal floating roof in a gasoline tank had sunk, the tank had been gas freed and the wreckage of the roof was being removed from the tank. However, one of the aluminium pontoons that supported the deck had leaked and contained gasoline. This was ignited by a spark from the shovel. The foreman had smelt gasoline several minutes before the fire but not stopped the work.

[gasoline, entry into confined space, floating roof tank, shovel, fire - consequence, mechanical spark, safety procedures inadequate]

Lessons

1. If any floating roof sinks it is likely that some product will be trapped in the wreckage. A careful inspection is required before any maintenance work is allowed. If flammable liquids are found they must be removed or made safe before any mechanical work is permitted.
 2. As a further precaution there should be a flammable gas detector and alarm inside the tank during the whole time this work is proceeding. There have been several cases where work has disturbed hydrocarbon containing sludge in storage tanks. This can result in a flammable mixture in tanks which have been gas freed, before work started.
-

Source : LOSS PREVENTION BULETIN, 106, 19-21.**Location :** ,**Injured :** 1 **Dead :** 0**Abstract**

A large release of propane occurred during sampling operations aboard a pressurised gas marine tanker. A crew member, the berth operator and the company operator debated which valve to use, the crew member insisting on the yellow "middle" valve. After much discussion the company operator ordered the berth operator to sample the third "bottom" valve even though the crew member had insisted that this was only used for draining.

The crew member started to demount the 90 nipple on the valve using an adjustable spanner. He did not notice that the threaded connection of the valve housing was turning at the same time. After a number of turns with the spanner the valve house suddenly opened up releasing propane. The valve ball had been released and propelled towards the berth by the pressure of the escaping gas.

The company operator immediately notified the shift supervisor by radio and requested a valve and pipe fittings for on-the-spot repair. However, the shift supervisor did not understand the seriousness of the accident from the information he had received and therefore did not raise the emergency alarm.

The company operator responsible for the berth and tank storage area overheard the radio conversation and drove straight to the berth with the requested equipment. The fittings were found to be inadequate. At this point the severity of the incident was realised and the shift supervisor called the emergency services. The time was then 17.05. Propane had been escaping for approximately fifteen minutes.

Meanwhile, on board the ship, crew members decided to try sealing off the leak with a wooden plug. A "broom handle" was constructed and pushed into the opening. This action successfully sealed the tank and the broom handle was secured. The leak was stopped. While the tank was at low pressure the broom handle was replaced with a cap.

After investigation two prime causes of the incident were identified:

1. Lack of clear, precise communication between ship and shore. Poor definition of responsibilities regarding work routines, instructions, procedures and training.
2. Unsatisfactory system of layout and labelling of sample points on board ship.

[operation inadequate, gas / vapour release]

Lessons

The following recommendations were made:

1. Instructions should be reviewed to emphasize the responsibilities of ship and shore personnel.
2. Sampling procedures should be reviewed.
3. Valves types should be discussed with ship owners and operators with a view to removing all ball valves of this type from service.

Source : LOSS PREVENTION BULLETIN, 089,18.

Location : ,

Injured : 1 Dead : 0

Abstract

An operator at an acid recovery unit fell head first from a scaffold platform at a piperack and landed on crushed limestone covered ground 6 metres (20 ft) below. The fall resulted in fractures to both bones in the employee's lower right leg. After investigation it was found that the operator had been trying to stretch to reach a valve and this was the primary cause of the accident. Contributing factors may have been wet scaffold boards with a small amount of tar on them and a lower guard rail which was only attached at one end may have moved under the employee's weight. Although it was night when the accident happened, area lighting was reasonably good and visibility is not believed to have been contributory.

[operator error, scaffolding]

Lessons

Emphasis should be placed on taking time to plan and execute jobs properly and to avoid short cuts. The faulty valve and chain operator have been replaced.

Safety harnesses are to be kept in the unit and all operators trained in their use. The harness will be required when operators are working at heights from anything other than a permanent platform.

Source : LOSS PREVENTION BULLETIN, 076, 33-34.**Location :** ,**Injured :** 0 **Dead :** 0

Abstract

A glass reinforced plastic reaction vessel of 80 tonnes capacity containing ammonia bisulphate liquor failed catastrophically so that sections of the bund wall were damaged allowing the acid liquor to escape. Similar adjacent tanks were also damaged resulting in the release of about 130 tonnes of material which escaped onto the factory floor and into the internal effluent system.

After investigation by a consultant, it was concluded that the tank was considerably overheated beyond its design temperature. It was also found that the lining had been damaged in the past by mechanical action, probably by digging out tank residues with shovels.

The failed tank was constructed to BS4994:1973 but no routine inspections were carried out on the structure. The failure of the GRP was a classic example of acid environmental stress corrosion cracking which occurs under aqueous acid conditions. It was the view of the consultant that the cracking developed over a period of time.

Inspection of the tank had not been taking place. Routine inspection would have indicated that the liquor had permeated through to the GRP layers, but the foreman had not appreciated the potential effect of dilute acid on GRP.

[vessel failure, tank failure, spill, overheating, inspection inadequate, storage]

Lessons

[None Reported]

11279Date Unknown

Source : INSTITUTE OF GAS ENGINEERS, COMMUNICATION 451, UNUSUAL INCIDENTS AT GAS WORKS AND THEIR LESSONS, PART 2, 28 SEP, 1954.

Location : , UK

Injured : 0 Dead : 0

Abstract

An explosion occurred within a booster house on a gas production works causing a fire and localised damage. A bypass was being installed to a booster fan. Due to cramped conditions the fitter could not use a normal drill, and he therefore used a compressed air drill to create a ring of small holes. He knocked out through a hole and trimmed the hole with a compressed air emery wheel. Sparks from this equipment ignited the gas-air mixture in the pipeline, causing an explosion which ruptured a gas valve. Gas escaped into the booster house causing a fire which was quickly brought under control.

[fire - consequence, damage to equipment, leak, maintenance, permit to work system inadequate]

Lessons

Importance of purging the gas line prior to carrying out hot work on this system should have been identified by the permit to work system.

Source : LOSS PREVENTION BULLETIN, 080, 20.

Location : ,

Injured : 1 Dead : 0

Abstract

An operator fell from a one foot high stepladder and broke a bone in his foot whilst painting using a solvent based aluminium paint.

The operator was painting two air heaters at the beginning of the afternoon shift. The heater steam valves were closed, but the heaters had not cooled down before painting started.

When he had finished the first heater, he complained to his foreman about the smell of solvent from the paint. His foreman told him to use his halfmask (gasmask).

After a break the operator started to paint the second air heater which was located above the kettle floor in a narrow space between two walls and under a mezzanine floor. The air heater was still warm when he started to paint standing on a 0.4 m stepladder. After about one hour he felt dizzy and fell, inuring his foot.

The operator had breathed in too much solvent when he was painting the first heater without using his gasmask. The break had been too short to vent out his lungs and when he returned to work in a warm area and in an awkward position, he became dizzy and fell.

[fall, maintenance]

Lessons

To prevent accidents such as this:

1. Painting should not be done on a warm surface.
 2. An artificial respirator should be worn when solvent odour is strong.
 3. A platform should be used even for such a low height.
-

Source : LOSS PREVENTION BULLETIN, 035, 5.

Location : ,

Injured : 1 Dead : 0

Abstract

Two operators were about to charge a filter press cake still moist with petroleum ether from metallic boxes into a paddle drier. When scraping the rest out of the fifth box, a jet of flame broke out of the funnel opening. The fire brigade had to put out the heavily smoking fire. One of operators suffered burns on one arm and on the head.

To scrape the press cake from the metallic press box, the latter was suspended on a mobile rack, running on plastic wheels, and hung freely in the air. When the operator, wearing shoes with conductive soles, touched the press cake with the metallic shovel, a spark flashed over and triggered the fire. Material damage was caused.

[lack of earthing, fire - consequence, damage to equipment, charging reactor]

Lessons

The following measures were taken: Earthing of the press box and use of a plastic shovel.

Source : LOSS PREVENTION BULLETIN, 022, 105.

Location : ,

Injured : 0 Dead : 0

Abstract

A contractors labourer pushed a trolley with one flat tyre up to a welders torch which was not in use and proceeded to fill the tyre with gas, the nozzle made a perfect fit.

When the man was stopped and questioned it became apparent that this was a common procedure carried out by many people. Contractors employees near the incident did not consider there was danger in using any of the two gases available, "as they are still confined". Further questioning produced the response from a man that he had", topped up a wheelbarrow and a couple of hand trucks", in the week he had been on the plant.

The trolley was taken to its proper area, all its tyres deflated and refilled with air, the same procedure was carried out with all other hand trolleys etc. fitted with pneumatic tyres.

[design or procedure error, human causes, near miss]

Lessons

[None Reported]
