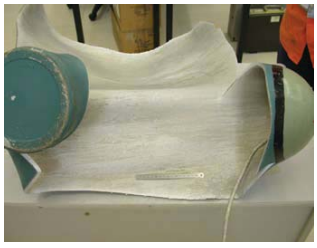
COMPILATION OF PRESSURE-RELATED INCIDENT SUMMARIES



June 2016 (Rev. 4)

TABLE OF CONTENTS

FOREWORD

The main purpose of this compilation is to increase the level of safety at Argonne by understanding mistakes that were made in the past and trying to prevent repeating them. Pressure vessels are containers for the containment of pressure, either internal or external. Pressure systems are defined as “all pressure vessels, and pressure sources including cryogenics, pneumatic, hydraulic, and vacuum”, including associated hardware (10 Code of Federal Regulations 851). All the people who design, fabricate, test, inspect, maintain, repair, operate, or simply work in areas where pressure vessels/systems are present need to understand potential hazards that can threaten personnel, equipment, and environment: Stored energy release, missiles (fragmentation), blast and shock, thermal energy (at both elevated and cryogenic temperatures), uncontrolled reactions, vibration, release of hazardous materials, starting a fire. It is important to recognize from enclosed cases that pressure-related incidents can occur from anything as small as a glass tube located in a lab, to a large steel stationary tanks.

This compilation presents **238 incident summaries** that occurred primarily in the U.S. between 2001 and 2016. Accidents are sorted chronologically from most to least recent. Compilation will be updated periodically as more detailed information (photos, causal factors, lessons learned) becomes available. Compilation is intended to be used as an Argonne reference document.

“A zero injury” workplace program can be accomplished only through the true commitment of everybody to safety of all the workers, along with integrated safety management system principles and functions.

Dejan Ristic
Energy / Pressure Systems Engineer (2-5075)
Facilities and Management Services

INCIDENT SUMMARIES

Florida State University/National High Magnetic Field Laboratory – Worker Fatality During Attempted Removal of Blind Flange on Cell 14 Magnet Cooling Water System

Summary

On October 21, 2015, two National High Magnetic Field Laboratory (NHMFL) mechanical technicians were involved in an incident while attempting to remove a Victaulic blind flange from supply piping on a Magnet Cooling Water (MCW) System. The mechanical technicians were assisting a welder to obtain final measurements to make final connections from the MCW system to a new Cell 14 cryostat as part of the Series Connected Hybrid magnet project. When loosening the nuts on the Victaulic flange collar, an explosion occurred. The flange, the water behind the flange, or some combination of both, struck and propelled one mechanical technician backward and into the metal support structure for the cryostat, resulting in his death. A second technician, who was approximately 10 feet away at the time of the explosion, sustained minor injuries.

Following the accident, it was discovered that a compressed air valve that delivers the compressed air needed to positively seat the pneumatic MCW butterfly valve was in a CLOSED position, and thus was not delivering compressed air to positively seat the pneumatic butterfly valve. Leakage of water past the valve caused high pressure water (~325 psig) to compress the air in the supply piping. As such a combination of pressurized water and pressurized air built up behind the Victaulic flange. The total stored energy from the compressed air and water was estimated to be about 1.4 million ft-lbf, which is equivalent to about 0.9 pounds (0.4 kg) of TNT explosive.

Recommendations / Lessons Learned

- System-specific, detailed step-by-step LTV procedures must be provided that positively confirm zero energy in system prior to work being performed.
- Appropriate instrumentation to indicate the presence of stored energy in the system is needed, not just in the final configuration, but during the construction phase.
- Detailed Piping and Instrumentation Diagrams (P&ID) should be generated and well-understood by workers.
- During construction, from inception to closeout, a person who has knowledge of every aspect of work coordination, e.g., water, pipes, valves, electrical, etc., must have a daily interaction with all workers so each person understands how their work may impact a set of workers focused on a different aspect of the project.
- A comprehensive LTV program commensurate with the complexity of the system (reference OSHA 1910.147 for best practices) is needed. Written programs should not be confused with written system-specific procedures needed for de-energizing equipment. The program also needs to address high risk items such as cryogens, high pressure and high voltage de-energization. Roles and responsibilities should to be clearly stated. Steps necessary to define the process when personal lock(s)/tag(s) need to be removed by those other than the originator should also be addressed.
- All isolation points must be locked in a safe position. Physical lockouts of butterfly, water, drain and vent valves should be included when appropriate.

- Ensure through engineering design review that appropriate positive isolation points have been incorporated into system designs and that all credible failure scenarios have been identified and have proper controls in place to mitigate stored energy potential. Consider whether:
    - Block valves are needed to isolate the process side still in service from the maintenance side. Blind(s) may also be needed to further isolate the system, in combination with a bleed valve to drain/vent any fluid trapped between the block valve and the blind;
    - Actuators meet desired failure mode(s), when pneumatic valves are used;
    - Pressure and temperature gauges are installed wherever appropriate, and referenced in appropriate Standard Operating Procedure(s); and,
    - Compressed air supply pressures for pneumatic valve actuators are designed to be lower than the maximum values listed on the valve nameplates.
- System design should include, at a minimum (reference ASME A13.1 for best practices), standardized labeling, such as directional arrows to indicate fluid flow, indication of valve numbering, indication of whether valves are "normally open" or "normally closed", and detailed P&IDs.
- Formality of work control should consider both the complexity and consequence of the tasks to be performed. For example, complexity of a system LTV should be handled at a higher level of rigor to ensure adequate safety review by appropriate subject matter experts.
- Personnel should have complete knowledge of the system, including all the valves, indicator lights, and their meaning in terms of open or closed.

Source

https://docs.anl.gov/main/groups/intranet/@shared/@eqo/@div/documents/lessonslearned/472201.pdf

FAILURE OF PRESSURE RELIEF VALVE AT FERMI LAB

Summary

On May 6, 2015, an employee was calibrating a relief valve that was mounted to the high pressure test vessel at the PAB Calibration Shop. As the test pressure was brought up to 1650 psig, the relief valve began to chatter rapidly before it propelled upwards towards the corrugated metal ceiling. The relief valve dented the ceiling and fell, contacting the employee in the back of the head. The contact with the 4.42 pound, 9” x 4”, relief valve caused a contusion and laceration. A second employee on the PAB mezzanine directly above the Calibration Shop reacted when the relief valve contacted the ceiling/floor causing a slight pain in his neck. A preliminary investigation with the assistance of the Mechanical Safety Subcommittee was performed. A Stop Work Notice for all calibrations of pressure relief valves has been sent to the entire laboratory pending the results.

Source

http://esh-docdb.fnal.gov/cgi-bin/ShowDocument?docid=3072

FAILURE OF A GLASS TUBING VACUUM SYSTEM

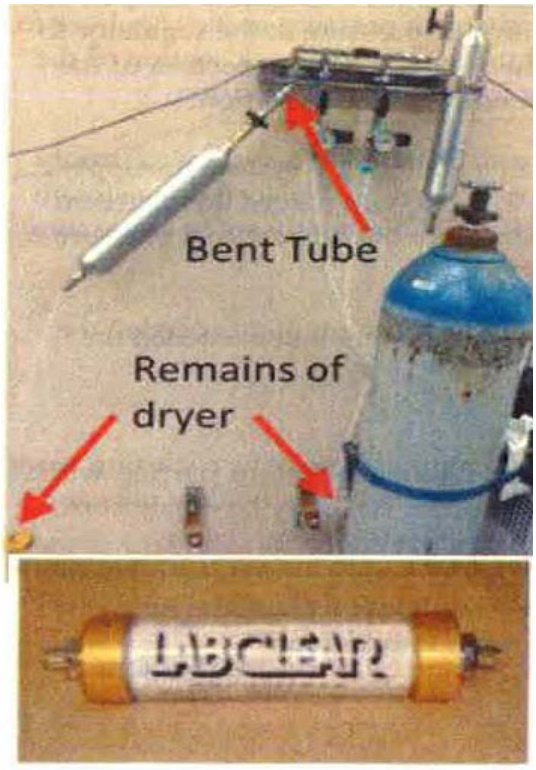
Summary

04/24/2015. At Pacific Northwest National Laboratory a researcher using a system with glass tubing attempted to backfill the system with ~2 psig nitrogen to relieve a vacuum. She was following a procedure, but was unable to open the system because it was still under vacuum. She increased the nitrogen pressure at the regulator to ~5 psig and tried to open the system again. After she opened the supply valves, a section of the glass pipe failed. The suspected cause was a leaking valve or incorrect valve position.

Source

Pacific Northwest National Laboratory Lesson ID: 2015-LL-PNNL-008

GAS DRYER FAILURE DUE TO OVERPRESSURE



Summary
04/24/15 At Pacific Northwest National Laboratory a dryer or desiccator that failed under excessive pressure was installed in a system to supply CO2 gas to an instrument. The dryer, whose pressure rating is 125 psi, was placed downstream of the regulator on a CO2 cylinder (~800 psi). The regulator was inadvertently set to a pressure of about 250 psi, causing the failure.

Lessons Learned
It is important to verify the pressure rating of your system and its individual components before starting work. The systems should be limited to the pressure ratings in order to protect the equipment and prevent failure.

Source
Pacific Northwest National Laboratory Lesson ID: 2015-LL-PNNL-008

SCROLL VACUUM PUMP FAILURE

Summary

At approximately 10 a.m. on Tuesday, February 10, 2015 a scroll vacuum pump ("pump") failed catastrophically when two SLAC workers (Worker M and Worker R) accidentally introduced high-pressure carbon dioxide (CO2) from a nearby experimental system to the pump's vacuum port. The failure blew the back plate off the pump, which struck the frame of the experimental system in close proximity to where one of the workers was standing. Neither of the workers was injured, however, a serious injury could have occurred if a worker had been struck by the back plate.

Lessons Learned

The failure occurred due to the workers opening the system while it was still pressurized. The workers were experienced with pressure systems, but had not been trained on how to evacuate and charge this specific device. It is important that each machine is handled properly.

Source

ORPS (Significance Category 3), Feb 10, 2015. SLAC National Accelerator Laboratory SC-SSO-SU-SLAC-2015-0001

MAN KILLED IN AIR TANK EXPLOSION AT MANUFACTURING PLANT

Summary
A man was killed in an air tank explosion at a machinery manufacturing plant on February 2, 2015 in northwest suburban Carol Stream. Chad Nelson, 35, was welding metal machinery about 9:30 p.m. at Maac Machinery, 590 Tower Blvd. in Carol Stream, when there was a "catastrophic failure," according to the DuPage County coroner's office. An estimated 200-gallon air tank exploded while being tested for leaks, according to a statement from the Carol Stream Fire Protection District. There was no fire or smoke in the explosion.

Source
http://chicago.suntimes.com/news/7/71/340206/one-person-killed-carol-stream-machinery-plant

INJURY DURING BREATHING AIR CYLINDER CHARGING OPERATION

Summary

On January 26, 2015, a minor injury (scratch on the left cheek with some swelling) was experienced by a Hanford Fire Department (HFD) Firefighter during Self-Contained Breathing Apparatus air cylinder charging operations. The injury resulted when the Firefighter loosened the coupling nut after the cylinder shutoff valve was closed and the hose depressurization valve was opened, but before the pressure was fully relieved. The coupling released and the residual pressure in the hose caused it to be ejected from the cylinder and struck the Firefighter on the left cheek. The operating procedure for this system specifies that upon completion of charging a cylinder, that the cylinder shutoff valve must be closed and a manual depressurization valve on the charging hose is to be opened until the air pressure is relieved. When the hose is depressurized the coupling nut is loosened to permit its quick disconnect feature to release the hose from the cylinder.

Lessons Learned

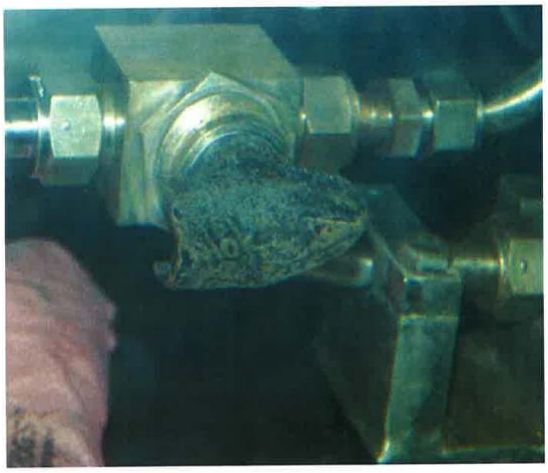
Safety protocols should always be reviewed and followed when handling or manipulating pressure systems.

Source

ORPS (Significance Category 3) January 26, 2015. Hanford Site, 600 Area. EM-MSC-HFD-2015-0001

INCORRECT INSTALLATION OF REPLACEMENT VALVE HANDLE

Incorrect Original Handle



New Handle

Summary

On 11/30/14, a pre-job briefing was conducted in the HB-Line facility at the Savannah River Nuclear Solutions to replace the handles on the NT-51/52 Inlet and Outlet valves. The work was started for replacement of the valve handles with the valves in the open position. For valve 655 the mechanic had difficulty getting the Allen wrench on the set screw to remove the handle, so the valve handle was rotated 90 degrees. The new handle was placed on valve 655 with the handle in the open position, but the valve stem was in the closed position. On December 1st 2014, the valve handle was removed and installed correctly.

Lessons Learned

The incorrect installation could have led to a serious failure had the problem not been found. Proper oversight and testing caught the issue before it became an issue.

Source

Blue- Savannah River Nuclear Solutions Lesson ID: 2015-SR-SRNS-04

RELIEF VALVE SYSTEM FAILURE DURING UNPLANNED GAS RELEASE

A View of the High Pressure Natural Gas Storage Vessels with the Failed Relief System Before (left) and Aft

Summary

On the days leading to January 6, 2014, unusual weather conditions with high temperature variations caused a large pressure rise inside the three storage vessels at the Brookhaven National laboratory (BNL) compressed natural gas (CNG) fueling facility. The pressure increase reached the point where the relief valve on each vessel opened automatically and released gas to the atmosphere. However, the valves experienced valve chatter, were damaged during the event and did not reclose as designed. Furthermore, the discharge piping structure downstream from the relief valves collapsed. Investigation found that the collapsed discharge piping was self-supporting, which is against prevailing code recommendation, and insufficiently braced to resist the reaction forces generated by the high pressure gas discharge.

Lessons Learned

All individual pieces were reviewed by an independent third party. However, it is important to realize that the system should be accessed again after assembly.

Source

Yellow- Brookhaven National Laboratory Lesson ID: 2014-BNL-CNG-0001

PRESSURE RELIEF VALVE IS RENDERED INEFFECTIVE BY FAULTY PLUG

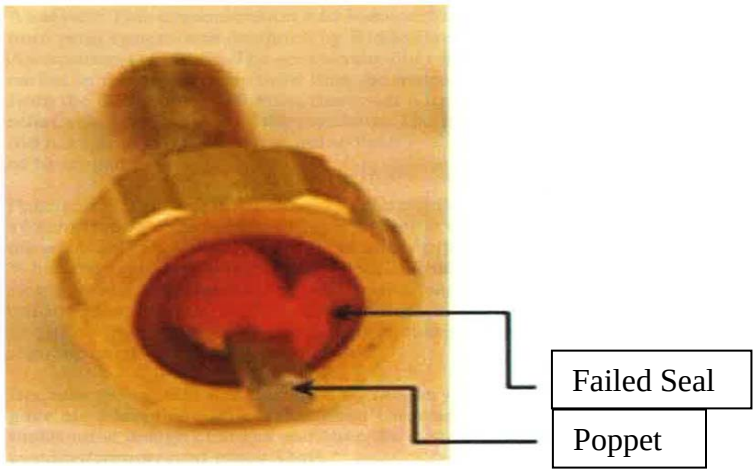
Summary

On June 12, 2014, as a pipefitter at the National Nuclear Security Administration manually opened the valve on a nitrogen cylinder, the newly renovated laboratory piping system in Room 115 of Building 1819, over pressurized to approximately 750psi. The cylinder had a maximum allowable working pressure of 250psi. The over pressurization occurred while the pipefitter was performing a pneumatic pressure test on the renovated argon, nitrogen and compressed air piping system. When he saw the digital gauge reading of 750psi, he immediately closed the nitrogen cylinder valve relieving the pressure from the piping system through an in-line high point valve in the system. Subsequent review found that a capped relief exhaust port with a ½ inch threaded plug on a pressure relief valve had rendered it ineffective as an engineering control to prevent system over pressurization.

Source

ORPS (Significance Category 3). 06/12/2014. Los Alamos National Laboratory. NA-LASO-LANL-MATSCCMPLX-2014-0003

HYDROGEN REGULATOR FAILS DURING PNNL DEMO



Summary

02/10/2014. At Pacific Northwest Laboratory a PNNL-led project team was demonstrating a vehicle hydrogen fire simulator during an off-site class for first responders when the regulator on the hydrogen cylinder failed and gas began flowing out of the pressure relief valve on the regulator. The hydrogen did not ignite and the instructor immediately shut off the valve on the cylinder, stopping the flow of hydrogen.

Lessons Learned

It was the relief valve, not the regulator that prevented a catastrophic failure. A regulator is not a safety device. Without additional protection, components downstream of a regulator can be exposed to pressures exceeding the set pressure up to the full bottle pressure. Never rely on a regulator as a source of protection.

Source

Yellow- Pacific Northwest National Laboratory. Lesson ID: 2014-LL-PNNL-0003

STARGON GAS CYLINDER KNOCKED OVER SNAPS OFF REGULATOR

Storage Truck

Transportation Truck

Summary

A gas cylinder was transported to a work area and was not properly staged in a storage truck. One of the key differences between a storage truck and transport truck is stability. The storage truck has a bar for securing the cylinders in place and has a wider and thicker base. Transport trucks compensate for the lack of stability by having a chain and rope to hold the tank upright. After transporting the cylinder, the chain on the hand truck was unlatched and the rope was not used. The gas cylinder tipped and fell out of the hand truck; snapping off the gas regulator during the fall. Pressurized gas was released until a nearby worker was able to close the bottle valve. No injuries occurred.

Lessons Learned

It is important that workers observe all of the safety procedures present in order to have contingencies.

Source

Blue- Bechtel National Inc/Waste Treatment Plant Lesson ID: RPP-WTP-LL-11-0021

FAILURE OF PRESSURE REGULATING DEVICE

Summary

On June 29, 2011, during the pressurization of a Control Air, Inc. Type 300 pressure regulating device to a compressed gas cylinder containing nitrogen, a catastrophic failure of the pressure regulating device occurred. The regulator was rated for 250 psig. The nitrogen cylinder contains up to 2,400 psig. The regulator was connected directly to the cylinder with a brass CGA-580 fitting. Immediately after connections were completed, senior engineer partially opened the compressed nitrogen cylinder valve pressurizing the regulator. The pressure regulating diaphragm was in the fully closed position. Within two to three seconds of pressurization, the catastrophic failure of the pressure regulator occurred. The 0.5-inch diameter brass fitting connecting the regulator to the nitrogen cylinder was sheared off at the regulator body. An investigation was initiated. There were no injuries.

Lessons Learned

The implementation of established Health Safety & Environment systems, hazard analysis, training, and line accountability failed to identify the hazards and controls necessary to prevent this incident.

Source

ORPS (Significance Category 3), July 1, 2011. Kansas City Plant, East Out Building, NA-KCSO-AS-KCP-2011-0007.

PRESSURE PIPE EXPLODES IN WELDING ACCIDENT

Summary
The plant maintenance staff in a power plant was charged with replacing a high-pressure steam piping spool piece that connects the main steam stop valve to the non-return valve. On the day work began, workers noticed that the main steam stop valve on an adjacent boiler was leaking steam. The workers were unfamiliar with the steam piping arrangement and dismissed its importance. The welders did not perform welder procedure inspections required by the American Society of Mechanical Engineers Piping and Boiler and Pressure Vessel Codes. After the first day of work, the new spool piece was being filled with water and steam because a drain pipe was left closed. When the worker returned the next day for a second pass, the vessel exploded.

Lessons Learned

- Welding on an enclosed structure when you don't know what is on the other side of the weld surface is extremely dangerous. Enclosed volumes should be thoroughly vented before welding begins.
- Welding inspections set up by the ASME should be followed when working with pressure vessels.
- Supervision and management should instill a culture of safety with the employees to prevent slacking behavior for inspections.

Source
Plant Safety. "Pressure Pipe Explodes". www.powermag.com April 2014.

EXPOSURE TO LIQUID NITROGEN DURING TANK VENTING

Summary

On May 17, 2011, an operator at the Integrated Waste Treatment Unit (IWTU) facility had liquid nitrogen flow under his work boots, freezing the boots to the concrete pad. The sole of the work boots cracked and pieces came off when the employee backed out of the way. The employee's contact with the liquid nitrogen was limited to the sole of his boots and did not result in any injury. The facility manager initially determined that the incident was ORPS reportable as a management concern, Significance Category 4. The incident is believed to be caused by a failure by the vender to properly communicate the venting procedure to the IWTU management. The vender did not feel that there was a possibility that liquid nitrogen would be discharged from the vent line diffuser; the nitrogen would evaporate in the pipe and diffuser. Thus proper precautions were not taken by IWTU management in the event that a discharge of liquid nitrogen would occur while venting took place.

Lessons Learned

- System configuration and system responses must be fully understood and all hazards identified prior to the development of procedure steps. Management, Engineering, and Industrial Safety did not identify how a full tank of liquid nitrogen was going to act as it warmed up and needed to be vented. This lack of understanding of the system response resulted in accepting the vendor's recommendation and adopting procedure steps that were less than adequate with the configuration of the vent valve and diffuser.
- Employees need to have a questioning mind as they approach a work task and look for hazards. If the procedure does not fit the situation in the field they need to step back until the procedure is corrected. It is important for employees to notify management when they identify hazards and work instructions that do not fit the conditions in the field.

Source

OPRS (Significance Category 4), May 17, 2011. EM-ID-CWI-IWTU-2011-0005.

PIPING HYDROSTATIC TEST PRESSURE

Summary

On January 19, 2011, it was discovered that the leak test pressure used for some piping jumpers is less than required by American Society of Mechanical Engineers (ASME) B31.3. Certain waste transfer primary piping jumpers use a stainless steel whose allowable yield stress is decreased at design temperatures relative to hydrostatic leak test temperatures. For this situation, ASME B31.3 requires the hydrostatic leak test pressure to be increased and calls into question compliance with ASME B31.3 for those affected piping jumpers. The functional requirement of waste transfer primary piping systems is to prevent leaks. The Documented Safety Analysis states that compliance with this functional requirement is demonstrated, in part, by performing leak testing in accordance with ASME B31.3; therefore, the ability of the piping jumpers to perform their safety function is called into question without additional evaluation. This new information indicates that the affected jumpers may not be fully capable of performing the safety function as described in the safety basis, and thus represents a potential inadequacy in the safety analysis. A red arrow entry in the Central Shift Manager's logbook states, "Do not perform any waste transfers unless the transfer system has been evaluated as compliant to the pressure testing requirements of ASME B31.3".

Source

ORPS (Significance Category 3), January 19, 2011. EM-RP-WRPS-TANKFARM-2011-0002.

TROUBLESHOOTING A LEAK IN PRESSURIZED COMPRESSED AIR LOCK

Summary

On January 12, 2011, a subcontractor worker was struck in the head by an ejected steel test blank following testing of newly installed compressed air piping. After testing the system for a leak, the pipe was depressurized, but a trapped air segment remained behind a check valve. When the blank was removed under pressure, it hit the nearby subcontractor worker in the head, cutting his scalp. While attempting to locate the leak, the subcontractor had removed an elbow in the 6-inch line and put in a blank that was held in place by a mechanical joint fitting. Subcontractor workers then pressurized the system to 150 psi. Approximately 24 inches upstream of the blank is a gate valve and about 18 inches further upstream is a check valve preventing the backflow of compressed air. Between the air compressor and the check valve, there is a bleed-off valve and pressure gauge. After the leak troubleshooting was completed, the bleed-off valve was opened to bleed the system from 150 to 0 psi. However, air beyond the check point valve remained trapped. A worker began to unbolt the mechanical joint fitting to remove the blank. The worker was standing on a step ladder wearing a hard hat and safety glasses. As he loosened the fitting, the blank forcibly ejected off the end of the pipe, bounced off of an adjacent pipe, and struck the worker in the head. An investigation was pending. Work was stopped on this project and a shut-down by the subcontractor.

Source

ORPS (Significance Category 2), January 12, 2011. SC-SSO-SU-SLAC-2011-0001.

EMPLOYEE IS INJURED BY EXPLODING PIPE

Incident Tracking

Incident Profile

Incident Title:	Employee Is Injured By Exploding Pipe		
Incident (Accident) Identifier:	200381069		
Report Date:	11/26/2010		
Report ID (OSHA):	0336000		
Incident Description:	On November 26, 2010, Employee #1 was injured when PVC (polyvinyl chloride) piping from a cooling tower exploded. Employee #1 apparently sustained a fracture to his head, and he was hospitalized. No one witnessed the accident. The explosion was most likely caused by a water hammer that resulted from malfunctioning breakers.		
INCIDENT CATEGORY:			
INCIDENT CAUSE:			
Inspection Number:	311879498		
OSHA Open Date:	11/26/2010	**OSHA Close Date:**	01/12/2011
Number of Days Open:	47		
Where did the incident occur?	Matrix Tool, Inc.		
Incident Jurisdiction (State-Zip):	PA 16415		
Fatalities:	0	**Injuries:**	1
Keywords (OSHA):	explosion, struck by, fracture, head, flying object, pipe, cooling tower, water, high pressure, mech malfunction		

SUSPECT PRESSURE RELIEF VALVE

Summary

On November 18, 2010, QA personnel discovered a suspect pressure relief valve during receipt inspection. The suspect relief valve is a ¾-inch x 1-inch flanged pressure relief valve procured from Chalmers & Kubeck – SC. The inspector recognized that one flange was marked to indicate that it met the requirements of ASTM A182 and ASME B16.5. These national consensus standards require the manufacturer's name/trademark to be on the flange. However, this flange did not have the required manufacturer's identity. Instead, only "China" was stamped on the flange. The DOE Suspect/Counterfeit Items Awareness Training Manual directs that parts with such markings are to be treated as Suspect/Counterfeit Items. QA personnel tagged and segregated the valve.

Source

ORPS (Significance Category 4), November 18, 2010. EM-SR-SRNS-MOGEN-2010-0007, Savannah River Site, N-area.

LIQUID NITROGEN LEAK

Summary

On October 19, 2010, a member of the workforce reported liquid nitrogen dripping from the ceiling from the HVAC return grille. On the way to the basement, the Coordinator met with a member of management. Due to previous liquid nitrogen events in the area, they initially investigated a lab across from the Men's Locker Room. After verifying that there were no open liquid nitrogen valves, they went to a neighboring room and verified that no one was in that room. They crossed the hall where they looked up and saw ice forming on the exhaust duct. They then went to the Men's Restroom where the outside door was already propped open. It was then that they noticed that the hallway oxygen deficiency alarms were alarming intermittently; there are two oxygen deficiency alarms directly across from the Men's Restroom. The Coordinator went inside to open the door to the shower room and looked in, but did not enter. The Coordinator saw fog and felt cold coming from inside the shower room. They immediately left the area and activated a fire alarm pull station to evacuate the building as a precautionary measure to prevent personnel from entering the area. The Coordinator reported the event to Emergency Management (EM). The Coordinator then closed all the red handled valves on the building liquid nitrogen tanks and condensers.

Source

ORPS (Significance Category 2), October 19, 2010. NA-SS-SNL-1000-2010-0011, National Nuclear Security Administration.

EMPLOYEE DIES AFTER GAS EXPLOSION

Incident Profile

Incident Title:	Employee Dies After Gas Explosion		
Incident (Accident) Identifier:	202126728		
Report Date:	10/18/2010		
Report ID (OSHA):	0627500		
Incident Description:	On October 18, 2010, Employee #1 was struck in the head by a furnace door after a gas explosion. He died.		
INCIDENT CATEGORY:			
INCIDENT CAUSE:			
Inspection Number:	313498834		
OSHA Open Date:	10/18/2010	**OSHA Close Date:**	08/22/2011
Number of Days Open:	308		
Where did the incident occur?	Arcelormittal		
Incident Jurisdiction (State-Zip):	TX 79835		
Fatalities:	1	**Injuries:**	0
Keywords (OSHA):	gas, explosion, struck by, head, furnace		

EMPLOYEE IS INJURED WHEN TIRE EXPLODES

Incident Tracking

Incident Profile

Incident Title:	Employee Is Injured When Tire Explodes		
Incident (Accident) Identifier:	201204575		
Report Date:	10/13/2010		
Report ID (OSHA):	1054114		
Incident Description:	On October 13, 2010, Employee #1 was filling a new light duty truck tire with air. As he inflated the tire, which was coned (secured down), the tire blew up at the bead and caused him to receive unspecified injuries. He was transported to a medical center. At the medical center, Employee #1 underwent treatment and received care, and then was hospitalized. No other details were provided in the narrative.		
INCIDENT CATEGORY:			
INCIDENT CAUSE:			
Inspection Number:	314782368		
OSHA Open Date:	10/15/2010	**OSHA Close Date:**	01/23/2012
Number of Days Open:	465		
Where did the incident occur?	Les Schwab Warehouse Center Inc		
Incident Jurisdiction (State-Zip):	OR 97402		
Fatalities:	0	**Injuries:**	1
Keywords (OSHA):	tire, explosion, flying object		

PLUMBER IS BURNED BY STEAM FROM FAILED FITTING

Incident Tracking

Incident Profile

Incident Title:	Plumber Is Burned By Steam From Failed Fitting		
Incident (Accident) Identifier:	202530317		
Report Date:	09/27/2010		
Report ID (OSHA):	0950664		
Incident Description:	On September 27, 2010, Employee #1, an oil well field contract employee, was returning Chevron's 8 in. steam header back into service after planned maintenance to replace three 3 in. steam valves on three branch lines. After the valves were replaced, the steam header was returned to service. Employees #1 and three coworkers were walking along the steam header catwalk checking the valve positions. A 2 in. 90 degree elbow, unrelated to the maintenance being conducted, suddenly failed. Steam pressurized to approximately 1,000 psi and 500 to 650 degrees Fahrenheit discharged onto Employee #1, who was knocked down onto the catwalk. One coworker shut off the steam flow while the other two rescued Employee #1. He was hospitalized for second- and third-degree burns on 80 percent of his body.		
INCIDENT CATEGORY:			
INCIDENT CAUSE:			
Inspection Number:	313641664		
OSHA Open Date:	10/04/2010	**OSHA Close Date:**	12/17/2010
Number of Days Open:	74		
Where did the incident occur?	Jacobs Engineering		
Incident Jurisdiction (State-Zip):	CA 93251		
Fatalities:	0	**Injuries:**	1
Keywords (OSHA):	valve, steam, steam line, elbow, pipe, high pressure, high pressure pipe, high temperature, burn, oil well servicing		

EMPLOYEE IMPALED IN EXPLOSION

Incident Profile

Incident Title:	Employee Impaled In Explosion		
Incident (Accident) Identifier:	200556207		
Report Date:	09/24/2010		
Report ID (OSHA):	0625700		
Incident Description:	On September 24, 2010 Employee #1 was standing five feet away from a pressure test being conducted with nitrogen. Inside the test cylinder was a downhole tool used in oil and gas production. For unknown reasons the tool inside the test cylinder exploded knocking the threaded end cap off the test cylinder. The explosion caused the straps holding down the test pipe to break, allowing the testing stand to fall over. The test pipe flew back off the test stand towards the inside of the shop, and as the test pipe flew off the test stand, it struck Employee #1 in the torso. Employee #1 died due to the injuries.		
INCIDENT CATEGORY:			
INCIDENT CAUSE:			
Inspection Number:	314767153		
OSHA Open Date:	09/25/2010	**OSHA Close Date:**	09/28/2010
Number of Days Open:	3		
Where did the incident occur?	Supreme Service & Specialty Co Inc Thru Tubing Div		
Incident Jurisdiction (State-Zip):	LA 70518		
Fatalities:	1	**Injuries:**	0
Keywords (OSHA):	struck by, pipe, explosion, cylinder, lubricating fluid, nitrogen		

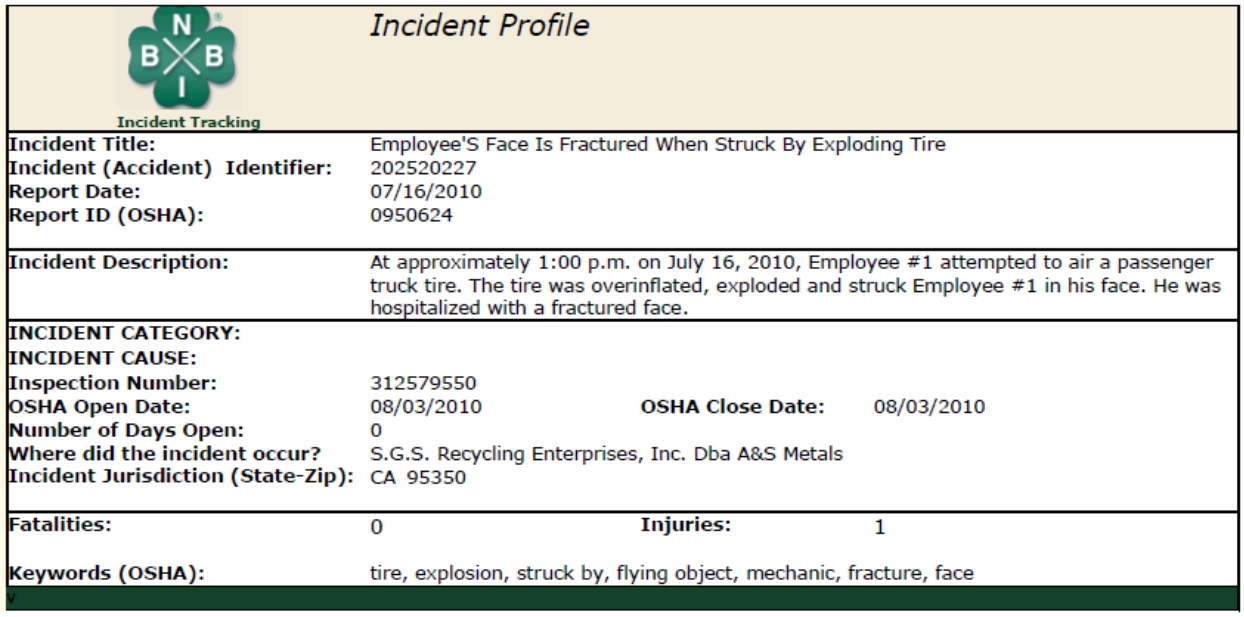
EMPLOYEE SUFFERS LACERATIONS IN EXPLOSION

Incident Tracking

Incident Profile

Incident Title:	Employee Suffers Lacerations In Explosion		
Incident (Accident) Identifier:	200358810		
Report Date:	09/22/2010		
Report ID (OSHA):	0453710		
Incident Description:	On September 22, 2010, Employee #1 was heating an agar solution in a flask, and the flask exploded. Shards of glass struck her face, causing multiple lacerations.		
INCIDENT CATEGORY:			
INCIDENT CAUSE:			
Inspection Number:	314380569		
OSHA Open Date:	09/22/2010	**OSHA Close Date:**	11/30/2010
Number of Days Open:	69		
Where did the incident occur?	Nc State University - Veterinary School		
Incident Jurisdiction (State-Zip):	NC 27606		
Fatalities:	0	**Injuries:**	1
Keywords (OSHA):	explosion, flying object, heat, laceration, face, struck by, ppe		

EMPLOYEE'S FACE IS FRACTURED WHEN STRUCK BY EXPLODING TIRE



Incident Tracking

Incident Profile

Incident Title:	Employee'S Face Is Fractured When Struck By Exploding Tire		
Incident (Accident) Identifier:	202520227		
Report Date:	07/16/2010		
Report ID (OSHA):	0950624		
Incident Description:	At approximately 1:00 p.m. on July 16, 2010, Employee #1 attempted to air a passenger truck tire. The tire was overinflated, exploded and struck Employee #1 in his face. He was hospitalized with a fractured face.		
INCIDENT CATEGORY:			
INCIDENT CAUSE:			
Inspection Number:	312579550		
OSHA Open Date:	08/03/2010	**OSHA Close Date:**	08/03/2010
Number of Days Open:	0		
Where did the incident occur?	S.G.S. Recycling Enterprises, Inc. Dba A&S Metals		
Incident Jurisdiction (State-Zip):	CA 95350		
Fatalities:	0	**Injuries:**	1
Keywords (OSHA):	tire, explosion, struck by, flying object, mechanic, fracture, face		

EMPLOYEE DIES FROM PROPANE TANK EXPLOSION

Incident Profile

Incident Title:	Employee Dies From Propane Tank Explosion		
Incident (Accident) Identifier:	202014759		
Report Date:	06/22/2010		
Report ID (OSHA):	0216000		
Incident Description:	On June 22, 2010, Employee #1 died as a result of an explosion within a storage trailer in which propane tanks were stored.		
INCIDENT CATEGORY:			
INCIDENT CAUSE:			
Inspection Number:	313003170		
OSHA Open Date:	06/22/2010	**OSHA Close Date:**	06/22/2010
Number of Days Open:	0		
Where did the incident occur?	Comprehensive Care Management		
Incident Jurisdiction (State-Zip):	NY 10467		
Fatalities:	1	**Injuries:**	0
Keywords (OSHA):	explosion, trailer, propane, fire, smoke, painter, construction		

EMPLOYEE IS KILLED IN EXPLOSION

Incident Tracking

Incident Profile

Incident Title:	Employee Is Killed In Explosion
Incident (Accident) Identifier:	202468849
Report Date:	06/17/2010
Report ID (OSHA):	0950643
Incident Description:	At approximately 1:15 p.m. on June 17, 2010, Employee #1, a laboratory supervisor at an alternative energy generating facility, was performing his daily duties when for some reason three pressure vessels failed and exploded. Employee #1 was killed. There were no witnesses to the accident.
INCIDENT CATEGORY:	
INCIDENT CAUSE:	
Inspection Number:	312437163
OSHA Open Date:	06/17/2010
OSHA Close Date:	06/17/2010
Number of Days Open:	0
Where did the incident occur?	Realm Catalyst, Inc.
Incident Jurisdiction (State-Zip):	CA 93065
Fatalities:	1
Injuries:	0
Keywords (OSHA):	pressure vessel, explosion, equipment failure, lab worker

WINDOW FAILURE IN SMALL VACUUM VESSEL

Summary

On June 15, 2010, inadequate engineered and administrative safety controls along with operator error caused a small vacuum vessel to overpressurize and a vacuum window to fail at a Princeton Plasma Physics Laboratory. The vacuum window, which is just less than 4 inches in diameter, on the vacuum vessel failed because of gas overpressurization. A helium gas bottle was plumbed to a secondary much-smaller volume with a set of valves to charge that volume to approximately 90 psi, and then subsequently release that gas to the vacuum vessel. However, two valves were misaligned and the vacuum vessel was inadvertently pressurized by the helium. The equipment/area was secured and work on the experiment was stopped. The experiment design did not address the possibility of pressurization and no pressure relief valve or a means of detecting or exhausting an overpressure was provided. The final experimental set-up and operation was performed by a graduate student from a set of basic requirements. There was no evidence that the final configuration was reviewed. There was no procedure or checklist in place and a Job Hazard Analysis had not been performed for the assembly or operation of this device. Safety glasses and a protective face shield were available in this shop area, but were not believed to be needed for this work. The Lab is reviewing other experiments to determine if similar situations exist.

Source

ORPS (Significance Category 4), June 18, 2010. Princeton Plasma Physics Laboratory.

BIOMASS STEAM PLANT BOILER PIPING NONCONFORMANCE

Summary

On May 6, 2010, during a walkdown of external boiler piping at the Biomass Steam Plant, they determined that the Boiler Blow-off and Emergency Feedwater systems were not installed per ASMW, Section I code requirements. It is currently unknown what code may have been used for the installation. All piping in the facility was installed by a sub-tier subcontractor. Some of the pipe, fittings, and valves installed within these boundaries are not ASME allowable materials. Additionally, Certified Material Test Reports (CMTRs) are not available for the materials within these boundaries that are stamped as ASME SA materials. The main issues are that the piping was not supplied by the boiler manufacturer, the installer was not a certificate holder, and that CMTRs were not provided for the installed piping. The equipment has been tagged with Non-Conformance Hold tags and a Fact Finding Meeting was held.

Lessons Learned

- Be sure that the installer is aware of and follows the latest codes and regulations.
- Be sure that there are CMTRs available for each material being used in the installation.

Source

ORPS (Significance Category 4), May 6, 2010. EM-SR-SRNS-SIPS-2010-0008, Savannah River Site, A Area.

RAW WATER PUMP MAY EXCEED PRIMARY PIPING DESIGN PRESSURE

Summary

On May 4, 2010, Base Operations Shift Operation learned that if the POR-132 raw water skid is connected via the tank 241-AN-101 pump pit, the design pressure (275 psig) of the safety-significant waste transfer primary piping may be exceeded. Based on preliminary engineering calculations, with an assumed over-speed failure of the variable frequency drive, the POR-132 raw water pump could produce a pressure in the range of 370 psig, which exceeds the design pressure of waste transfer primary piping that could be flushed by this pump. There currently is no safety basis control for protecting safety-significant structures, systems, components from overpressure during flushing operations. Therefore, this condition represents a potential inadequacy of the documented safety analysis. Action Tracking Binder, ATB-10-008, which states, “Do not operate POR-132 water skid until the raw water pump variable frequency drive is analyzed” was established. The Red Arrow entry, which restricts connecting external liquid sources without evaluation, was verified in place.

Source

ORPS (Significance Category 4), May 4, 2010. NA-LASO-LANL-NUCSAFEGRDS-2010-0004, Los Alamos National Laboratory.

DEEPWATER HORIZON BLOWOUT PREVENTER MALFUNCTION

Summary
In April 2010, the infamous incident occurred in the Gulf of Mexico in which an oil rig failed due to a combination of several factors including a hydraulic leak in the blowout preventer and dead batteries. The incident left 11 workers dead, and incredible environmental damage. The Congressional investigation confirmed that the companies involved had documents that showed there was a leak in the hydraulic systems that operated the blowout preventer, as well as the dead batteries before the accident. Also those documents showed that they ignored the tests that had shown a problem.

Lessons Learned

- Safety should always be of utmost importance.
- Proper maintenance could prevent such incidents from occurring.

Sources

http://www.upstreamonline.com/live/article214769.ece

http://www.smslegal.com/blog/deepwater-horizon-oil-rig-explosion-blowout-preventer-confirmed-as-cause.cfm

http://www.aolnews.com/nation/article/oil-spill-debacle-points-to-rig-blowout-preventer-as-utter-failure/19461009

GAS MAIN ACTS AS PROJECTILE DURING PRESSURE-TESTING

Summary

On March 3, 2010, a Peoples Gas **worker died and another was seriously injured** after they were struck by a pipe while pressure-testing an underground gas main. The workers were using compressed air for the test when a section of the pipe moved and struck them.

Source

http://archive.chicagobreakingnews.com/2010/03/2-injured-in-incident-downtown.html

TWO EMPLOYEES ARE BURNED BY STEAM FROM REACTION VESSEL

Incident Tracking

Incident Profile

Incident Title:	Two Employees Are Burned By Steam From Reaction Vessel		
Incident (Accident) Identifier:	201204328		
Report Date:	02/21/2010		
Report ID (OSHA):	1054194		
Incident Description:	Employees #1 and #2 were working near a reaction vessel. The rapidly rising temperature in the vessel caused liquid and steam to erupt out of the vessel and onto both employees. They suffered serious burns to their face, arms, and back and were hospitalized. Further investigation revealed that the temperature of exothermic reaction was not controlled adequately.		
INCIDENT CATEGORY:			
INCIDENT CAUSE:			
Inspection Number:	313775603; 313775454		
OSHA Open Date:	02/21/2010	**OSHA Close Date:**	02/21/2010
Number of Days Open:	0		
Where did the incident occur?	Columbia Forest Products Inc; Lao K Llc		
Incident Jurisdiction (State-Zip):	OR 97322		
Fatalities:	0	**Injuries:**	2
Keywords (OSHA):	vessel--container, pressure release, steam, burn, chemical reaction, arm, face, back		

CORRUGATED STAINLESS STEEL TUBING RUPTURE

Summary

On February 10, 2010, a section of Corrugated Stainless Steel Tubing (CSST) ruptured while performing a system line up. A Maintenance Technician (MT) was performing a Lockout Tagout (LOTO) to support routine maintenance on an air compressor. Normal operating pressure for the compressor is between 110 to 140 psig. As part of the LOTO, a preoperational check was required to verify the compressor would run prior to hanging the LOTO. The air compressor was not operating and was in a normal lineup for the idle compressor (electrical disconnect switch open and discharge valve closed). At no time was the compressor motor started by the MT. The MT opened the discharge valve on the air compressor as part of a system line up prior to starting the air compressor. When the MT opened the discharge valve, a 1.5 inch by 15 inch section of CSST running between the discharge valve and the compressor motor ruptured. Shortly after the CSST rupture, the MT observed the braiding on the CSST was shredded and hanging from the compressor motor end of the connection. The corrugated internal part of the CSST was separated from both ends and was lying on the floor below the discharge valve end of the connection. There was a dent in the top of the compressor belt guard as a result of where it had been struck by the CSST. The MT reported that the loud bang from the CSST rupture caused a ringing in his ears, but was cleared by the Site Medical Coordinator and returned to work with no restrictions.

Lessons Learned

- Be sure to incorporate manufacture installation instructions into engineering/construction/maintenance work control documents to prevent risk of premature component failure.

Source

ORPS (Significance Category 3), February 10, 2010. EM-ID-BBWI-AMWTF-2010-0005, Idaho National Laboratory.

NEAR MISS RESULTING FROM OVER PRESSURIZED SAMPLE BOTTLE

Summary

On February 9, 2010, a worker opened a 500cc bottle containing a gas sample into a ¾-inch vacuum header that was connected to a capillary tube on a piece of analytical equipment. The flex line (rated at 100 psig) that attached the bottle to the equipment was immediately damaged. The worker realized the bottle was over pressured and immediately closed the manual valve on the sample bottle and began a series of valve alignments to protect equipment and relieve the gas pressure. Gas samples at 20 psig had been routinely ordered by the Principle Investigator (PI). The procurement process was different for this sample, and the 20 psig pressure requirement was not identified on the specification that was submitted to the vendor. The PI did not know that the vendor filled the 500cc bottle to its maximum pressure of 1,800 psig. The bottle did not have any labeling or indication that it had been filled to its maximum pressure. There was no impact to personal safety, health, or the environment as a result of this event.

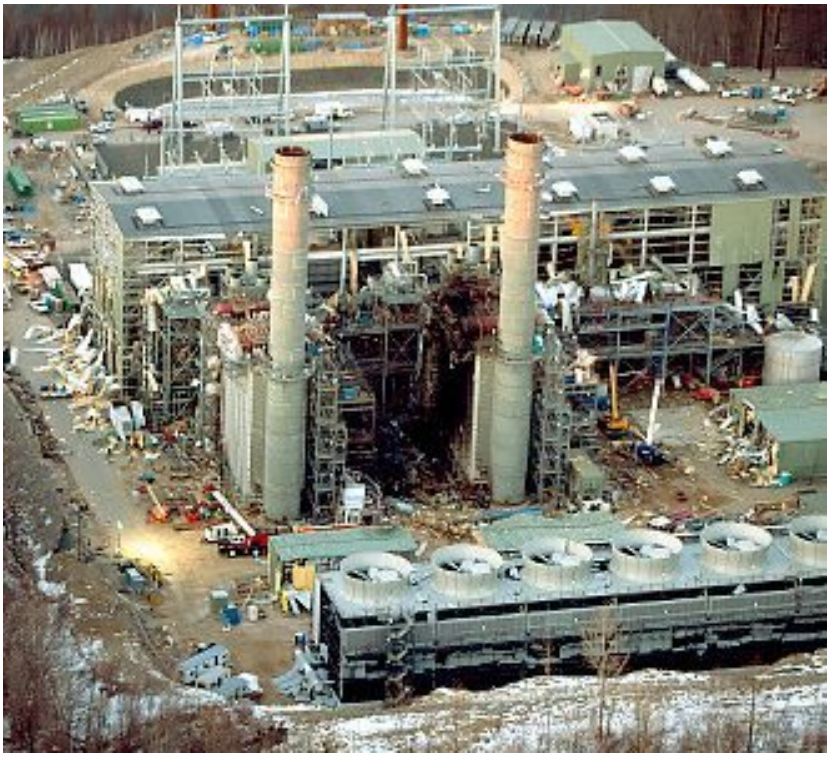
Lessons Learned

- It is imperative to label containers in detail so they can be handled properly by others.

Source

ORPS (Significance Category 3), February 9, 2010. NA-LASO-LANL-TRITFACILS-2010-0002, Los Alamos National Laboratory.

NATURAL GAS BLOW LEADS TO EXPLOSION



Summary

On February 7, 2010, an investigator with the U.S. Chemical Safety Board (CSB) said a natural gas blow might have caused an explosion at a Connecticut power plant that **killed six and injured 26.** The blast happened during a planned blow at the 620 MW Kleen Energy Plant during which workers used natural gas at a high velocity to clean debris out of gas pipes. Initial investigations show there was 400,000 standard cubic feet of gas released into an area with two heat recovery steam generators and the wall of the power block building in the ten minutes before the explosion, slowing down the gas' dispersment. With so many construction activities going on at the time, anything could have ignited the gas.

Lessons Learned

- Be aware of the possible hazards within your workspace when dealing with flammable substances;
- Insure gas is being vented properly;
- Possible alternatives to using natural gas are air, steam, nitrogen, and water.

Source

http://www.power-eng.com/articles/2010/02/kleen-explosion-update.html

WORKER BURNS LEG WITH HOT WATER WHILE REPAIRING WATER SYSTEM

Incident Tracking

Incident Profile

Incident Title:	Worker Burns Leg with Hot Water While Repairing Water System		
Incident (Accident) Identifier:	201614401		
Report Date:	01/12/2010		
Report ID (OSHA):	1054113		
Incident Description:	On January 12, 2010, Employee #1, of Kerr Concentrates Inc, was replacing a sensor on a water heating system and failed to release all the hot water. The water temperature was approximately 200 degrees Fahrenheit; gravity caused approximately one-gallon of this hot water to pour out onto his right leg. Employee #1 sustained a first to second degree burn on his right leg and was hospitalized.		
INCIDENT CATEGORY:	Boiler-related		
INCIDENT CAUSE:	Operator Error		
Inspection Number:	313680126		
OSHA Open Date:	01/20/2010	**OSHA Close Date:**	07/13/2010
Number of Days Open:	174		
Where did the incident occur?	Kerr Concentrates Inc		
Incident Jurisdiction (State-Zip):	OR 97301		
Fatalities:	0	**Injuries:**	1
Keywords (OSHA):	hot water, hot water tank, burn, leg, repair		

LEAKING ACETYLENE CYLINDER SHUTOFF VALVES

Summary

On January 11, 2010, while cutting rebar with an acetylene torch at the Savannah River Salt Waste Processing Facility (SWPF), a small fire (3-inch flame) occurred at a cylinder shutoff valve, which was quickly extinguished. Investigators determined that the cylinder shutoff valve was leaking at the valve stem when the valve was in the open position. An extensive inspection was conducted on acetylene cylinders at the SWPF. Five out of eight cylinders were found to be leaking just below the handwheel of the shutoff valve. The leaks occurred only when the valves were open. The gas vendor removed the leaking cylinders and provided seven new cylinders; however, three of them also leaked at the same location.

Lessons Learned

- Leaking valves should be closed and cylinders taken out of service;
- Cylinders should be inspected for corrosion, valve damage, leaks, signs of tampering, and valid hydrostatic test date;
- Leak checks should be performed on cylinder valves, fittings, and regulators;
- Acetylene cylinders should be located away from and protected from ignition sources;
- Work closely with gas suppliers to ensure receipt of leak-free and safe cylinders.

Source

Safety Advisory from the Office of Health, Safety and Security, January 2010.

INCOMPATIBLE COMPONENTS FOR OXYGEN SYSTEM CAUSE FIRE

Summary

On December 16, 2009, workers were troubleshooting the loss of oxygen flow at the time of the accident. The fire happened shortly after opening and closing the valve in question, venting 2200 psig oxygen to atmosphere. The most likely scenario is that the frictional heating associated with actuating the valve – along with the flow friction associated with venting high pressure to the atmosphere – resulted in sufficient heat to ignite the incompatible lubricant within the valve. Once ignited, the fire spread to the valve's soft-seat materials (PTFE), and then eventually to the stainless steel valve body itself. The fire then propagated to the surrounding enclosure and impinged on the building wall as well. An injury occurred.

Lessons Learned

- It is imperative for users to understand manufacturer's markings related to oxygen compatibility.

Source

ORPS Significance (Category 4) December 16, 2009. SSO-SNL-2009-4122-02, Sandia National Laboratories.

PRESSURE VESSEL EXPLODES, KILLS TRUCK DRIVER

Incident Tracking

Incident Profile

Incident Title:	Pressure Vessel Explodes, Kills Truck Driver
Incident (Accident) Identifier:	200824415
Report Date:	12/07/2009
Report ID (OSHA):	521400

Incident Description:	At approximately 2:36 pm on December 7, 2009, an explosion occurred when producing AT and Optical Crystals in high pressure autoclaves/vessels. The high pressure vessels were manufactured by Engineered Pressure Systems, Inc. Employees were required to load and unload the high pressure vessels with propriety substances. Once the vessels were loaded, the employees monitored the process and performed other duties. During the operation, vessel Number 2 exploded and released high temperature caustic solvent that created a large plume. The pressure blast destroyed the facility and emitted debris onto adjacent properties. A truck driver on an adjacent highway was struck by the flying building material and was killed instantly. The truck driver was not an employee of NDK Crystals. Employees working at the NDK facility received minor injuries such as lacerations and contusions. Employees at the plant were provided some training on the process, but were not provided adequate training on hazard communication and PPE. All employees at the facility spoke English. Employees were provided with some PPE, but only for the loading and unloading process. The preliminary findings were that the explosion was related to stress fractures and corrosion cracking.

INCIDENT CATEGORY:			
INCIDENT CAUSE:			
Inspection Number:	312731425		
OSHA Open Date:	12/07/2009	**OSHA Close Date:**	12/07/2009
Number of Days Open:	0		
Where did the incident occur?	NDK CRYSTALS		
Incident Jurisdiction (State-Zip):	IL BELVIDERE		

Fatalities:	0	**Injuries:**	1
Keywords (OSHA):	CORROSION, PRESSURE VESSEL, EXPLOSION, UNTRAINED		

ONE EMPLOYEE IS KILLED IN BOILER EXPLOSION, ANOTHER IS INJURED

Incident Tracking

Incident Profile

Incident Title:	One Employee Is Killed In Boiler Explosion, Another Is Injured		
Incident (Accident) Identifier:	201925021		
Report Date:	12/04/2009		
Report ID (OSHA):	0626700		
Incident Description:	At approximately 8:45 p.m. on December 4, 2009, Employee #1, #2, and other coworkers were restarting the B28 boiler in the Steam Unit, when the boiler catastrophically failed. The boiler explosion threw Employee #1 under the structure of the B27 boiler, causing him to sustain fatal blunt force trauma. A coworker and Employee #2 suffered unspecified injuries. Employee #2 was transported to a medical center, where he received treatment and was hospitalized.		
INCIDENT CATEGORY:			
INCIDENT CAUSE:			
Inspection Number:	312920226		
OSHA Open Date:	12/04/2009	**OSHA Close Date:**	04/13/2011
Number of Days Open:	495		
Where did the incident occur?	Valero Refinery		
Incident Jurisdiction (State-Zip):	TX 77590		
Fatalities:	1	**Injuries:**	1
Keywords (OSHA):	boiler, explosion		

GAS EXPLOSION IN UTAH

Summary

On November 4, 2009, an explosion occurred at the Silver Eagle Oil Refinery in Woods Cross, UT when a 10-inch pipe failed catastrophically. Although the failure mechanism has yet to be determined, the pipe showed evidence of significant thinning, which had not been detected by the refinery's mechanical integrity program. The blast damaged nearby homes and was felt over a distance of several miles. A six-member team CSB led by Investigations Supervisor Donald Holmstrom was deployed to the scene of the explosion, which occurred in the diesel hydro-treater unit. Over the past several days, the CSB team has developed a number of serious concerns about the integrity of the piping and equipment at various locations in the plant. These concerns include a lack of required documentation and a lack of needed calculations of the fitness for service of various pieces of equipment. The agency discussed these serious concerns with Utah OSHA, the Utah Labor Commission, federal OSHA and Silver Eagle executives. CSB Chairman John Bresland told the chairman of the board and the president of Silver Eagle that in his view, the best course of action for the refinery would be to stand down as quickly and safely as possible. The refinery units should remain shut down until the integrity and fitness for service of all the equipment can be documented and verified. Silver Eagle's management responded by beginning an orderly process to stand down the refinery until the steps were accomplished.

Lessons Learned

- Keep up-to-date and accurate records of the integrity and fitness of piping and equipment within a facility;
- Do not operate a facility if integrity and fitness of piping and equipment is either insufficient or unknown.

Source

http://ehstoday.com/fire_emergencyresponse/news/chemical-safety-board-gas-explosion-woods-cross-5456/

EMPLOYEE IS INJURED AFTER STRUCK BY SHATTERED GUARD

Incident Tracking

Incident Profile

Incident Title:	Employee Is Injured after Struck by Shattered Guard
Incident (Accident) Identifier:	202080271
Report Date:	10/29/2009
Report ID (OSHA):	453730
Incident Description:	On October 29, 2009, Employee #1 was performing pressures tests on 30-pound fire extinguisher bodies, using a test machine run in automatic mode. Employee #1 loaded four bodies/cylinders into the machine and started the test cycle by activating the two-hand control. The machine submerged the fire extinguishers into a water bath, and the bodies were to be pressurized to approximately 640 psi. As Employee #1 was observing for water bubbles, which indicated that the body did not pass the pressure test, one fire extinguisher body ruptured. The 0.375-inch-thick Lexan cover/guard, used as an observation port, blew apart. Piece(s) of the cover/guard and/or air pressure struck Employee #1 in the face and head. Employee #1 sustained multiple facial fractures and was hospitalized.
INCIDENT CATEGORY:	Pressure Vessel-related
INCIDENT CAUSE:	Failure of Equipment
Inspection Number:	313977613
OSHA Open Date:	10/29/2009 **OSHA Close Date:** 04/05/2010
Number of Days Open:	158
Where did the incident occur?	BUCKEYE FIRE EQUIPMENT COMPANY
Incident Jurisdiction (State-Zip):	NC 28086
Fatalities:	0 **Injuries:** 1
Keywords (OSHA):	STRUCK BY, FRACTURE, FACE, FLYING OBJECT, HIGH PRESSURE, FIRE EXTINGUISHER, RUPTURE, GUARD, AIR PRESSURE

UNEXPECTED DISCONNECT OF LIQUID NITROGEN FILL LINE

Summary

On October 8, 2009, a technologist was in the process of filling a 240-liter nitrogen Dewar at an outside fill station when the six-foot metal fill hose blew off and away from the Dewar causing it to whip around. The technologist did not feel safe trying to turn off the liquid nitrogen fill valve so the technologist got assistance from a second technologist. The technologists attempted to restrain the whipping fill hose with heavy rubber pads but this failed. They then used a broom to restrain the hose to approach close enough to the fill unit to shut the valve and turn off the liquid nitrogen. No injuries occurred during this event. The filling activity was halted, the ES&H coordinator reviewed the scene, and the damaged hardware was removed and replaced. The ES&H coordinator recommended that a whip arrester be used during the filling operations.

Lessons Learned

- Inspect fill lines to see if the line is damaged in any way prior to filling;
- Look into installing a restraining device or whip arrester to prevent the fill line from whipping around in case of failure.

Source

ORPS (Significance Category 3), October 8, 2009.

EMPLOYEE IS INJURED WHEN STRUCK BY FLYING OBJECT

Incident Profile

Incident Title:	Employee Is Injured When Struck By Flying Object		
Incident (Accident) Identifier:	200651701		
Report Date:	10/02/2009		
Report ID (OSHA):	0521100		
Incident Description:	At approximately 2:45 p.m. on October 2, 2009, Employee #1, a machine operator, was working with a boiler technician to replace a gas valve actuator on the boiler, a Hurst Boiler and Welding Co. Inc. Mfg., Serial Number S2500 15037, and Model Number B66549. The repair was completed and the boiler technician was on the control end while Employee #1 was on the other end of the boiler, looking through the sight glass. There was an internal boiler gas explosion and Employee #1 was hit by a manhole. He was hospitalized for treatment.		
INCIDENT CATEGORY:			
INCIDENT CAUSE:	Failure of Controls		
Inspection Number:	312553589		
OSHA Open Date:	10/02/2009	**OSHA Close Date:**	04/15/2010
Number of Days Open:	195		
Where did the incident occur?	Appleton Medical Center		
Incident Jurisdiction (State-Zip):	WI 54911		
Fatalities:	0	**Injuries:**	1
Keywords (OSHA):	machine operator, struck by, flying object, boiler, pressure vessel, explosion, head, concussion		

COMPRESSED GAS CYLINDER RUPTURES, AMPUTATES WORKER'S LEGS

Incident Tracking

Incident Profile

Incident Title:	Compressed Gas Cylinder Ruptures, Amputates Worker's Legs		
Incident (Accident) Identifier:	200358174		
Report Date:	08/20/2009		
Report ID (OSHA):	453710		
Incident Description:	On August 20, 2009, a worker was filling a 60-cylinder manifold system of compressed oxygen. It was operating at 2,350 lbs of pressure. During filling a gas cylinder ruptured. At the time of the cylinder rupture, the worker was turning off the cylinder valves. EMS responded to the scene, and the worker was transported to Wayne Memorial Hospital and then airlifted to Pitt Memorial Hospital, where he was hospitalized. As a result of the severity of the worker's injury, medical personnel amputated both legs at the mid-thigh level.		
INCIDENT CATEGORY:			
INCIDENT CAUSE:			
Inspection Number:	313216988		
OSHA Open Date:	09/30/2009	**OSHA Close Date:**	02/25/2010
Number of Days Open:	148		
Where did the incident occur?	AIRGAS NATIONAL WELDERS INC.		
Incident Jurisdiction (State-Zip):	NC 27530		
Fatalities:	0	**Injuries:**	1
Keywords (OSHA):	STRUCK BY, FLYING OBJECT, CYLINDER, LEG, RUPTURE, AMPUTATED, COMPRESSED GAS, OXYGEN, HIGH PRESSURE, EXPLOSION		

COMPRESSED GAS CYLINDER RUPTURES

Summary

On August 20, 2009, at Airgas National Welders Inc. a worker was filling a 60-cylinder manifold system of compressed oxygen. It was operating at 2,350 lbs of pressure. During filling, a gas cylinder ruptured. At the time of the cylinder rupture, the worker was turning off the cylinder valves. As a result of the severity of the worker's injury, medical personnel amputated both legs at the mid-thigh level.

Source

"The 2014 National Board Incident Report-Based on 2009 OSHA Data". National Board Bulletin. www.nationalboard.org

AIR LINE RUPTURE ACCIDENT

Summary

On August 19, 2009, Sandia National Laboratories experienced a pressure system failure. The air line rupture was the result of bringing together the three necessary ingredients for combustion: a source of oxygen, a fuel source, and means of ignition. Oxygen was supplied in the form of compressed air used to drive the hammer drill; Fuel existed in the form of the oil used for lubrication of the hammer drill; and the Heat (or ignition) source was produced upon opening the fast acting valve with the resultant compressional heating of the air / oil mixture to the point of auto ignition. Internal pressures generated by this explosive event far exceeded the material strength of the tubing. The accident resulted from an internal combustion event that occurred immediately upon the opening of the quarter valve. The air line was made of 0.75 inch outside diameter, 0.065 inch wall thickness stainless steel tubing and was rated to approximately 3300 psig. The line fragmented in a violent fashion and threw stainless steel fragments around the area. Three workers were in the near vicinity, but thankfully no one was injured. Other damage from the event included a large hole in the side of the shed at the location where the line fragmented.

Lessons Learned

- Modification of standard industrial practices (e.g. increasing operational pressure ranges in equipment involving lubrication oil and compressed air) must be evaluated in a very robust manner;
- Critical in-depth reviews of non-standard operations are required to identify and control such hazards that are not recognized in the system design process.

Source

SSO-SNL-2009-6300-01, Sandia National Laboratories.

EMPLOYEE DIES AFTER CHEMICAL INHALATION

Incident Tracking

Incident Profile

Incident Title:	Employee Dies After Chemical Inhalation
Incident (Accident) Identifier:	202507166
Report Date:	07/31/2009
Report ID (OSHA):	0950663
Incident Description:	At approximately 9:15 a.m. on July 31, 2009, Employee #1, with TriCal, Inc. (an agricultural chemical mixing plant and chemical transfer facility), was filling a cylinder with 115 lbs of liquid chloropicrin and 245 lbs of liquid methyl bromide. He was adjacent to the cylinder in a ventilated booth. The only personal protective equipment he was wearing was safety glasses and boots. When the cylinder was pressurized to approximately 80 psi, it suddenly ruptured. He was splashed with the chemicals. Employee #1 was transported to Antelope Valley Hospital in Lancaster, CA, where he died at 11:30 p.m. that day from pulmonary edema caused by the inhalation of the chemicals. The cylinder was manufactured and hydrostatically tested to 480 psi in April of 2006 by Manchester Tank & Equipment Company. The ruptured cylinder was found to have severe internal corrosion but no external corrosion. The employer had used the cylinder for various mixtures, one of which contained a detergent and water.
INCIDENT CATEGORY:	
INCIDENT CAUSE:	
Inspection Number:	311074157
OSHA Open Date:	08/07/2009
OSHA Close Date:	08/07/2009
Number of Days Open:	0
Where did the incident occur?	Trical,Inc.
Incident Jurisdiction (State-Zip):	CA 93501
Fatalities:	1
Injuries:	0
Keywords (OSHA):	inhalation, respiratory, corrosion, chemical, chemical vapor, ppe, rupture, leak, cylinder, pressure release

EMPLOYEE IS INJURED WHEN AUTOCLAVE DOOR BLOWS OFF

Summary

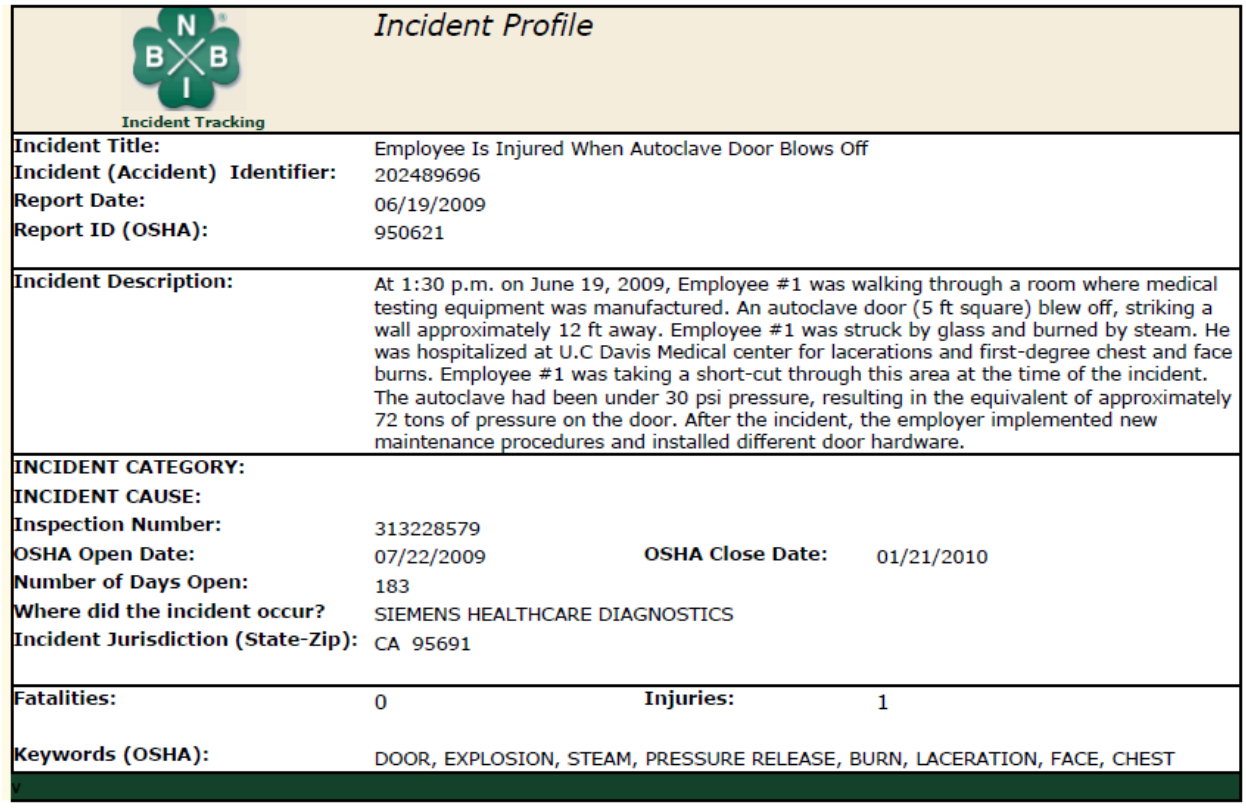
At 1:30pm on June 19, 2009, at Siemens Healthcare Diagnostics, Employee #1 was walking through a room where medical testing equipment was manufactured. An autoclave door (5ft square) blew off, striking a wall approximately 12ft away. Employee #1 was struck by glass and burned by steam. He was taking a short-cut through this area at a time of the incident. The autoclave had been under 30psi. After the incident, the employer implemented new maintenance procedures and installed different door hardware.

Lessons Learned

It's important to revisit old procedures and see if they can be improved before an incident occurs.

Source

"The 2014 National Board Incident Report-Based on 2009 OSHA Data". National Board Bulletin. www.nationalboard.org



Incident Profile

Incident Tracking

Incident Title:	Employee Is Injured When Autoclave Door Blows Off		
Incident (Accident) Identifier:	202489696		
Report Date:	06/19/2009		
Report ID (OSHA):	950621		
Incident Description:	At 1:30 p.m. on June 19, 2009, Employee #1 was walking through a room where medical testing equipment was manufactured. An autoclave door (5 ft square) blew off, striking a wall approximately 12 ft away. Employee #1 was struck by glass and burned by steam. He was hospitalized at U.C Davis Medical center for lacerations and first-degree chest and face burns. Employee #1 was taking a short-cut through this area at the time of the incident. The autoclave had been under 30 psi pressure, resulting in the equivalent of approximately 72 tons of pressure on the door. After the incident, the employer implemented new maintenance procedures and installed different door hardware.		
INCIDENT CATEGORY:			
INCIDENT CAUSE:			
Inspection Number:	313228579		
OSHA Open Date:	07/22/2009	**OSHA Close Date:**	01/21/2010
Number of Days Open:	183		
Where did the incident occur?	SIEMENS HEALTHCARE DIAGNOSTICS		
Incident Jurisdiction (State-Zip):	CA 95691		
Fatalities:	0	**Injuries:**	1
Keywords (OSHA):	DOOR, EXPLOSION, STEAM, PRESSURE RELEASE, BURN, LACERATION, FACE, CHEST		

DEADLY CONAGRA EXPLOSION

Summary

On June 9, 2009, a natural gas explosion at the ConAgra Slim Jim production facility in Garner, North Carolina, which **caused four deaths, three critical life-threatening burn injuries, and other injuries that sent a total of 67 people to the hospital**. In preliminary findings, CSB investigators determined that the catastrophic explosion resulted from the accumulation of significant amounts of natural gas that had been purged indoors from a new 120-foot length of pipe during the startup of a new water heater in the plant that made Slim Jims, a popular beef-jerky product. During pipe purging, workers feed pressurized gas into a pipe in order to displace air or other gases so that only pure fuel gas remains in the piping when it is connected to an appliance such as a water heater or boiler.

CSB Chairman John Bresland said, "The board is very concerned that companies across the country continue to purge pipes indoors, and this evening we will consider recommendations to the National Fire Protection Association (NFPA), the American Gas Association (AGA) and the International Code Council (ICC). Currently, the codes of the NFPA and ICC do not require gases to be vented outdoors or define adequate ventilation or hazardous conditions, nor do they require the use of combustible-gas detectors during these operations. The CSB recommendations, if adopted, would urge that these things be done." CSB investigations supervisor Donald Holmstrom said his team made the recommendations to the board during the course of the ConAgra investigation after discovering gaps in the fuel gas codes. "Purging flammable gases into building interiors is a recipe for disaster. At ConAgra, we determined the accident would not have happened had the gas been vented safely outdoors through a hose or pipe." Mr. Holmstrom noted that since the June 2009 accident, ConAgra has instituted strict policies on purging, requiring it be done to safe outdoor locations.

Source

http://www.csb.gov/

EMPLOYEE DIES WHEN CYLINDER EXPLODES

Incident Tracking

Incident Profile

Incident Title:	Employee Dies When Cylinder Explodes		
Incident (Accident) Identifier:	201312006		
Report Date:	05/13/2009		
Report ID (OSHA):	0213400		
Incident Description:	On May 13, 2009, a compressed gas cylinder exploded, killing Employee #1. No additional information was provided in the narrative.		
INCIDENT CATEGORY:			
INCIDENT CAUSE:			
Inspection Number:	311919849		
OSHA Open Date:	05/13/2009	**OSHA Close Date:**	02/18/2010
Number of Days Open:	281		
Where did the incident occur?	J.W. Goodliffe & Son, Inc. Dba/Cyberweld		
Incident Jurisdiction (State-Zip):	NJ 07036		
Fatalities:	1	**Injuries:**	0
Keywords (OSHA):	cylinder, compressed air, gas, explosion		

COMPRESSED AIR TANK FAILURE

Summary

In May 2009, a compressed air tank failed, blowing the bottom off of the tank and sending fragments flying into a concrete wall, puncturing the wall. Investigation following the incident revealed several serious problems with the condition of the tank, including severe corrosion and rust at the bottom of the tank, where it failed, and an improper weld repair which had been made to the tank at some time in the past. Although the weld repair did not contribute to this incident, it is a symptom of improper maintenance and inspection, and could have caused a tank failure. Fortunately, nobody was in the area when the tank failed, and there were no injuries.

Lessons Learned

- Visually inspect vessels, piping, and other equipment as you walk through your plant, and report anything which appears to be corroded or improperly maintained. Follow up and make sure that problems are corrected.
- Understand the equipment inspection and maintenance program in your plant, and understand your role in ensuring that all activities are completed as required.
- When you do mechanical work that requires removal of insulation from equipment, take the opportunity to look at the condition of the equipment and report any corrosion or other problems that you observe. Corrosion under insulation may be hidden.
- Make sure that all welds and other repairs follow all required standards, and meet the original design specifications for the equipment.
- Assure that all pressure vessels in your plant, including portable tanks and tanks which are a part of “packaged systems” (for example, compressors, refrigeration units, compressed air systems, etc.), are included in the plant mechanical integrity inspection program and are being inspected by qualified pressure vessel inspectors.
- Make sure that compressed air tanks and other portable compressed gas cylinders are stored in dry locations to prevent external rust and corrosion.

Source

http://www.sache.org/beacon/files/2009/05/en/read/2009-05-Beacon-s.pdf

PRESURE VESSEL RUPTURE

Summary

On April 6, 2009, an accident at an academic research laboratory seriously injured a worker when a 120-pound laser diagnostic detector assembly broke loose from its overhead mounting and fell onto the worker. This in-house designed and fabricated equipment included a pressurized tube that failed during the accident.

In another accident that occurred at a DOE facility several years ago, a pressure vessel ruptured and was propelled approximately 60 feet, damaging experimental equipment, a storage cabinet, and a roll-up door. In other accidents, workers have been injured by failures of pressure systems connected to facility piping systems or compressed gas cylinders, and by failures of attachments to overhead structures or walls. In all of these cases, the failures involved "low-tech" equipment that, when properly engineered and installed, would have been safe to operate.

Lessons Learned

Failures of pressure systems, pressure vessels, and overhead equipment installations can cause serious injuries. Several accidents at research and development facilities demonstrate the importance of implementing engineering standards for designing, fabricating, assembling, installing and inspecting equipment to assure that work is performed as specified, and for reviewing and controlling changes in that equipment once installed and in use.

Source

Lawrence Livermore National Security, LLC. Lesson ID**:** LL-2009-LLNL-02 (LLNL-AR-409531-Rev 1).

TWO EMPLOYEES ARE KILLED WHEN HOT WATER TANK EXPLODES

Incident Tracking

Incident Profile

Incident Title:	Two Employees Are Killed When Hot Water Tank Explodes		
Incident (Accident) Identifier:	202549853		
Report Date:	03/20/2009		
Report ID (OSHA):	950631		
Incident Description:	At 11:30 p.m. on March 19, 2009, employees from the third shift had just come in to work. Their employer is a manufacturer of plastic conveyor parts. One employee pointed out to the on-shift supervisor (Employee #1) that there was a pool of water near an 80-gallon water heater (Whirlpool Model Number EE3Z80HD055V, Serial Number 0745105567) that was being used to supply heating water to the production process. Minutes after this exchange, the water heater tank exploded. Both Employee #1 and Employee #2, the second-shift supervisor, suffered blunt force injuries in the explosion and were instantly killed. The hot water tank broke through the roof, about 30 feet above the floor, and returned through the roof and fell into the workplace about 25 feet from its original location. A third employee was injured by flying shrapnel and was treated and released at a local hospital.		
INCIDENT CATEGORY:			
INCIDENT CAUSE:			
Inspection Number:	310297064		
OSHA Open Date:	03/20/2009	**OSHA Close Date:**	03/20/2009
Number of Days Open:	0		
Where did the incident occur?	SOLUS INDUSTRIAL INNOVATIONS LLC		
Incident Jurisdiction (State-Zip):	CA 92688		
Fatalities:	2	**Injuries:**	0
Keywords (OSHA):	EXPLOSION, HOT WATER TANK, CONTUSION, PLASTIC MFG, LACERATION		

HOT WATER TANK EXPLODES AND KILLS TWO EMPLOYEES

Summary

At 11:30pm on March 19, 2009, at Solus Industrial Innovations LLC, employees from the third shift had just come in to work. Their employer is a manufacturer of plastic conveyor parts. One employee pointed out to the on-shift supervisor (Employee #1) that there was a pool of water near an 80-gallon water heater that was being used to supply heating water to the production process. Minutes after this exchange, the water heater tank exploded. Employee #1 and Employee #2, the second-shift supervisor, suffered blunt force injuries in the explosion and were instantly killed. The hot water tank broke through the roof, about 30 feet above the floor, and returned through the roof and fell into the workplace about 25 feet from its original location. A third employee was injured by flying shrapnel and was treated and released at a local hospital.

Lessons Learned

Treat any reports of malfunction in a high pressure system seriously. What may seem like a small issue could easily become a catastrophic failure.

Source

"The 2014 National Board Incident Report-Based on 2009 OSHA Data". National Board Bulletin. www.nationalboard.org

EMPLOYEE IS KILLED WHEN TIRE RUPTURES

Incident Tracking

Incident Profile

Incident Title:	Employee Is Killed When Tire Ruptures
Incident (Accident) Identifier:	200902344
Report Date:	03/10/2009
Report ID (OSHA):	418400
Incident Description:	On March 10, 2009, Employee #1 was standing next to a 24 in. tire on a dirt pan. The tire ruptured during inflation and shrapnel struck the left side of his face and neck. Employee #1 sustained a fractured neck; he was killed.
INCIDENT CATEGORY:	Pressure Vessel-related
INCIDENT CAUSE:	
Inspection Number:	310992417
OSHA Open Date:	03/10/2009 **OSHA Close Date:** 03/11/2009
Number of Days Open:	0
Where did the incident occur?	SIKES BROTHERS METER GA 1 12
Incident Jurisdiction (State-Zip):	
Fatalities:	1 **Injuries:** 0
Keywords (OSHA):	TIRE, RUPTURE, INFLATING, PRESSURE RELEASE, WHEEL, STRUCK BY, FACE, NECK, FRACTURE, VERTEBRA

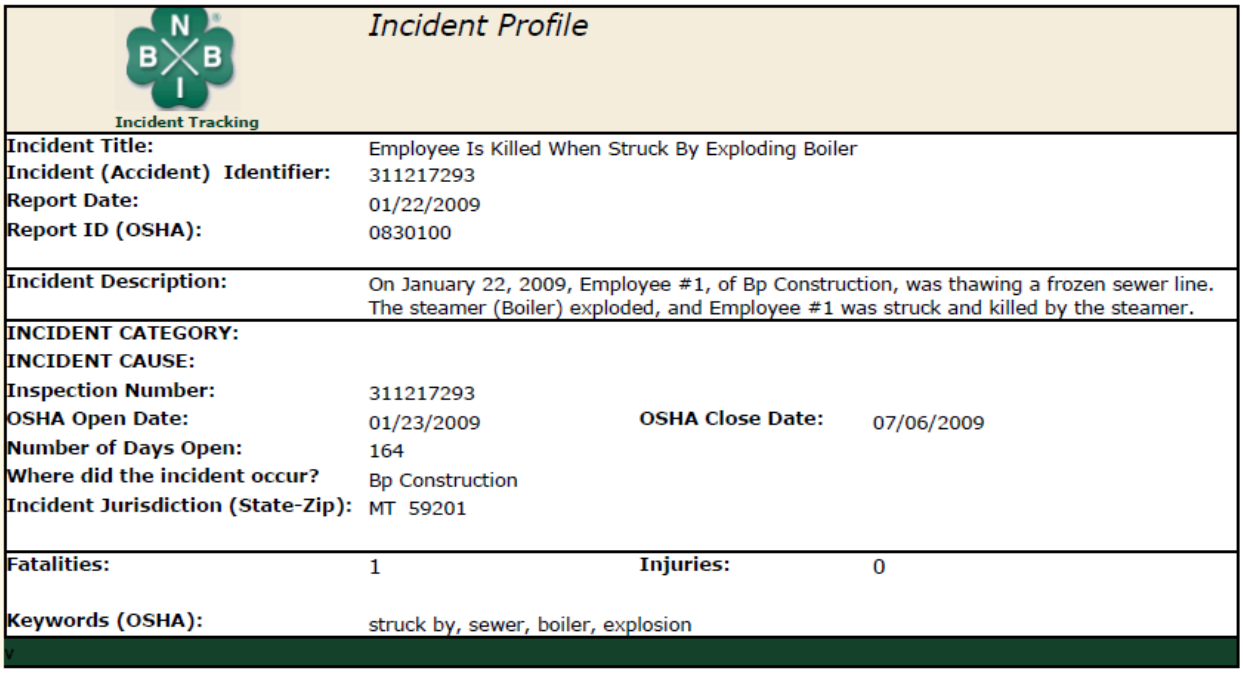
EMPLOYEE IS INJURED WHEN STRUCK BY RELIEF DISK

Incident Tracking

Incident Profile

Incident Title:	Employee Is Injured When Struck By Relief Disk		
Incident (Accident) Identifier:	201492444		
Report Date:	02/27/2009		
Report ID (OSHA):	950625		
Incident Description:	At approximately 6:30 a.m. on February 27, 2009, Employee #1 was working at a farming facility that processes, packs, and ships fresh carrots and juice nationwide. Employee #1 was positioned about 40 feet away from a pressure relief discharge port that was connected to a 6-inch diameter pipe that branched off into the main plumbing. It was through this pressurized piping system that the facility's carrot wash water was recycled. The main plumbing system measured approximately 30 inches in diameter and operated at 30 psi. In addition, the 6-inch pipe housed an engineered disk that works as a safety-relief valve to rupture when 125 psi is reached in the system. As Employee #1 was working, the disk ruptured and struck him on the side of his face. Employee #1 was hospitalized, where he was treated for lacerations to his face.		
INCIDENT CATEGORY:	Pressure Vessel-related		
INCIDENT CAUSE:	Violation of Safety Procedures		
Inspection Number:	312911506		
OSHA Open Date:	08/12/2009	**OSHA Close Date:**	08/24/2009
Number of Days Open:	12		
Where did the incident occur?	Esparza Enterprises		
Incident Jurisdiction (State-Zip):	CA 93307		
Fatalities:	0	**Injuries:**	1
Keywords (OSHA):	pressure piping, valve, laceration, struck by, face, water, flying object		

EMPLOYEE IS KILLED WHEN STRUCK BY EXPLODING BOILER



Incident Tracking

Incident Profile

Incident Title:	Employee Is Killed When Struck By Exploding Boiler		
Incident (Accident) Identifier:	311217293		
Report Date:	01/22/2009		
Report ID (OSHA):	0830100		
Incident Description:	On January 22, 2009, Employee #1, of Bp Construction, was thawing a frozen sewer line. The steamer (Boiler) exploded, and Employee #1 was struck and killed by the steamer.		
INCIDENT CATEGORY:			
INCIDENT CAUSE:			
Inspection Number:	311217293		
OSHA Open Date:	01/23/2009	**OSHA Close Date:**	07/06/2009
Number of Days Open:	164		
Where did the incident occur?	Bp Construction		
Incident Jurisdiction (State-Zip):	MT 59201		
Fatalities:	1	**Injuries:**	0
Keywords (OSHA):	struck by, sewer, boiler, explosion		

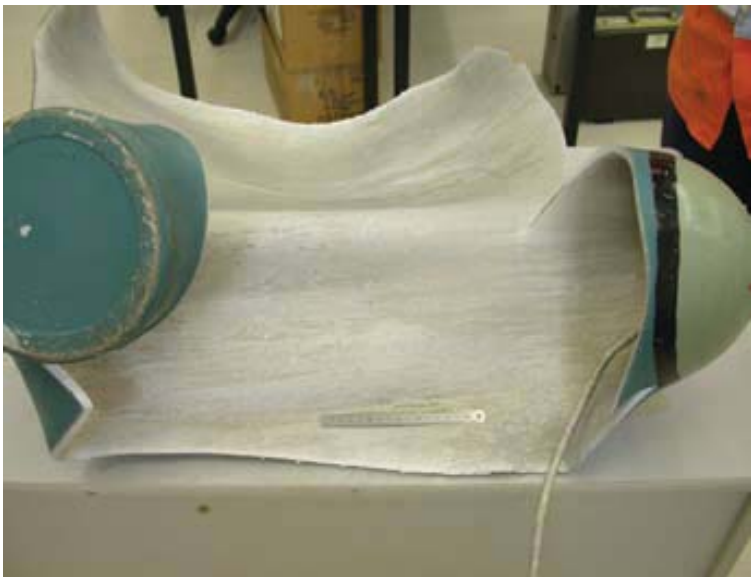
COMPANY OWNER IS KILLED IN AIR TANK EXPLOSION

Incident Tracking

Incident Profile

Incident Title:	Company Owner Is Killed in Air Tank Explosion		
Incident (Accident) Identifier:	201492261		
Report Date:	01/16/2009		
Report ID (OSHA):	950625		
Incident Description:	On January 16, 2009, the owner of Conner's Manufacturing, Inc., was killed when an air tank exploded.		
INCIDENT CATEGORY:	Pressure Vessel-related		
INCIDENT CAUSE:	Failure of Equipment		
Inspection Number:	310829080		
OSHA Open Date:	01/17/2009	**OSHA Close Date:**	01/17/2009
Number of Days Open:	0		
Where did the incident occur?	Conner'S Mfg, Inc		
Incident Jurisdiction (State-Zip):	CA 93706		
Fatalities:	1	**Injuries:**	0
Keywords (OSHA):	explosion, compressed air, tank		

GAS CYLINDER RUPTURES



Summary

In 2009 at an Australian gas supplier's facility a gas cylinder that was being filled with Argon based mixture ruptured and blew open. Fortunately Argon is a noble gas and is highly unreactive so no fire occurred. Upon investigation it was discovered that the cylinder had been exposed to high amounts of heat in the past and had its heat tag replaced (device which melts when exposed to high temperatures giving an indication that this device should not be used). The evidence of repainting was also uncovered indicating someone had unsuccessfully repaired the cylinder in the past. Also there was a reduction in hardness throughout the cylinder.

Lessons Learned

- Equipment repair is only to be done by someone who is trained and authorized.
- Cylinders should be kept away from extreme temperatures unless they have been designed for those conditions.

Source

http://www.worksafe.vic.gov.au/wps/wcm/connect/e891ad804071f0bdb39cffe1fb554c40/Alert_Gas+cyclinders.pdf?MOD=AJPERES

STATIC ELECTRICITY CAUSES FIRE

Summary

At the end of 2008, an incident was published which included a fire starting in a packaging area while a 300-gallon portable steel tank (a “tote”) was being filled with ethyl-acetate. Static electricity was discussed as an ignition source, the importance of bonding and grounding, and the use of dip pipes or bottom loading for filling containers with flammable liquids. In this issue we will discuss another important lesson from the same incident. The consequence of this incident became much more severe because the initial fire spread to an adjacent flammable material storage warehouse. The wall separating the two areas was not fire-rated. Large non-fire-rated doors between the warehouse and packaging area were kept open, and were not equipped with self-closing mechanisms. Also there was no fire protection system (sprinklers or other fire suppression system) in the flammable material packaging area. Spill containment is important whenever you are filling containers with any material, whether flammable or not. For flammable materials, containment helps to limit the area potentially impacted by a fire. And, for all materials containment keeps spills from getting into drains, sewers, surface water drainage, or onto uncontaminated soil. While improper spill containment was not identified as a factor in this particular incident, the incident is a reminder of why containment is important.

Lessons Learned

- Conduct flammable material container filling operations in areas which have been properly desgined for this service
- Be sure that there is proper spill containment around any containers which you are filling. The spill containment must be liquid tight, made of a material appropriate to contain the liquid being handled, and of sufficient size to contain a spill which could occur.
- Conduct a management of change review for any unusual operations which involve filling of containers in areas not originally designed for that purpose, and be sure to consider ignition source control, fire protection, and spill containment.
- Always use properly designed equipment for filling any containers with flammable liquids.
- Static electric charge can be created by liquid freely falling through air, and can result in sparks which can cause ignition of a flammable atmosphere.

Source

http://www.sache.org/beacon/files/2009/02/en/read/2009-02-Beacon-s.pdf
http://www.sache.org/beacon/files/2009/01/en/read/2009-01-Beacon-s.pdf

EMPLOYEE IS OVERCOME BY CARBON MONOXIDE, LATER DIES

	OSHA Incident Profile
Incident Title:	Employee Is Overcome by Carbon Monoxide, Later Dies
Incident (Accident) ID:	201262433
Report Date:	12/05/2008
Report ID (OSHA):	524200
Incident Description:	On December 5, 2008, Employee #1 was dispatched to the site to perform normal maintenance on the building's boiler equipment. Two domestic heating boilers and three comfort heating boilers were located in the room. Employee #1 was working alone in the room. An employee of a cleaning service entered the boiler room at approximately 10:00 a.m. to get a ladder and observed that Employee #1 was sweating profusely and the room was extremely warm. At 11:00 a.m. an employee of the building management company tried to reach the victim by phone and did not receive a response. Between 11:30 a.m. and 12:00 p.m. on December 5, 2008, the victim's supervisor arrived at the site (also, after trying to reach him by phone) and found the door to the boiler room locked. At approximately 12:00 p.m. Employee #1 was found unresponsive in a boiler room of a condominium complex. Employee #1's supervisor reported that one of the three comfort heating boilers was operating. When the supervisor obtained the key to the room, he found Employee #1 sitting on the floor leaning against a box unconscious. Employee #1 was pronounced dead at 12:25 p.m. at the scene. The medical examiner called the fire department and requested that carbon monoxide measurements be taken in the boiler room. The fire department measured approximately 1,400 parts-per-million of carbon monoxide in the room. Exhaust dampers on two of the comfort heating boilers were observed by the contractor to be partially closed during troubleshooting following the accident. This included the damper on the boiler that was operating when Employee #1's supervisor entered the boiler room. Following an autopsy, the medical examiner declared Employee #1 died of carbon monoxide intoxication.
Inspection Number:	312752249
Establishment Name:	"ANCHOR MECHANICAL
(State-Zip):	IL DES PLAINES
Fatalities:	1 **Injuries:** 0
Keywords (OSHA):	ASPHYXIATED, CARBON MONOXIDE, UNCONSCIOUSNESS, BOILER, HEATER

EMPLOYEE IS KILLED WHEN STRUCK BY PRESS ROLL END CAP

OSHA Incident Profile

Incident Title:	Employee Is Killed When Struck by Press Roll End Cap
Incident (Accident) ID:	201391877
Report Date:	11/24/2008
Report ID (OSHA):	552652
Incident Description:	On November 24, 2008, Employee #1 and two other employees were attempting to remove an end cap from a press roll for a paper manufacturer. During the process, they had removed all retaining bolts from the end cap and roll. The employees failed in all attempts to remove the end cap with pusher bolts. In further attempts to remove the end cap, they attached an air valve and pressure gauge to the roll and applied 50 psig (pounds per square inch gauge) to the inside of the roll. The employees left the air pressure in the roll over the weekend. At the start of the new week, employees again attempted to remove the end cap with pusher bolts. When the cap released from the roll, it struck and killed Employee #1.
Inspection Number:	308820208
Establishment Name:	MILL ASSIST SERVICES
(State-Zip):	MI 49078
Fatalities:	1 **Injuries:** 0
Keywords (OSHA):	STRUCK BY, PAPER ROLL, PAPER MACHINE, AIR PRESSURE, HIGH PRESSURE

EMPLOYEE IS BURNED BY STEAM KETTLE

	OSHA Incident Profile
Incident Title:	Employee Is Burned by Steam Kettle
Incident (Accident) ID:	202539987
Report Date:	11/22/2008
Report ID (OSHA):	950641
Incident Description:	At approximately 7:00 a.m., on November 22, 2008, Employee #1 was a food service mechanic replacing the high limit sensor of a steam kettle in the kitchen at the North Campus Student Center. The kettle had been overheating. He replaced the switch then turned the power back on and fired the kettle. The kettle started heating and he observed that the pressure gauge passed 30 psi. He found that the sensor was still not working and turned off the kettle to allow it to cool down. Employee #1 left for an hour to retrieve a tool and to allow the kettle to cool. Upon his return, he removed the nipple of the newly installed sensor in order to determine if it was clogged. He was injured when hot water and steam gushed out onto his forearm and abdomen. He was hospitalized at the Grossman Burn Center for treatment of his burns.
Inspection Number:	126203348
Establishment Name:	UC LOS ANGELES ASSOC. STUDENT DEPT.
(State-Zip):	CA 90024
Fatalities:	0 **Injuries:** 1
Keywords (OSHA):	STEAM, FOOD PREPARATION, MAINTENANCE, COOKER--PRESSURE, HOT WATER, BURN, ABDOMEN, FOREARM, ARM, REPAIR

EMPLOYEE IS BURNED WHEN PROPANE TANK EXPLODES

OSHA Incident Profile

Incident Title:	Employee Is Burned When Propane Tank Explodes
Incident (Accident) ID:	202449690
Report Date:	11/18/2008
Report ID (OSHA):	950633
Incident Description:	On November 18, 2008, Employee #1 was filling a propane tank, when it exploded. Employee #1 was burned.
Inspection Number:	310605373
Establishment Name:	LEISO INC. DBA APEX RENTALS
(State-Zip):	CA 92345
Fatalities:	0 **Injuries:** 1
Keywords (OSHA):	PROPANE, FIRE, EXPLOSION, FLAMMABLE LIQUID, BURN, SCALP

CORROSION CAUSES VALVE BREAKAGE

Summary

On November 17, 2008, a utility operator from the Facilities, Infrastructure, and Services (FIS) organization was attempting to close a steam condensate valve for the purpose of repairing a minor leak, when the valve broke loose from the pipe at ends, spraying steam and condensate on the worker. The worker was burned on the face, neck, and arms. This ¾-inch steel piping was located in a condensate drain between an office area heating coil (served by 35 psig steam) and a steam trap. Upon investigation, it was determined that the piping in the system had corroded nearly 50% from its original wall thickness. Although the exact age of the system could not be determined, it is estimated that the system had been in service for between 20 and 40 years.

Lessons Learned

- Utility Operators, Chemical Operators, and other personnel, who operate steam condensate valves or who are in close contact with these systems as part of their daily job assignments, must be aware of potential corrosion problems that can cause these systems to fail without prior warning.
- Personnel should ensure proper personal protective equipment (PPE) is determined and used when directly interfacing with steam condensate systems.
- While steam pipes are usually Schedule 40, condensate piping is Schedule 80 (due to a mild acidity).

Nominal Pipe Size (in)	Original Nominal Pipe Wall Thickness (in), for Sch. 40 pipe	Acceptable Remaining Wall Thickness (in)
½	0.109	0.082
¾	0.113	0.085
1	0.133	0.100
1 ¼	0.140	0.105
1 ½	0.145	0.108

Source

Originating Organization or Contracting Company: B. K. Walker, B&W Y-12, Design Engineering, 865-574-8930. Lesson ID: Y-2009-OR-BWY12-0301.

BOILER WORKER SUFFERED BURNS WHEN WATER PIPE BURST

OSHA Incident Profile

Incident Title:	Boiler Worker Suffered Burns When Water Pipe Burst
Incident (Accident) ID:	202502274
Report Date:	10/31/2008
Report ID (OSHA):	352450
Incident Description:	Employee #1, suffered first and second degree burns to the front of his upper body when a boiler pipe burst. Employee #1 noticed a leak on the vale that was tapped into the main line out of the boiler. When Employee #1 touched the valve to turn it off, the pipe between the valve and main line broke off at the threaded area. Employee #1 was sprayed with hot water (around 200 degrees) resulting in first and second degree burns to the front of his upper body.
Inspection Number:	312671118
Establishment Name:	JPI APARTMENT MANAGEMENT
(State-Zip):	MD Gaithersburg
Fatalities:	0 **Injuries:** 1
Keywords (OSHA):	BURN, BOILER, CHEST, WATER, HOT WATER, HOT WATER TANK, PIPE, VALVE; N029 000069594

EMPLOYEE IS BURNED WHEN AIR COMPRESSOR FAILS

	OSHA Incident Profile
Incident Title:	Employee Is Burned When Air Compressor Fails
Incident (Accident) ID:	200053270
Report Date:	09/03/2008
Report ID (OSHA):	0728900
Incident Description:	At approximately 3:45 a.m. on September 3, 2008, an industrial air compressor (Atlas Copco, Model Number GAU809) catastrophically failed in the engine room of a large meat processing facility. An aluminum air cooler burst, causing a spill of approximately 16 gallons of machine oil, which then ignited. Employee #1 was hospitalized for second-degree burns to both arms. The air compressor was installed in 1986 with no major mechanical issues since installation. The air cooling component that failed was replaced two years before the incident.
Inspection Number:	311463392
Establishment Name:	Cook'S Ham, Inc.
(State-Zip):	NE 68508
Fatalities:	0 **Injuries:** 1
Keywords (OSHA):	compressor, air pressure, lubricating fluid, equipment failure, burn, fire, spill

EMPLOYEES ARE EXPOSED TO AMMONIA

	OSHA Incident Profile
Incident Title:	Employees Are Exposed To Ammonia
Incident (Accident) ID:	200514727
Report Date:	09/03/2008
Report ID (OSHA):	0552700
Incident Description:	On September 3, 2008, a water flow switch malfunctioned at a Birds Eye Foods facility, causing a pressure increase in an outside ammonia vessel. Ammonia emitted from a pressure relief valve and was drawn into the facility, exposing employees. Employee #1 was hospitalized for treatment and 21 others were treated and released.
Inspection Number:	312519382
Establishment Name:	Birds Eye Foods
(State-Zip):	MN 56093
Fatalities:	0 **Injuries:** 1
Keywords (OSHA):	ammonia, leak, equipment failure, pressure release, valve, inhalation, respiratory, respiratory tract, vapor

EXPLOSION KILLS TWO EMPLOYEERS

	OSHA Incident Profile
Incident Title:	Explosion Kills Two Employees
Incident (Accident) ID:	200631935
Report Date:	08/28/2008
Report ID (OSHA):	316400
Incident Description:	At approximately 10:25 p.m. on September 28, 2008, Employee #1 was in the Methomyl unit structure setting up equipment to blow steam in a vent or flow line. Employee #2 was sent out to help Employee #1. As Employee #2 approached the Residue Treater, which contained flammable solvents, the vessel ruptured and exploded from an exothermic run away reaction and subsequent over pressurization. Employee #2 died. Employee #1 received second degree burns to approximately 60 percent of his body and was hospitalized. On October 10, 2008, Employee #1 died from his injuries while still in the hospital.
Inspection Number:	311684252
Establishment Name:	BAYER CROPSCIENCE EXPLOSION,FIRE,STRUCK BY,FLAMMABLE LIQUID,PRESSURE PIPING,BURN,CHEMICAL REACTION
(State-Zip):	WV Institute
Fatalities:	2 **Injuries:** 0
Keywords (OSHA):	

EMPLOYEE IS INJURED IN GAS LINE EXPLOSION

	OSHA Incident Profile
Incident Title:	Employee Is Injured in Gas Line Explosion
Incident (Accident) ID:	202562716
Report Date:	07/23/2008
Report ID (OSHA):	950612
Incident Description:	On July 23, 2008, Employee #1 was injured during a pressure test of a gas line. The gas line was pressurized with air, during the test, and it exploded. The employee was struck with pieces of the regulator in the gas line and suffered small cuts. Employee #1 taken to the emergency room, where his cuts were bandaged, but he was not hospitalized. The test pressure for this test should have been under 2 pounds per square inch, and examination of the regulator revealed rot and corrosion inside the unit.
Inspection Number:	312349160
Establishment Name:	"ASSOCIATED PLUMBING
(State-Zip):	CA MONTEREY
Fatalities:	0 **Injuries:** 1
Keywords (OSHA):	GAS, LACERATION, EXPLOSION

PRESSURE VESSEL EXPLOSION

Summary

On August 6, 2008, a pressure vessel exploded in the Omega Laser Facility at the University of Rochester laboratory. A technician from LLE, Sam Roberts, was seriously injured from the explosion when he was pressurizing the LLNL/LLE GCD light pipe in the target bay, the apparatus collapsed on Sam.

Lessons Learned

- The importance of not working in a lab alone.

Source

http://rnews.com/?ArID=363810

DEWAR CAP BURST-OFF

Summary

A guest scientist sustained a minor injury when a Dewar cap burst off and hit his forehead. The scientist needed to fill the 50-Liter liquid nitrogen Dewar, which hadn't been used for several months. He assumed it was depressurized because of its lack of use, and attempted to verify this assumption by pulling a pressure relief plug. His assumptions were incorrect, and the Dewar did contain residual pressure. When the scientist removed a clamp holding the top valve assembly, it burst off and hit him. He suffered a slight laceration to the forehead between the eyes, was treated at a local hospital and returned to work the same day.

Lessons Learned

- Even workers with years of lab experience who have satisfied all the training requirements can make poor choices in the absence of established protocol.
- Personal protective equipment should be worn at all times inside a lab.
- Supervisors should perform frequent laboratory inspections in which worker behavior, lab conditions, and experimental protocol are evaluated.

Source

Blue-Lesson ID: Lawrence Berkeley National Laboratory Lesson ID: LBNL-LL08-0030

EMPLOYEE KILLED IN PROPANE EXPLOSION

OSHA Incident Profile

Incident Title:	Employee Is Killed In Propane Explosion
Incident (Accident) ID:	200758696
Report Date:	07/17/2008
Report ID (OSHA):	0522500
Incident Description:	At approximately 10:30 a.m. on July 17, 2008, Employee #1, a welder, was torch cutting stainless steel, wearing a flame resistant jacket, hardhat, and work gloves. The pressure regulator gauges on the fuel supply tanks were not visible due to clouding and scratches. Employee #1 was not aware of the excessive fuel pressure on the torch, causing the line to rupture. This released an aerosol that ignited during the torch cutting, resulting in an explosion that killed Employee #1.
Inspection Number:	311835805
Establishment Name:	Mamula Demolition Company
(State-Zip):	OH 43907
Fatalities:	1 **Injuries:** 0
Keywords (OSHA):	welder, welding, torch, propane, vapor, explosion, ppe

THREE EMPLOYEES BURNED WHEN WORKING ON STEAM LINE

OSHA Incident Profile

Incident Title:	Three Employees Burned When Working On Steam Line
Incident (Accident) ID:	200555290
Report Date:	07/03/2008
Report ID (OSHA):	0625700
Incident Description:	At approximately 2:00 p.m. on July 3, 2008, Employee #1, #2 and #3 were engaged in breaking a flange on a 600-pound steam line. Employee #2 was a foreman. Because the bolts were corroded, employee #1 utilized a grinder to grind the stem of the bolts and then used a torc wrench to break the bolts in half. After most of the bolts were removed a sudden spray of boiling hot water engulfed employees #1, #2 and #3 thereby burning them. Employee #1 was burned the most severe followed by employee #2 and then employee #3. All employees were hospitalized overnight.
Inspection Number:	311525141
Establishment Name:	P2s, L.L.C.
(State-Zip):	LA 70810
Fatalities:	0 **Injuries:** 3
Keywords (OSHA):	burn, steam, steam line, heat, bolt

INCORRECT VALVE REPLACED ON PROCESS SYSTEM

Summary

On July 1, 2008, an incorrect valve was placed on a process system. A work request was generated by a Maintenance Planner replacement of a water relief valve. The replacement valve information and SAP identification numbers were identified in the work package by the Work Planner based on information in the parent test and inspection work request and spare part data provided by the System Engineer. The Pipefitters went to the work site to replace the pressure safety valve (PSV). As there were two virtually identical PSV's (PSV-A and PSV-B) located in the same area, the pipefitters requested clarification of which valve to change prior to starting work. After receiving general directions from both Operations and Maintenance Supervisors, the Pipefitters began to remove valve PSV-B. During the valve removal, residual liquid from the line dripped and splattered onto one of the Pipefitter's shoes. The Pipefitters suspended the work to raise concerns about potential hazards regarding the splattered liquid. The liquid was checked by operations with litmus paper and the pH appeared neutral. In addition, operations personnel checked the conductivity meter on the tower water monitor and found it to be in the normal range. The pipefitters resumed work, removed the old valve and discovered the new valve gasket was not a "like-for-like" replacement part. They suspended work again and consulted the Operations and Maintenance Supervisors. The Systems Engineer was contacted and confirmed that the gasket provided was the correct one for the application and work was resumed. The work was completed and the LO/TO released.

On September 10, 2008, another System Engineer was reviewing SAP data and found that PSV-A was overdue for an inspection. After reviewing information and conducting an evaluation in the field, he discovered that Process-X PSV-B valve was replaced with the valve intended for PSV-A. The Process-X system was not operated between the work task performed on July 1, 2008 and follow-up on September 10, 2008, thus confirmed to be in safe configuration.

Lessons Learned

- Personnel must be diligent in ensuring components are adequately identified in Work Packages, that expectations for verifying component identification numbers are clearly communicated, and workers in the field are thorough in performing component verification prior to starting a work activity.
- When unexpected conditions are identified that cause workers to pause their work activity and question safety of materials, a thorough review of all aspects of the work, including re-verification of the identified components and isolation points (if any) must take place before the activity is resumed.

Source

Y-2008-OR-BWY12-1108.

EMPLOYEE BURNS STOMACH, IS TREATED AND RELEASED

Incident Tracking	*OSHA Incident Profile*
Incident Title:	Employee Burns Stomach, Is Treated and Released
Incident (Accident) ID:	202449450
Report Date:	06/29/2008
Report ID (OSHA):	950633
Incident Description:	At approximately 4:29 p.m. on June 29, 2008, Employee #1 was switching from one boiler water feed pump to another. Employee #1 accidently opened the drain valve instead of the blow down valve. As Employee #1 opened the drain valve, the hot steam (450-degrees Fahrenheit) came out of the open-ended flange striking him in the stomach. Employee #1 received second-degree burn to his stomach. Employee #1 was treated and released from the hospital.
Inspection Number:	310603733
Establishment Name:	SEARLES VALLEY MINERALS
(State-Zip):	CA 93562
Fatalities:	0 **Injuries:** 1
Keywords (OSHA):	HEAT, BURN, STEAM, STOMACH, INATTENTION

FATAL RUPTURE OF HEAT EXCHANGER

Summary

On June 11, 2008 during a maintenance operation on a heat exchanger, pressurized, liquid ammonia was used to cool chemicals that are later processed to make synthetic rubber. The rubber-making chemicals were pumped through steel tubes inside the heat exchanger, while ammonia flowed through a cylindrical steel shell that surrounded the tubes. The day prior to the accident, the process was shut down for cleaning. During the shutdown, an isolation valve was closed between the heat exchanger and a pressure-relief device designed to protect the heat exchanger from possible over-pressure. On the morning of the accident, an operator used steam to clean out process piping; the steam also flowed through the heat exchanger tubes. The steam heated the liquid remaining in the exchanger shell which caused the pressure to build. With the path to the pressure-relief device blocked, the heat exchanger ruptured over. An operations supervisor, who was not involved in the maintenance work but was working in the area, was **killed** by the explosion. Her body, which was covered with explosion debris, was not discovered until several hours after the emergency had been declared over.

Lessons Learned

- It is important to carry out effective pressure relief systems and practices while focusing on managing, inspecting, and maintaining relief systems in order to prevent equipment from over-pressure and causing hazards for employees.

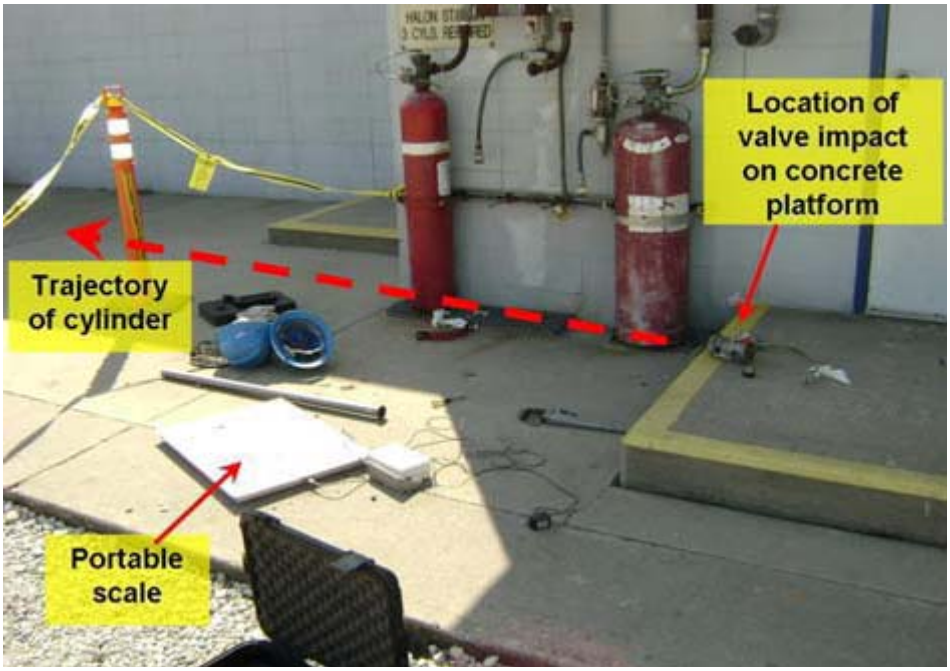
Source

http://www.csb.gov/newsroom/detail.aspx?nid=9

OSHA Incident Profile

Incident Title:	Explosion Kills One Employee, Injures Six Others
Incident (Accident) ID:	201924438
Report Date:	06/11/2008
Report ID (OSHA):	626700
Incident Description:	At approximately 7:10 a.m. on June 11, 2008, Operators at the C2 unit (Plant 2) in C building were injecting 60-psi steam at a temperature of approximately 400-degrees Fahrenheit into a precooler, heat exchanger Model Number E300-G, to purge the process of the latex products. Latex was on the tube side and ammonia was on the shell side. The steam was injected into the tubes heating the ammonia on the shell side. The precooler over pressured, rupturing the shell, releasing ammonia into the environment. Employee #1 was found dead beneath the debris in the area of the heat exchanger several hours after the explosion occurred. Five contracted employees were severely exposed to ammonia. Employees #2, #3, #4, and # 6 were hospitalized. Employee #5 received
Inspection Number:	311957161, 311957179, 311957187, 311957195
Establishment Name:	DEBUSK INDUSTRIAL SERVICES COMPANY (DISC)
(State-Zip):	TX 77017
Fatalities:	1 **Injuries:** 6
Keywords (OSHA):	EXPLOSION, CONCUSSION, OVEREXPOSURE, AMMONIA

HALON CYLINDER BECOMES ROCKET



Summary

In June 2008, a cylinder was dropped and its top valve hit a concrete platform. The impact of the cylinder valve on the concrete caused the threads on the screw connection which held the valve on the cylinder to fail, resulting in complete separation of the valve from the cylinder. The cylinder's internal pressure was 600 psig. The combination of pressure and size of the cylinder hole caused the cylinder to discharge its contents rapidly, and it flew through the air like a rocket.

Lessons Learned

- Treat every cylinder as capable of becoming a projectile if dropped and the top valve sheared off,
- Be aware of any compressed gas cylinders in your facility which do not have provision for protective caps, and handle them with particular care
- Ensure that contractors handle cylinders safely.

Source

http://www.aiche.org/CCPS/Publications/Beacon/index.aspx

COMPRESSED NATURAL GAS CYLINDER RUPTURE DESTROYS VAN

Summary

On June 9, 2008 the cylinders used to store a van's fuel, compressed natural gas (CNG), ruptured and subsequently caused significant damage to a van. No injuries were mentioned in source. Parts of the van were blown clear of the vehicle, and parts of the cylinder in question were located inside the vehicle's cabin. Moderate damage was caused to nearby vehicles. Investigation yielded corrosion in parts of the cylinder's internal liner, as well as rust from chlorine due to road salt exposure. There were also fractures in the composite liner of the cylinder. There was also evidence to indicate that the pressure in the cylinder was too high because of the malfunction of a pressure limiter in the fueling station the van was refueled at earlier.

Lessons Learned

- Pressure limits exist for a reason and should not be exceeded.
- Equipment should be maintained

Source

http://www.cleanvehicle.org/technology/PGW_Overall_Final_Report.pdf

THREE KILLED IN BOILER EXPLOSION

Summary

On May 24, 2008, **three laborers were killed** and seventeen injured when a boiler at a metal forging industrial unit here burst due to built-up steam pressure in New Delhi, India.

Source

http://www.hinduonnet.com/2008/03/25/stories/2008032557201000.htm

EMPLOYEE IS KILLED BY STEAM

	OSHA Incident Profile
Incident Title:	Employee Is Killed By Steam
Incident (Accident) ID:	200356988
Report Date:	05/14/2008
Report ID (OSHA):	0453710
Incident Description:	At approximately 2:25 p.m. on May 14, 2008, Employee #1 was bringing the steam system back on line. He opened two gate valves downstream of the pressure reducer valves on the one-third and the two-thirds systems. When Employee #1 opened the gate valves, the 8-in. strainer on the two-thirds system ruptured which caused steam and condensation to quickly flow into the room. As the room filled with steam and condensation, Employee #1 apparently attempted to exit the mechanical room through the double doors located on the northwest side of the room. Employee #1's body was discovered by the Durham Fire Department behind a large heat exchanger in the mechanical room, between heat exchanger PHWT&P-2 and a cinder block wall.
Inspection Number:	311934616
Establishment Name:	Duke University
(State-Zip):	NC 27710
Fatalities:	1 **Injuries:** 0
Keywords (OSHA):	steam, valve, rupture, steam line, burn

FATAL BOILER EXPLOSION IN PAPER MILL

Summary

On May 3, 2008, a fire and an explosion occurred in International Paper's Vicksburg Mill, Mississippi, **killing one man and injuring seventeen people**. OSHA fined the mill $77,000 for numerous reasons including failing to start the recovery boiler without adequate system, a willful violation, and failing to have written procedures to determine that an adequate amount of odorant was being added to the natural gas supply line coming into the power plant, a serious violation.

Lessons Learned

- Importance of writing boiler set-up and operating procedures.

Source

http://www.vicksburgpost.com/articles/2008/11/03/news/doc490f3619cd1be681313093.txt

ONE EMPLOYEE IS KILLED, FOUR OTHERS ARE INJURED IN EXPLOSION

OSHA Incident Profile

Incident Title:	One Employee Is Killed, Four Others Are Injured in Explosion
Incident (Accident) ID:	201363249
Report Date:	05/03/2008
Report ID (OSHA):	419400
Incident Description:	On May 3, 2008, Employees #1, #2, #3, #4, and #5 were restarting the recovery boiler under a partial-natural-draft. The power boiler was not online at the time. The boiler exploded, and Employee #1 was blown over a standard guard railing on the South side of the sixth floor. He fell down some 25 ft on a scaffold staging. He died from blunt force trauma to the chest. His injuries included lacerations to his both lungs, diaphragm, liver, and thoracic aorta. Employees #2, #3, #4 were burned, and they were hospitalized. Employee #5 sustained sprain and strain of his ankle and was not hospitalized.
Inspection Number:	311414544, 311415145
Establishment Name:	"M-CO, "HYDROCHEM INDUSTRIAL SERVICES
(State-Zip):	MS REDWOOD
Fatalities:	1 **Injuries:** 4
Keywords (OSHA):	CONSTRUCTION, BOILER, FALL, SCAFFOLD, CHEST, LACERATION, LUNG, LIVER, BURN, SPRAIN

TWELVE EMPLOYEES ARE BURNED IN BOILER EXPLOSION

OSHA Incident Profile

Incident Title:	Twelve Employees Are Burned in Boiler Explosion
Incident (Accident) ID:	201363256
Report Date:	05/03/2008
Report ID (OSHA):	419400
Incident Description:	On May 3, 2008, Employees #1-#12 were working in a power plant. They were installing plumbing lighting fixtures when a recovery boiler exploded. Employees #1-#12 were burned, and five of them were hospitalized.
Inspection Number:	311414551
Establishment Name:	"RMR MECHANICAL
(State-Zip):	MS REDWOOD
Fatalities:	0 **Injuries:** 12
Keywords (OSHA):	CONSTRUCTION, INSTALLING, LIGHTING FIXTURE, EXPLOSION, BOILER, PLUMBING, BURN, STRUCK BY, SMOKE, HEAT

TWO EMPLOYEES ARE KILLED IN BOILER EXPLOSION

OSHA Incident Profile

Incident Title:	Two Employees Are Killed in Boiler Explosion
Incident (Accident) ID:	200996858
Report Date:	04/28/2008
Report ID (OSHA):	551800
Incident Description:	On April 28, 2008, Employee #1 and #2, both boilermakers, were repairing a leak in a man way lid on Heat Exchanger E-150, Level 8. Flammable gas was emanating from the man way. The man way cover had 36 fasteners and 12 of them were loose. Operators attempted to tighten the fasteners on the man way cover. The leak persisted but not enough of a leak to ignite. A hose was placed at the leak and nitrogen applied near to the leak to keep it from igniting. The employees attempted to tighten the lid and stop the leak. As they were using a electric impact wrench, coworkers below level 8 heard the impact and felt a massive explosion. The plant was evacuated. Both employees were found dead.
Inspection Number:	311264105
Establishment Name:	STERLING BOILER AND MECHANICAL
(State-Zip):	IN 47855
Fatalities:	2 **Injuries:** 0
Keywords (OSHA):	REPAIR, BOILER, EXPLOSION

EMPLOYEES ARE EXPOSED TO CARBON MONOXIDE GAS

Incident Tracking	*OSHA Incident Profile*
Incident Title:	Employees Are Exposed To Carbon Monoxide Gas
Incident (Accident) ID:	200103125
Report Date:	04/10/2008
Report ID (OSHA):	0522300
Incident Description:	On April 10, 2008, 15 people were treated on-site for a possible carbon monoxide exposure. Two employees were evaluated at a hospital. The gas company identified boilers as the source of the gas. There were no carbon monoxide monitors inside the building.
Inspection Number:	
Establishment Name:	Akron General Akron Health Center
(State-Zip):	OH 44311
Fatalities:	0 **Injuries:** 15
Keywords (OSHA):	carbon monoxide, gas, toxic fumes, chemical, chemical vapor, boiler, equipment failure

FATAL BOILER EXPLOSION

Summary

On March 31, 2008 in Bangladesh, the explosion happened with a loud bang gearing sounds of three explosions that plunged the factory into darkness leave **three killed and fifteen others wounded**.

Source

http://news.xinhuanet.com/english/2008-03/31/content_7890083.htm

FOUR EMPLOYEES ARE BURNED WHEN PIPE FAILS

OSHA Incident Profile

Incident Title:	Four Employees Are Burned When Pipe Fails
Incident (Accident) ID:	200212363
Report Date:	02/22/2008
Report ID (OSHA):	0626000
Incident Description:	On February 22, 2008, four employees suffered thermal burns when the high incident bleeder pipe for the vacuum tower bottoms heat exchanger failed, and they were sprayed with hot process safety chemicals while the employees were working on the line. Employee #1 and Employee #2 are boilermakers and were hospitalized. Employee #3 and Employee #4 are supervisors and were not hospitalized.
Inspection Number:	311801146
Establishment Name:	
(State-Zip):	TX 78469
Fatalities:	0 **Injuries:** 4
Keywords (OSHA):	burn, boiler, heat exchanger, pipe

EMPLOYEE DIES OF CARBON MONOXIDE EXPOSURE

OSHA Incident Profile

Incident Title:	Employee Dies Of Carbon Monoxide Exposure
Incident (Accident) ID:	201262284
Report Date:	01/28/2008
Report ID (OSHA):	0524200
Incident Description:	At approximately 9:40 p.m. on January 28, 2008, Employee #1, a maintenance worker with Peacock Oil Company, was called into work on this Sunday evening to repair some equipment. A worker found Employee #1 unresponsive in a 30 ft by 8 ft equipment room for the car wash operations. Two police officers removed Employee #1, who died of acute carbon monoxide poisoning. Acute cocaine intoxication was also revealed by the autopsy. Surveillance video footage showed that approximately 95 minutes had elapsed between the time Employee #1 entered the room and the time he was removed. The police reported that two open tool kits were on top of drums of car wash chemicals in the room. Apparently, Employee #1 had been working on the car wash equipment. Possible sources of the carbon monoxide in the equipment room included a defective boiler exhaust system, a lack of make-up air, and a defective heat exchanger on a room heating unit. The defective boiler (Raypak Model Number 724 WP-B, Serial Number 0988106022) had several cracks in the top, the side panels, and the draft hood. Initial carbon monoxide measurements made by the fire department indicated 0 ppm carbon monoxide in the room; however, this measurement was made after the room was ventilated. The gas company made a carbon monoxide measurement after the defective boiler was activated; this measurement showed approximately 1,100 ppm of carbon monoxide near one of the cracks. Employee #1's carboxyhemoglobin level was 42.7 after he arrived at the hospital. Based on that level, his exposure to carbon monoxide was calculated to be approximately 258 ppm as an 8-hour time-weighted average, which is 5.15 times the PEL of 50 ppm.
Inspection Number:	311718928
Establishment Name:	Peacock Oil Company
(State-Zip):	IL 60048
Fatalities:	1 **Injuries:** 0
Keywords (OSHA):	carbon monoxide, equipment failure, heater, boiler, repair

PRESSURE VESSEL KILLS WORKER

Summary

On January 15, 2008 a pressure vessel at a New Jersey foundry exploded, killing one 60-year-old worker instantly while injuring eight other workers with shrapnel. The pressure vessel in question was used to pressurize/depressurize molten aluminum in order to prevent/eliminate porosity from the metal.

The incident occurred while two workers, including the one that was killed, were testing a new O-ring gasket that had just been installed for leaks. The procedure is one person stands beside the vessel and operates the controls, while the other one stands in front and observes for signs of leaks. On the day in question the first sign of a leak occurred at 80 psi. Then in an attempt to force the O-ring in to place they increased the pressure to 112 psi at which point the explosion occurred propelling the worker 38 feet, and the hatch of the vessel 35 feet. It is important to note here that the maximum pressure this vessel was rated for was 100 psi.

Lessons Learned

- Recommendation #1**:** Employers should ensure that pressure vessels are not pressurized above allowable limits, all pressure relief valves are properly functioning, and that any repairs to this type or similar pressure vessels be conducted by a certified worker. Discussion**:** Several factors likely contributed to the explosion of the pressure vessel. First, the vessel ruptured due to overpressurization. In an attempt to correct a leak, the workers pressurized the vessel to 112 psi, which is greater than 3% of the maximum allowable working pressure of the unit (100 psi). Second, it was discovered that the pressure relief valves were clogged with aluminum production material and were inoperative. According to the American Petroleum Institute (API) 510, 8th Edition, Addendum #4, August 2003, Sections 6 and 7, all pressure vessels and pressure-relieving devices shall be inspected at specific intervals to ensure vessel integrity. Third, repairs and welds were performed on the vessel by a worker who was not certified by the American Society of Mechanical Engineers (ASME), or the National Board.
- Recommendation #2: Employers should ensure that workers are properly trained on the safe operation of pressure vessels and are knowledgeable about the associated hazards. Discussion**:** All vessel operators should be properly trained in the safe use of the equipment. Employers should provide classroom and hands-on training to the operators, and training must be specific to the worksite and equipment used. Training on safe operation and the associated hazards must be taught by a competent person, and workers should be certified as having passed the training.
- Recommendation #3: A safety and health plan based on a job hazard analysis should be developed and followed.

Source

http://www.cdc.gov/niosh/face/stateface/NJ/08NJ003.html

OSHA Incident Profile

Incident Title:	Employee Is Killed When Struck By Pressure Vessel Door
Incident (Accident) ID:	201381027
Report Date:	01/15/2008
Report ID (OSHA):	0214500
Incident Description:	At approximately 8:04 a.m. on January 15, 2008, Employee #1 was performing maintenance on a pressure vessel when, for some reason, the vessel's door ruptured. Employee #1 was struck in the abdomen by the vessel door and was killed.
Inspection Number:	311051155
Establishment Name:	Tec-Cast, Inc
(State-Zip):	NJ 07072
Fatalities:	1 **Injuries:** 0
Keywords (OSHA):	struck by, maintenance, pressure vessel, door, rupture, abdomen, explosion, foundry

PRESSURE VESSEL FAILURE DURING HYDROTEST

Summary

On November 28, 2007, a pressure vessel failed whilst under hydrotest during post fabrication testing. This vessel was manufactured by a vessel vendor in China and the plate was of Chinese mill origin. Unfortunately this is another example of serious equipment/material failures with equipment being sourced out of the rapidly developing economies such as China, Eastern Bloc and others. These examples are becoming almost a weekly occurrence now and are exhibiting failure modes not seen in the mature manufacturing economies since the 1930's. Again we need to ensure vigilance in the acceptance of manufacturers and once more it is important to know where the base materials are sourced from. Apparently this pressure vessel had reached fifty percent of the required test pressure when the shell ruptured. A metallurgical failure report is not available however from the photographs a number of observations could be made regarding the quality of the material and the welding.

Lessons Learned

- All base metal requirements shall be specified in P.O Requisition per project/Industry Code requirements.
- Consult specialists (i.e., Materials and Corrosion Engineers) whenever you doubt.
- All inspection (from base materials to final products) should be performed per the codes, specs & standards.
- Importance of proper welding and knowing the source of which your equipment is produced. In this case it would be China; however with equipment being sourced out, serious equipment and material failures can occur.

Source

http://www.pipingdesign.com/China_hydrotest_failure.pdf

EMPLOYEE KILLED WHEN STRUCK BY FLYING VALVE ASSEMBLY

OSHA Incident Profile

Incident Title:	Employee killed when struck by flying valve assembly
Incident (Accident) ID:	201763042
Report Date:	11/24/2007
Report ID (OSHA):	626600
Incident Description:	On November 24, 2007, Employee #1 was working as a labor foreman for a company installing a new, steel, 36 in. diameter natural gas pipeline. He was participating in a hydrostatic test of section 1, a 14-mile stretch of the pipeline. He released some of the pressure from the pipe, holding more than 1,400 psi. He then took the wrench off the 2 in. ball valve and readjusted the wrench to release more pressure. When Employee #1 did this, the valve assembly blew off the threaded line and struck him on his right side, under his arm. Emergency Services was called. Employee #1 was conscious when EMTs arrived and transported him to Memorial Herman Baptist Hospital in Orange, TX. He died at approximately 12:30 a.m. on November 25, 2007, as a result of injuries he sustained when struck by the flying valve assembly.
Inspection Number:	311491815
Establishment Name:	WILLBROS RPI
(State-Zip):	TX 77614
Fatalities:	1 **Injuries:** 0
Keywords (OSHA):	CONSTRUCTION, STRUCK BY, FLYING OBJECT, CHEST, VALVE, PIPELINE, HIGH PRESSURE, PRESSURE RELEASE, WORK RULES, HAND TOOL

TWO EMPLOYEES ARE STRUCK AND KILLED BY VALVE PIECES

OSHA Incident Profile

Incident Title:	Two Employees Are Struck and Killed by Valve Pieces
Incident (Accident) ID:	200812519
Report Date:	11/21/2007
Report ID (OSHA):	627400
Incident Description:	The employees were conducting fracturing operations. A pump seal had to be seated in between stages. The pump operator began to pressure-up the line to set the seal prior to the employees that were out of the area, rigging up the riser. The pump operator did not see any pressure on his controls and continued to pressure up the line to the point of failure of the wheel valve. When the wheel valve failed, two employees in the area of the well head were struck by high pressure and valve pieces. Employee #1 employee died on site, and Employee #2 was pronounced dead at the hospital.
Inspection Number:	311307797
Establishment Name:	HALLIBURTON ENERGY SERVICES
(State-Zip):	TX 79706
Fatalities:	2 **Injuries:** 0
Keywords (OSHA):	STRUCK BY, FLYING OBJECT, VALVE, EQUIPMENT FAILURE, PRESSURE RELEASE, OIL WELL SERVICING

EMPLOYEE SUSTAINS THERMAL BURNS

OSHA Incident Profile

Incident Title:	Employee Sustains Thermal Burns
Incident (Accident) ID:	202506382
Report Date:	11/16/2007
Report ID (OSHA):	950663
Incident Description:	At approximately 10:21 a.m. on November 16, 2007, Employee #1 was pressure washing trays located inside the beer column located at the corner of the plant. The beer column is considered a confined space and two attendants and a safety coordinator were near the beer column at the time of the accident. While Employee #1 was inside of the beer column, the boilers remained operational and maintained steam pressure in the system at approximately 100 psi. The manual steam blocker valve was not in the closed position and steam bypassed the manual steam blocker valve and the steam control valve. The steam heated the water in the beer feed preheater, causing boiling water to travel through the beer feed line into the beer column. Employee #1 was inside the beer column and sustained burns to his face, bilateral upper extremities, and back. Employee #1 was hospitalized.
Inspection Number:	311068761
Establishment Name:	PACIFIC ETHANOL
(State-Zip):	CA 93637
Fatalities:	0 **Injuries:** 1
Keywords (OSHA):	BURN, BOILER, FACE, STEAM, TORSO, BACK, CONFINED SPACE, VALVE, HOT WATER

THREE EMPLOYEES ARE KILLED WHEN BOILER TUBE RUPTURES

OSHA Incident Profile

Incident Title:	Three Employees Are Killed When Boiler Tube Ruptures
Incident (Accident) ID:	200775021
Report Date:	11/06/2007
Report ID (OSHA):	134000
Incident Description:	On November 6, 2007, Employees #1, #2 and #3 were killed when a boiler tube ruptured on them.
Inspection Number:	311425474
Establishment Name:	DOMINION ENERGY NEW ENGLAND
(State-Zip):	MA 1970
Fatalities:	3 **Injuries:** 0
Keywords (OSHA):	BOILER, RUPTURE, BURN

EMPLOYEE KILLED WHEN CAUGHT UNDER STREAM OF HOT WATER

	OSHA Incident Profile
Incident Title:	Employee killed when caught under stream of hot water
Incident (Accident) ID:	202500682
Report Date:	11/01/2007
Report ID (OSHA):	352440
Incident Description:	On November 1, 2007, Employee #1 was installing insulation around pipes in the boiler room. He was standing approximately 10 ft in front of the valve cap on the hot water return when the pressure blew the cap off of the fitting. Employee #1 was struck by a stream of 185 degree F water that pinned him under the boiler. He died of injuries sustained in the accident.
Inspection Number:	311662373
Establishment Name:	TBN ASSOCIATES
(State-Zip):	MD 20745
Fatalities:	1 **Injuries:** 0
Keywords (OSHA):	CONSTRUCTION, HOT WATER, HIGH PRESSURE, PRESSURE RELEASE, HIGH TEMPERATURE, BURN, ACCIDENTAL DISCHARGE, INSTALLING, WORK RULES, UNSECURED

RESIDUAL FLAMMABLE VAPORS IN PVC PIPE CAUSE EXPLOSION

Summary

On September 13, 2007, a subcontractor was implementing a hot tap into a carbon steel pipe. The explosion was caused by the heat from the acetylene torch kindled the residual vapor inside attaching to the polyvinylchloride (PVC) piping. Shrapnel pieces were blown up to 100 feet outwards due to the force of the explosion. The two workers who were closest to the explosion were guarded by an alcove wall. However, the explosion resulted in **four** other **workers**, who were standing 25 feet away, suffering temporary hearing loss.

Lessons Learned

- From this situation we can conclude that before anything is started on, all potential hazards need to be identified and addressed.
- Workers should be able to avoid assumptions from previous experiences, and be familiar with the dangers associated with their work.

Source

http://www.hss.energy.gov/csa/analysis/oesummary/oesummary2008/2008-05-03.pdf

WORKERS SUFFER MINOR BURNS DURING BOILER MAINTENANCE

	OSHA Incident Profile
Incident Title:	Workers Suffer Minor Burns During Boiler Maintenance
Incident (Accident) ID:	201126349
Report Date:	08/27/2007
Report ID (OSHA):	0950613
Incident Description:	At approximately 10:30 AM on August 27, 2007, Employee #1 and Employee #2 were performing a regular maintenance on boiler heater (Teledyne Laars, Model # PW1670IN09C1AR, Serial # 1923823). After performing the maintenance, employee #1 turned on the ignition switch to relight the heater, however, the pilot did not come on, and he heard some rattling noise from the valve. So employee #1 turned off the switch and called his supervisor over the phone for further technical assistance. Employee #1 again turned on the ignition switch and asked the Employee #2 to bend down and see if the heater had ignited. As Employee #2 bent to see the pilot, a flare up occurred which burned Employee #1 and employee #2's face. This explosion disappeared after 1-2 seconds. Nothing else was burned or blackened in the boiler room where other 3 boilers were present. Both employees were taken to the Stanford Hospital where they were observed and released. It was determined that both employees suffered minor first-degree burns.
Inspection Number:	310092655
Establishment Name:	Acco Engineering Systems (Ymca)
(State-Zip):	CA 94401
Fatalities:	0 **Injuries:** 2
Keywords (OSHA):	burn, boiler, explosion, heater, face, pilot light, electric switch, valve, ignition system

EMPLOYEE IS KILLED WHEN AUTOCLAVE EXPLODES

OSHA Incident Profile

Incident Title:	Employee Is Killed When Autoclave Explodes
Incident (Accident) ID:	200713253
Report Date:	08/24/2007
Report ID (OSHA):	636900
Incident Description:	On August 24, 2007, Employee #1 and a coworker were buffing out and repairing tires in a shop, where an autoclave was also located. The pressure vessel was used in a vulcanizing process. Employee #1 and the coworker heard a hissing noise from the autoclave and Employee #1 went to investigate the source of the noise, suspecting an air leak. Employee #1 walked to the side of the pressure vessel and then in front of it. The autoclave suddenly lost pressure. The lid for the vessel was blown out of the building, as well as six tires that were being processed inside it. Employee #1 was struck by the lid and probably also by the tires. He was killed.
Inspection Number:	310441852
Establishment Name:	RATLIFF TIRE COMPANY INC.
(State-Zip):	TX 76077
Fatalities:	1 **Injuries:** 0
Keywords (OSHA):	STRUCK BY, EXPLOSION, PRESSURE VESSEL, TIRE, REPAIR, LACERATION, AIR PRESSURE, FLYING OBJECT, COVER

EMPLOYEE BURNED WHEN NATURAL GAS LINE IGNITES AND EXPLODES

OSHA Incident Profile

Incident Title:	Employee burned when natural gas line ignites and explodes
Incident (Accident) ID:	201126406
Report Date:	08/23/2007
Report ID (OSHA):	950613
Incident Description:	On August 23, 2007, Employee #1 was using a welder's torch to repair a natural gas line connection when the gas ignited and exploded. He suffered burns, for whihc he was hospitalized.
Inspection Number:	310092739
Establishment Name:	ARB S
(State-Zip):	CA 94070
Fatalities:	0 **Injuries:** 1
Keywords (OSHA):	CONSTRUCTION, PIPELINE, EXPLOSION, NATURAL GAS, WELDER, ACETYLENE TORCH, REPAIR, FLAMMABLE VAPORS, BURN, WORK RULES

EMPLOYEE DECAPITATED WHEN TANK EXPLODES

OSHA Incident Profile

Incident Title:	Employee Decapitated When Tank Explodes
Incident (Accident) ID:	201282779
Report Date:	08/21/2007
Report ID (OSHA):	0418100
Incident Description:	Employee #1 was welding a stainless steel connection on a 540- gallon mixing tank for the installation of a flow meter. The tank previously contained sodium methylate and had been purged over night using compressed air. The welding began at approximately 10:30 a.m. Employee #1 went to lunch at approximately 11:50 a.m. and the tank was purged again from noon until approximately 12:45 p.m. Employee #1 resumed welding once the air line was disconnected. At approximately 1:30 p.m. an explosion occurred. The top of the tank blew off and became lodged in the ceiling of the metal building. Employee #1 was thrown from the tank and had been decapitated. A small fire occurred during the explosion and was quickly extinguished by the fire department. Employee #1 was killed.
Inspection Number:	311034268
Establishment Name:	Advance Industrial Maintenance & Machine, Inc.
(State-Zip):	GA 30906
Fatalities:	1 **Injuries:** 0
Keywords (OSHA):	welder, welding, tank, explosion, decapitated, fire

EMPLOYEE SERIOUSLY BURNED BY LEAKY PIPING VALVES

Incident Tracking	*OSHA Incident Profile*
Incident Title:	Employee Seriously Burned By Leaky Piping Valve
Incident (Accident) ID:	201183910
Report Date:	08/06/2007
Report ID (OSHA):	0950611
Incident Description:	At approximately 12:36 p.m. on August 6, 2007, Employee #1, a stationary engineer, and three other employees were removing a hot water pump and motor unit. A valve on the pump was leaking hot water at an approximate temperature of 120 degrees Fahrenheit. Pressure had not been relieved to the pump before work began. There were no other intermediate check valves throughout the whole piping system as well. And, prior to the start of work, the employer did not have a lockout procedure in writing. Employee #1 checked the valves and proceeded to tighten the coupling when he and a coworker were sprayed by steam from a leaky piping valve. Emergency services were summoned, and the fire department and paramedics responded. Employee #1 was transported to a medical center where he underwent treatment for first-degree and second-degree burns to his midsection and upper front thighs. After receiving the medical attention, he was hospitalized and then released approximately noontime the next day.
Inspection Number:	307398560
Establishment Name:	Four Seasons Hotel
(State-Zip):	CA 94103
Fatalities:	0 **Injuries:** 1
Keywords (OSHA):	thigh, valve, steam, burn, pipe, leak, pump, water, water pipe, hot water

THREE EMPLOYEES KILLED, THREE INJURED IN EXPLOSION

OSHA Incident Profile

Incident Title:	Three Employees Killed Three Injured in Explosion
Incident (Accident) ID:	201089349
Report Date:	07/26/2007
Report ID (OSHA):	950625
Incident Description:	At approximately 2:30 p.m. on July 26, 2007, six employees of an aerospace development company were working at a testing facility. Including contract workers, a total of 17 employees were at the site. The company was conducting a "Cold Flow" test of nitrous oxide, a component to be used in the propulsion system of a spacecraft under development. Approximately three seconds into the test an explosion occurred. Two employees were fatally injured at the scene, and another employee died later while being treated. Three employees were hospitalized with critical injuries.
Inspection Number:	310821103
Establishment Name:	SCALED COMPOSITE LLC
(State-Zip):	CA 93501
Fatalities:	3 **Injuries:** 0
Keywords (OSHA):	EXPLOSION, BURN, HEAT

FATAL STEAM PIPE EXPLOSION

Summary

On July 19, 2007, a steampipe explosion sparked the fears of an asbestos contamination in Manhattan, NYC, NY. If there was any asbestos, the steam generated by the water would have washed it down. **One person was killed** (the blast gave him a heart attack) and **twenty others with minor and serious injuries**. Smoke and steam filled the air as the cause of the explosion is still unidentified. This incident produced mass chaos as pedestrians believed it to be another terrorists attack. Con Edison agreed to pay $24 million to make up for damage.

Lessons Learned

- The importance of controlling a commercial steam system operations and maintenance.

Source

http://www.smh.com.au/news/general/explosion-rocks-manhattan/2007/07/19/1184559904680.html

EMPLOYEE BURNED HAND AND ARM IN VALVE FIRE

	OSHA Incident Profile
Incident Title:	Employee Burned Hand and Arm in Valve Fire
Incident (Accident) ID:	201071081
Report Date:	07/18/2007
Report ID (OSHA):	950632
Incident Description:	At 9:45 a.m. on July 18, 2007, Employee #1, a dive instructor working at a not-for-profit college of oceanography and engineering in San Diego suffered serious injury when a valve on a high pressure oxygen line caught fire and exploded. The worksite where the accident occurred is a facility where students are trained to be commercial divers. The business includes several buildings which are currently being built or remodeled by a General Contractor. The building where the accident occurred was a new building that the college had occupied on July 9, 2007, although there was still some items being completed at the time of the accident. A subcontractor was doing some finishing work on the gas piping systems. The oxygen line was connected to a hyperbaric chamber that is used in instruction activities. Employee #1's job that day included working with another instructor to set up the oxygen system for a class demonstration. The oxygen system had been online once about two weeks prior to the accident for pressure testing, but had not been used since. Employee #1 went downstairs to an exterior covered storage area where the compressed air tanks and gas cylinders were stored. There were three oxygen cylinders connected to a manifold. Employee #1 opened up one of the cylinders and noted the pressure, then opened up another small metering valve on the manifold. He then reached up to the last valve in the line which was a quarter turn ball valve. Just as he opened the valve he heard a "pop" and the valve exploded outward, with the oxygen briefly catching fire and burning his hand and arm where he had been holding the valve. Employee #1 was transported to UCSD Medical Center where he underwent treatment for third-degree burns to his right hand and arm.
Inspection Number:	310812417
Establishment Name:	NATIONAL POLYTECH COLLEGE OF ENGINEERING AND OCEAN
(State-Zip):	CA 92123
Fatalities:	0 **Injuries:** 1
Keywords (OSHA):	BURN, HAND, ARM, COMPRESSED GAS, OXYGEN, FIRE, EXPLOSION, VALVE

EMPLOYEE BURNED BY STEAM WHILE SERVICING BOILER

OSHA Incident Profile

Incident Title:	Employee burned by steam while servicing boiler
Incident (Accident) ID:	200774750
Report Date:	07/11/2007
Report ID (OSHA):	134000
Incident Description:	On July 11, 2007, Employee #1 was servicing a boiler when there was a release of steam. He sustained burns, for which he was hospitalized.
Inspection Number:	311177562
Establishment Name:	KENDALL BOILER AND TANK CO. INC.
(State-Zip):	MA 1890
Fatalities:	0 **Injuries:** 1
Keywords (OSHA):	CONSTRUCTION, STEAM, ACCIDENTAL DISCHARGE, HIGH TEMPERATURE, BOILER, LEAK, BURN, MAINTENANCE

TWO EMPLOYEES ARE INJURED IN EXPLOSION

OSHA Incident Profile

Incident Title:	Two Employees Are Injured in Explosion
Incident (Accident) ID:	201636966
Report Date:	06/07/2007
Report ID (OSHA):	1054191
Incident Description:	On June 7, 2007, an ammonia explosion occurred. The explosion was due to a failure of an anhydrous ammonia compressor. Two employees were injured in the explosion. Employee #1 was treated at an area hospital and released. Employee #2 was admitted to the hospital for treatment.
Inspection Number:	311166672
Establishment Name:	Americold Logistics Llc
(State-Zip):	CA 91745
Fatalities:	0 **Injuries:** 2
Keywords (OSHA):	anhydrous ammonia, explosion, compressor

EMPLOYEE IS BURNED WHEN PROPANE TANK EXPLODES

OSHA Incident Profile

Incident Title:	Employee Is Burned When Propane Tank Explodes
Incident (Accident) ID:	201021169
Report Date:	06/01/2007
Report ID (OSHA):	950615
Incident Description:	At approximately 9:45 a.m. on June 1, 2007, Employee #1 was filling a DOT-approved cylinder in an RV from the storage tanks when an explosion occurred. Employee #1 sustained second and third degree burns to 30 percent of his body. He was hospitalized for his injuries.
Inspection Number:	125540773
Establishment Name:	BROWN'S RECREATION CENTER
(State-Zip):	CA 95457
Fatalities:	0 **Injuries:** 1
Keywords (OSHA):	PROPANE, TANK, EXPLOSION, FIRE, BURN

EMPLOYEE IS KILLED WHEN COMPRESSED GAS TANK EXPLODES

OSHA Incident Profile

Incident Title:	Employee Is Killed When Compressed Gas Tank Explodes
Incident (Accident) ID:	201039195
Report Date:	05/26/2007
Report ID (OSHA):	950635
Incident Description:	At about 9:52 a.m. on May 26, 2007, Employee #1, a franchise employee of SuperShuttle Los Angeles, Inc., was refueling his Ford E350 Club Wagon van (California license 6R59353, VIN 1FBSS31MX1HB49951) at the Clean Energy refueling station. The van was powered by compressed natural gas (CNG) and contained five fuel tanks. For some reason, Employee #1 went to the rear of the van and knelt down by the rear tank, the tank closest to the rear bumper. The tank exploded and ripped the back bodywork and metal bumper off the van, catching Employee #1 and throwing him approximately 40 feet across the tarmac. The bumper landed on the sidewalk at the edge of the refueling station lot. Employee #1 sustained massive trauma and was killed. The Department of Safety and Health (DOSH) Pressure Vessel Unit conducted a forensic investigation. It concluded that the tank's failure was caused by its rapid bursting, due to structural damage and corrosion from battery acid splashed on the tank from another car's battery during a previous rear end collision.
Inspection Number:	309906014
Establishment Name:	SUPERSHUTTLE LOS ANGELES
(State-Zip):	CA 90746
Fatalities:	1 **Injuries:** 0
Keywords (OSHA):	EXPLOSION, STRUCK BY, FLYING OBJECT, MOTOR VEHICLE, TANK, COMPRESSED GAS, EQUIPMENT FAILURE, INADEQUATE MAINT, DRIVER

EMPLOYEE IS KILLED IN HEAT EXCHANGER EXPLOSION

OSHA Incident Profile

Incident Title:	Employee Is Killed in Heat Exchanger Explosion
Incident (Accident) ID:	200713147
Report Date:	05/25/2007
Report ID (OSHA):	636900
Incident Description:	On May 25, 2007, an employee and a coworker, plant operators, were working the evening shift to ignite the heat exchanger. After four attempts, the coworker received the green light on the control panel. He gave a thumb's up sign to the employee to proceed. The employee was at the gas heater controls, bending over at the controls when the heat exchanger exploded. The employee was killed. No fire or flash was noted.
Inspection Number:	310440631
Establishment Name:	CRESTWOOD MIDSTREAM PARTNERS LP
(State-Zip):	TX 76033
Fatalities:	1 **Injuries:** 0
Keywords (OSHA):	EXPLOSION, HEAT EXCHANGER, CONTUSION, STRUCK BY, FLYING OBJECT

EMPLOYEE IS BURNED WHEN HE TRIPS AND OPENS DRAIN VALVE

	OSHA Incident Profile
Incident Title:	Employee Is Burned When He Trips and Opens Drain Valve
Incident (Accident) ID:	201089653
Report Date:	05/20/2007
Report ID (OSHA):	950625
Incident Description:	On May 20, 2007, Employee #1 was in the boiler room filling the boiler with water and watching the water level gauge. As he backed up along the base of the boiler, the back of his foot hit the boiler drain valve handle and it opened, spraying steam and water into the drain trough. The hot water hit the bottom and splashed back up onto his pant legs, causing burns to his legs. Employee #1 was initially treated on site with burn ointment. It was then determined to be a chemical burn and he was taken to the Grossman Burn Center, where he was hospitalized for treatment.
Inspection Number:	120148978
Establishment Name:	WM BOLTHOUSE FARMS INC
(State-Zip):	CA 93307
Fatalities:	0 **Injuries:** 1
Keywords (OSHA):	BOILER, DRAIN PLUG, TRIPPED, STEAM, HOT WATER, BURN, LEG, VALVE, WALKING BACKWARD

EMPLOYEES ARE KILLED AND INJURED IN STEAM LINE RUPTURE

OSHA Incident Profile

Incident Title:	Employees Are Killed and Injured in Steam Line Rupture
Incident (Accident) ID:	200002442
Report Date:	05/09/2007
Report ID (OSHA):	728500
Incident Description:	A pipe that was carrying boiler water at 350 degrees Fahrenheit and 2,500 pounds of pressure ruptured unexpectedly at a coal fired electric generating station. Several employees were working a few yards away unplugging wet coal in a pulverizer. Employee #1 was struck by the water and steam and was killed immediately. The other two nearby employees were severely burned. Employee #2 died of burns in the hospital a day later. Employee #3 was hospitalized.
Inspection Number:	310932322
Establishment Name:	KANSAS CITY POWER & LIGHT COMPANY
(State-Zip):	MO 64098
Fatalities:	2 **Injuries:** 1
Keywords (OSHA):	BURN, HEAT, COAL, COAL CRUSHER, RUPTURE, PIPE, STEAM

EMPLOYEE IS KILLED WHEN PROPANE TANK EXPLODES

	OSHA Incident Profile
Incident Title:	Employee Is Killed When Propane Tank Explodes
Incident (Accident) ID:	200925030
Report Date:	05/07/2007
Report ID (OSHA):	355123
Incident Description:	At approximately 8:35 PM on May 7, 2007, Employee #1 was using a 14-oz propane cylinder with a torch when it exploded. He received severe burns and was hospitalized and died from his injuries on November 15, 2007.
Inspection Number:	311026355
Establishment Name:	GOODYEAR TIRE & RUBBER COMPANY
(State-Zip):	VA 24541
Fatalities:	1 **Injuries:** 0
Keywords (OSHA):	EXPLOSION, PROPANE, PROPANE TORCH, BURN

EMPLOYEE IS KILLED WHEN STRUCK BY PIPE

OSHA Incident Profile	
Incident Title:	Employee Is Killed When Struck by Pipe
Incident (Accident) ID:	200713121
Report Date:	05/01/2007
Report ID (OSHA):	636900
Incident Description:	On May 1, 2007, Employee #1 was trying to start a compressor and it would continue to stop. He and coworkers thought it might be a bad suction or discharge valve. They called a mechanic to check the problem. Employee #1 closed off the valves on the lines going to the compressor. He was bleeding the pressure off to get the compressor ready for the mechanic. The pressure was approximately 900 psig at the Balon ball valve. The Balon ball valve had 3000 psig working pressure capacity. The pipe came off when Employee #1 opened the Balon ball valve and struck him. Employee #1 was killed.
Inspection Number:	310440250
Establishment Name:	XTO ENERGY
(State-Zip):	TX 76031
Fatalities:	1 **Injuries:** 0
Keywords (OSHA):	PIPE, STRUCK BY, PRESSURE RELEASE, COMPRESSOR, VALVE, FLYING OBJECT

EMPLOYEE AMPUTATES HAND IN EXPLOSION

OSHA Incident Profile

Incident Title:	Employee Amputates Hand in Explosion
Incident (Accident) ID:	201043056
Report Date:	04/02/2007
Report ID (OSHA):	953220
Incident Description:	On April 2, 2007, an employee was using Alligator Shears to cut an oxygen cylinder that was still under pressure. The cylinder exploded and the employee suffered a near amputation on his right wrist and also a laceration on his lower left hand. The Emergency technicians were called, and the employee was transported to UMC to address his wounds. He was hospitalized and treated for hand amputation.
Inspection Number:	311013098
Establishment Name:	NEVADA RECYCLING
(State-Zip):	NV 89081
Fatalities:	0 **Injuries:** 1
Keywords (OSHA):	AMPUTATED, HAND, LACERATION, EXPLOSION, CYLINDER

EMPLOYEE STRUCK BY HOT LIQUID AND STEAM, LATER DIES

	OSHA Incident Profile
Incident Title:	Employee Struck by Hot Liquid and Steam, Later Dies
Incident (Accident) ID:	200271674
Report Date:	03/24/2007
Report ID (OSHA):	524500
Incident Description:	At approximately 8:30 p.m. on March 23, 2007, Employee #1 was working from a scissor lift installing insulation around a section of 6-in. pipe approximately 15 ft in the air. An upset in the system caused hot liquid and steam to erupt from a pipe approximately 13 ft behind and above Employee #1. Employee #1 was engulfed in the liquid and jumped from the scissor lift. Employee #1 was wearing a full body harness with a lanyard attached to the railing. As Employee #1 hung from the harness, his foreman was able to grab him by his legs while Employee #1 unhooked the harness from the lanyard. Employee #1 was taken to an emergency shower and was transported by ambulance to the hospital. Employee #1 was transferred to the burn unit with burns over 87 percent of his body. Employee #1 died at approximately 8:30 p.m. on March 24, 2007, as a result of the burns.
Inspection Number:	310795364
Establishment Name:	ECF
(State-Zip):	IL 62521
Fatalities:	1 **Injuries:** 0
Keywords (OSHA):	HEAT, BURN, STEAM, LANYARD, FALL PROTECTION

EMPLOYEE IS KILLED WHEN REFRIGERATION SYSTEM EXPLODES

	OSHA Incident Profile
Incident Title:	Employee Is Killed When Refrigeration System Explodes
Incident (Accident) ID:	202004925
Report Date:	03/13/2007
Report ID (OSHA):	317000
Incident Description:	On March 13, 2007, Employee #1 was working for a firm that, as a subcontractor, performed maintenance on commercial food service equipment. He was in the kitchen area of a single-story restaurant, attempting to locate the source of a refrigerant leak in an ice cream storage dipping cabinet. Employee #1 connected a cylinder containing pressurized nitrogen to the dipping cabinet's refrigeration system via a hose without using a pressure reducing device, such as a pressure regulator or pressure relief valve. The cylinder's internal pressure of approximately 2,200 psig was considerably in excess of the dipping cabinet's maximum test pressure of approximately 150 psig. This disparity overpressurized the dipping cabinet's refrigeration system and caused it to explode. The upper part of the compressor broke off and struck Employee #1 in the head, killing him.
Inspection Number:	310715214
Establishment Name:	SERVICE SPECIALISTS
(State-Zip):	PA 19019
Fatalities:	1 **Injuries:** 0
Keywords (OSHA):	REFRIGERATOR, REFRIGERANT, MAINTENANCE, NITROGEN, HIGH PRESSURE, EXPLOSION, STRUCK BY, HEAD

EMPLOYEE IS KILLED WHEN PRESSURE VESSEL EXPLODES

OSHA Incident Profile

Incident Title:	Employee Is Killed When Pressure Vessel Explodes
Incident (Accident) ID:	201924164
Report Date:	03/08/2007
Report ID (OSHA):	626700
Incident Description:	On March 8, 2007, Employee #1 was painting next to a pressure vessel that was being pressure tested for start up. The coworkers walked away from the pressure vessel during the testing procedure, waiting for the pressure to reach the operating pressure. The pressure vessel exploded, and Employee #1 was blown 50 ft and died of a blunt force trauma.
Inspection Number:	310261748
Establishment Name:	AMERICAN ELASTOMER PRODUCTS
(State-Zip):	TX 77001
Fatalities:	1 **Injuries:** 0
Keywords (OSHA):	EXPLOSION, PRESSURE VESSEL, STRUCK BY, STRUCK AGAINST, PAINTER, BOILER

TWO WORKERS ARE BLINDED BY BOILER FLASH FIRE

OSHA Incident Profile

Incident Title:	Two Workers Are Blinded by Boiler Flash Fire
Incident (Accident) ID:	202363248
Report Date:	02/08/2007
Report ID (OSHA):	352450
Incident Description:	On February 8, 2007, Employees #1 and #2 were working as industrial engineering technicians for a real estate management firm. They were installing a thermocouple on boiler Number 2 in the boiler room on the penthouse floor of a building. They had removed the defective thermocouple from the boiler and replaced it with a new one. During the procedure, the natural gas supplied to boiler had never been turned off. Further, it had not been locked out or tagged to prevent any gas from being supplied to the boiler. Approximately thirty minutes after initially starting the work, the workers used a gas grill lighter in an attempt to light the pilot at the new thermocouple. They had no success. They then tried to light a second thermocouple, one on which they had not performed any work. The boiler blew up in their faces. A flash fire started inside the boiler and came out of the openings on the bottom side of the boiler, causing first- and second-degree burns to Employees #1 and #2. One employee experienced partial blindness immediately after the explosion, and the other experienced total blindness immediately after the explosion. Both employees were transported by ambulance to George Washington University Hospital in the Northwest part of Washington, DC, where they were admitted for several days for treatment. The employee who experienced the total blindness had eye injuries resulting in temporary damage to the corneas of his eyes. He was using antibiotics, steroids, and special eye drops to try to correct the damage he sustained to his eyes.
Inspection Number:	310805940
Establishment Name:	THE CHEVY CHASE LAND COMPANY OF MONTGOMERY COUNTY
(State-Zip):	MD 20814
Fatalities:	0 **Injuries:** 2
Keywords (OSHA):	BOILER, PILOT LIGHT, NATURAL GAS, LOCKOUT, FLAMMABLE VAPORS, FLASHBACK, BURN, EYE

FOUR WORKERS ARE KILLED IN PROPANE GAS EXPLOSION

OSHA Incident Profile

Incident Title:	Four Workers Are Killed in Propane Gas Explosion
Incident (Accident) ID:	200631505
Report Date:	01/30/2007
Report ID (OSHA):	316400
Incident Description:	On January 30, 2007, two workers employed by Appalachian Heating were installing a new propane tank at a small convenience store (Little General Store) and gas station. The workers were transferring gas from the existing tank to the new one, when a relief valve on the old tank stuck in the open position. Propane was released, and when the propane gas cloud reached an ignition source, an explosion occurred. The explosion destroyed the convenience store and several nearby vehicles. The two employees from Appalachian Heating were killed, as were two volunteer fire fighters. Four convenience store workers and a volunteer fire fighter were seriously injured and hospitalized.
Inspection Number:	309474781
Establishment Name:	APPALACHIAN HEATING
(State-Zip):	WV 25843
Fatalities:	4 **Injuries:** 0
Keywords (OSHA):	CONSTRUCTION, MECHANIC, INSTALLING, PROPANE, TANK, GAS LEAK, EQUIPMENT FAILURE, FLAMMABLE VAPORS, EXPLOSION, CONCUSSION

EMPLOYEE IS BURNED WHEN STEAM VALVES FAILS

OSHA Incident Profile

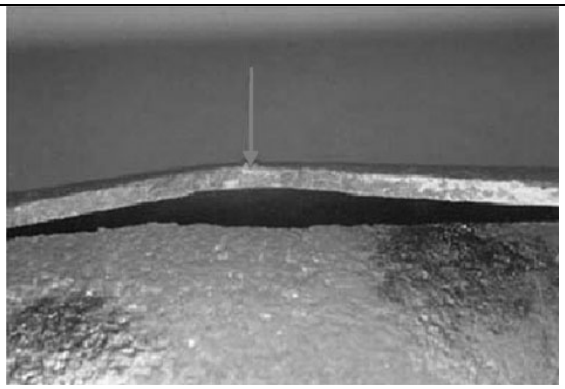
Incident Title:	Employee Is Burned When Steam Valve Fails
Incident (Accident) ID:	310399670
Report Date:	01/14/2007
Report ID (OSHA):	453720
Incident Description:	On January 14, 2007, Employee #1 was starting up Boiler Number 2 in preparation for plant production. He was injured when an angle gate valve failed on a 10-in. steam line and the boiler room filled with steam. Employee #1 was hospitalized for first-degree and second-degree burns to his left and right arms, fingers, and torso.
Inspection Number:	310399670
Establishment Name:	PRECISION FABRICS GROUP
(State-Zip):	NC 27401
Fatalities:	0 **Injuries:** 1
Keywords (OSHA):	STEAM, BURN, ARM, TORSO, FINGER, VALVE, BOILER, TEXTILE PRODUCTION, TEXTILE

EMPLOYEE IS KILLED IN HYDROGEN GAS EXPLOSION

OSHA Incident Profile

Incident Title:	Employee Is Killed in Hydrogen Gas Explosion
Incident (Accident) ID:	200758365
Report Date:	01/08/2007
Report ID (OSHA):	522500
Incident Description:	At approximately 8:55 a.m. on January 8, 2007, an employee, a truck driver arrived at the American Electric Power (AEP) Muskingum River plant located in Waterford, Ohio. The truck driver was delivering hydrogen gas to fill two 6500 cubic feet storage cylinders at the plant. The hydrogen gas was used to cool the generator at the power plant. At approximately 9:22 a.m., the employer, who was working alone at the time, was in the final stages of filling the cylinders. At this time witnesses heard a loud noise, like high pressure gas venting through a relief valve, and within 15 to 20 seconds, the hydrogen gas exploded, killing the employee and injuring eight AEP coworkers. The investigation revealed that the hydrogen gas over pressurized a rupture disk attached to one of the hydrogen cylinders. As the set pressure of the rupture disk was between 3500 and 4000 psi, and the maximum pressure that could have be put on the system during filling was 2600 psi, the rupture disk failed well below its designed pressure. The release of hydrogen through the relief vent piping, which terminated outside above the roof, also caused the copper vent tubing to fail and burst apart at a 45 degree elbow below the roof, therefore releasing hydrogen gas under the roof. This allowed the gas to accumulate into a large cloud that subsequently ignited and exploded. The force of the explosion killed the employee and injured nine AEP workers in an adjacent building.
Inspection Number:	309178523
Establishment Name:	"CGI INTERNATIONAL
(State-Zip):	OH 45786
Fatalities:	1 **Injuries:** 0
Keywords (OSHA):	EXPLOSION, GAS, HYDROGEN, TRUCK DRIVER

FROZEN DISTILLING UNIT CATCHES FIRE



Summary

In 2006 after a long period of inactivity during the winter, a distilling unit was reactivated. Unfortunately frozen condensate inside a pipe caused a blockage, which in turn caused a backflow which ruptured the pipe. To make matters worse a damaged valve made it impossible to stop flow to the affected area. The source is not clear how the substance caught fire, but it did at some point.

Lessons Learned

- Equipment needs to be properly stored during long periods of inactivity, especially in extreme conditions.
- Any equipment that is to be used after long periods of inactivity needs to be properly inspected.
- Valves should be properly maintained.

Source

http://cms.icheme.org/mainwebsite/resources/document/lpb190pg28-31.pdf

EMPLOYEE IS KILLED WHEN TANK EXPLODES

	OSHA Incident Profile
Incident Title:	Employee Is Killed When Tank Explodes
Incident (Accident) ID:	201320934
Report Date:	12/28/2006
Report ID (OSHA):	317900
Incident Description:	On December 28, 2006, Employee #1 was repairing a 200 gallon water tank, which had been removed from an Oshkosh S- Series concrete mixer truck. Employee #1 finished the repair and was testing the tank for leaks with the use of air pressure, when the tank exploded, killing him.
Inspection Number:	309863033
Establishment Name:	CONSTRUCTURAL DYNAMICS
(State-Zip):	PA 19030
Fatalities:	1 **Injuries:** 0
Keywords (OSHA):	WATER TANK, REPAIR, AIR PRESSURE, EXPLOSION, STRUCK BY, AMPUTATED, LEG

DEWAR FAILURE

Summary

In December of 2006, a Dewar cylinder failed due to over pressurization and caused substantially laboratory damage. This incident occurred at University chemistry laboratory. The over-pressurization blew out the bottom of the cylinder and propelled the cylinder upwards. The catastrophic failure of the nitrogen cylinder was a result of the removal of the pressure relief devices.

Lessons Learned

- Importance of being properly trained when safe handling high pressure cylinders,
- Report to a Supervisory if high pressure or liquefied gas seems to be modified
- Never modify equipment without qualified engineering evaluation.

Source

http://www.aiche.org/uploadedFiles/NewOrleans/Uploads/Process_Safety_Beacon/Process%20Safety%20Beacon%2012-06.pdf

EXPLOSION OF PRESSURE VESSEL

Summary
On Dec. 3, 2004, a 50,000-pound steel pressure vessel violently exploded at the Marcus Oil and Chemical facility in southwest Houston. The vessel contained flammable hydrocarbons such as hexane. The vessel was a horizontal tank 12 feet in diameter, 50 feet long and operated at a pressure of approximately 67 psi. Marcus Oil did not use a qualified welder or proper welding procedure to reseal the vessels and did not pressure-test the vessels after the welding was completed. The defective welds had decreased the strength of the vessels by more than 75%. The welds were further weakened by metal fatigue. Texas is one of 11 states that have not adopted national safety standards for pressure vessels and is one of 17 states that do not require adherence to the National Board Inspection Code. The code requires alterations to pressure vessels to be inspected, tested, certified and stamped.

Lessons Learned

- It is important to provide documentation concerning the design, construction, or safe operating pressure of the vessels.
- It is important to recognize unregulated, uninspected, and improperly maintained pressure vessels and to follow safety codes including installing relief devices on all pressure vessels, and avoiding the contamination of its nitrogen supply with air to prevent fires.

Source
http://www.csb.gov/newsroom/detail.aspx?nid=161

EMPLOYEE IS STRUCK AND KILLED BY BROKEN PRESSURE VESSEL

	OSHA Incident Profile
Incident Title:	Employee Is Struck and Killed by Broken Pressure Valve
Incident (Accident) ID:	200170801
Report Date:	11/14/2006
Report ID (OSHA):	257260
Incident Description:	Employee #1 was performing hydrostatic test when a pressure valve broke and hit him causing a concussion and his death.
Inspection Number:	307931741
Establishment Name:	ALSTOM CARIBE INC
(State-Zip):	PR 00936
Fatalities:	1 **Injuries:** 0
Keywords (OSHA):	STRUCK BY, EQUIPMENT FAILURE, PRESSURE PIPING, CONCUSSION, HEAD

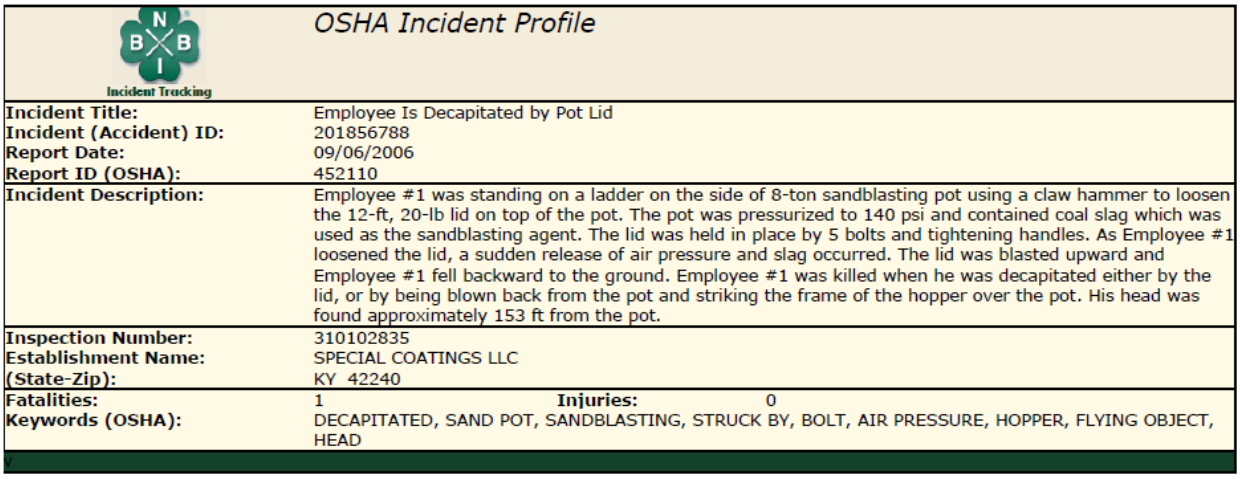
AMMONIA LINE RUPTURE KILLS ONE WORKER, INJURING TWO

	OSHA Incident Profile
Incident Title:	Ammonia Line Rupture Kills One Worker, Injuring Two
Incident (Accident) ID:	201344223
Report Date:	10/31/2006
Report ID (OSHA):	729700
Incident Description:	On October 31, 2006, two employees were performing maintenance on an ammonia line when the line ruptured. Employee #1 was transported to a hospital and was pronounced dead at 2:08 p.m. Employee #2 suffered chemical burns from contact to liquid ammonia and was taken to the hospital for treatment. Employee #3, a first responder, was also treated at the hospital for postevent respiratory symptoms. Employees #2 and #3 were not hospitalized.
Inspection Number:	309890093
Establishment Name:	TYSON PREPARED FOODS
(State-Zip):	KS 67504
Fatalities:	1 **Injuries:** 2
Keywords (OSHA):	MAINTENANCE, AMMONIA, PIPELINE, RUPTURE, ASPHYXIATED, BURN, OVEREXPOSURE, RESPIRATOR, RESPIRATORY, PPE

EMPLOYEE'S EYE STRUCK BY FLYING OBJECT

Incident Tracking	*OSHA Incident Profile*
Incident Title:	Employee's Eye Struck by Flying Object
Incident (Accident) ID:	201168416
Report Date:	10/23/2006
Report ID (OSHA):	950641
Incident Description:	At approximately 4:00 p.m. on October 23, 2006, Employee #1 had installed a pipe, 2-in. in diameter, to the main line and a pressure gauge. He was checking the pressure gauge when the pipe ruptured. The gauge blew off and struck his face. He was hospitalized with an eye injury.
Inspection Number:	126161074
Establishment Name:	RELIABLE LANDSCAPE SERVICES
(State-Zip):	CA 90034
Fatalities:	0 **Injuries:** 1
Keywords (OSHA):	EYE, STRUCK BY, FLYING OBJECT, PIPE, CONTUSION, PRESSURE RELEASE, RUPTURE

EMPLOYEE IS DECAPITATED BY POT LID



OSHA Incident Profile

Incident Title:	Employee Is Decapitated by Pot Lid
Incident (Accident) ID:	201856788
Report Date:	09/06/2006
Report ID (OSHA):	452110
Incident Description:	Employee #1 was standing on a ladder on the side of 8-ton sandblasting pot using a claw hammer to loosen the 12-ft, 20-lb lid on top of the pot. The pot was pressurized to 140 psi and contained coal slag which was used as the sandblasting agent. The lid was held in place by 5 bolts and tightening handles. As Employee #1 loosened the lid, a sudden release of air pressure and slag occurred. The lid was blasted upward and Employee #1 fell backward to the ground. Employee #1 was killed when he was decapitated either by the lid, or by being blown back from the pot and striking the frame of the hopper over the pot. His head was found approximately 153 ft from the pot.
Inspection Number:	310102835
Establishment Name:	SPECIAL COATINGS LLC
(State-Zip):	KY 42240
Fatalities:	1 **Injuries:** 0
Keywords (OSHA):	DECAPITATED, SAND POT, SANDBLASTING, STRUCK BY, BOLT, AIR PRESSURE, HOPPER, FLYING OBJECT, HEAD

EMPLOYEE IS INJURED WHILE PRESSURE WASHING EQUIPMENT

	OSHA Incident Profile
Incident Title:	Employee Is Injured While Pressure Washing Equipment
Incident (Accident) ID:	202220554
Report Date:	08/09/2006
Report ID (OSHA):	111100
Incident Description:	On August 9, 2006, Employee #1 was pressure cleaning equipment with a 300 pound tank with 10 psi. The end of the tank blew off, propelling its top 147 feet. Also the metal bands holding the tank broke loose and struck Employee #1. Employee #1 suffered multiple bruises and abrasions.
Inspection Number:	113790307
Establishment Name:	L. V. ALLEN & SON EXCAVATION
(State-Zip):	ME 04073
Fatalities:	1 **Injuries:** 0
Keywords (OSHA):	STRUCK BY, ABRASION, CONTUSION, EXPLOSION, PRESSURE RELEASE, PRESSURE VESSEL, HEAD

EMPLOYEE IS INJURED BY PRESSURIZED GAS RELEASE

	OSHA Incident Profile
Incident Title:	Employee Is Injured By Pressurized Gas Release
Incident (Accident) ID:	201088374
Report Date:	08/08/2006
Report ID (OSHA):	0950625
Incident Description:	At approximately 9:00 p.m. on August 8, 2006, Employees #1 and #2 attempted to clean out a heat exchanger. The heat exchanger was part of a natural gas piping system in the power generation facility of a wastewater treatment plant. The heat exchanger contained methane and natural gas, pressurized to approximately 300 pounds per square inch. Approximately 200 parts per million of hydrogen sulfide contaminant was present in the natural gas. The natural gas piping system contained two compressors, labeled Compressor A and Compressor B. The heat exchanger that Employees #1 and #2 were to clean out was connected to Compressor B. Compressor B was off and Compressor A was running. Employees #1 and #2 incorrectly assumed that since compressor B was not running, it had already been isolated from Compressor A by a closed valve. However, the valve between compressor A and B was in the "open" position. Employee #2 began removing a plug on the Compressor B heat exchanger, with a pneumatic impact gun, while Employee #1 was standing directly behind him. When the heat exchanger plug was removed, the pressurized natural gas came out of the 0.5-inch plug opening and blew Employees #2 and #1 back. The natural gas did not ignite. Employee #1 was rendered unconscious from the impact. Employee #2 initiated emergency shutdown of the natural gas system and notified other employees about the emergency. An ambulance was called, but neither employee was hospitalized.
Inspection Number:	306365230
Establishment Name:	Fresno Wastewater Treatment Plant
(State-Zip):	CA 93706
Fatalities:	0 **Injuries:** 2
Keywords (OSHA):	struck by, pressure release, high pressure, high pressure pipe, unconsciousness, methane, natural gas, compressor, valve, lockout

STEAM LINE EXPLOSION KILLS ONE EMPLOYEE AND INJURES ANOTHER

OSHA Incident Profile

Incident Title:	Steam Line Explosion Kills One Employee and Injures Another
Incident (Accident) ID:	200881159
Report Date:	08/03/2006
Report ID (OSHA):	215800
Incident Description:	On August 3, 2006, Employees #1 and #2 were employed by a real estate firm. They were working on a high pressure steam line, when a valve exploded, releasing 400-degree Fahrenheit steam into the utility room. Employee #1 was killed, due to burns he sustained to several parts of his body, and Employee #2 was critically injured. There is no mention of Employee #2 on the injury line.
Inspection Number:	309383321
Establishment Name:	HURON REAL ESTATE ASSOCIATES BLDG. 14
(State-Zip):	NY 13760
Fatalities:	1 **Injuries:** 1
Keywords (OSHA):	STEAM, STEAM LINE, VALVE, PRESSURE PIPING, EXPLOSION, HIGH TEMPERATURE, BURN

EXPLOSION RESULTS IN EMPLOYEE LEG AMPUTATION

OSHA Incident Profile

Incident Title:	Explosion Results in Employee Leg Amputation
Incident (Accident) ID:	202362570
Report Date:	07/17/2006
Report ID (OSHA):	352450
Incident Description:	Employee #1 was injured when the 300-gallon air receiver of an air compressor unit ruptured resulting in severe injuries to both his legs The accident was caused by rust inside the receiver that weakened the steel due to the receiver not been drained. The safety valve was inoperative due to corrosion from not being tested. The pressure gauge was stuck on 90 psi. Employee #1 was transported to the hospital where his left leg had to be amputated below the knee and the right leg required several pins. Employee #1 was hospitalized.
Inspection Number:	310078282
Establishment Name:	J. & J. BAY #3
(State-Zip):	MD 21704
Fatalities:	0 **Injuries:** 1
Keywords (OSHA):	AMPUTATED, LEG, EXPLOSION, EQUIPMENT FAILURE, AIR RECEIVER, COMPRESSED AIR, COMPRESSOR

EMPLOYEE IS INJURED WHEN STRUCK IN FACE BY LID

OSHA Incident Profile

Incident Title:	Employee Is Injured When Struck in Face by Lid
Incident (Accident) ID:	202316220
Report Date:	07/14/2006
Report ID (OSHA):	950612
Incident Description:	At approximately 7:00 p.m. on July 14, 2006, Employee #1, working for Accura Precision, Inc., was assisting the owner of the company in conducting a leak check on a lid chamber. After securing the chamber assembly with screws, they sprayed soapy water on the welded area to look for the leak identified by the negative pressure machine. They applied air pressure from the stand-up air compressor, which was set with maximum output of 120 psi. The screws failed, and the lid was released. Employee #1 was leaning over, looking for bubbles, when the lid struck him in the face. He suffered contusions and was transported to Valley Medical Center for hospitalization.
Inspection Number:	309896397
Establishment Name:	ACCURA PRECISION
(State-Zip):	CA 95054
Fatalities:	0 **Injuries:** 1
Keywords (OSHA):	COVER, STRUCK BY, TANK, AIR PRESSURE, PRESSURE RELEASE, FACE, CONTUSION, LEAK

EMPLOYEE RECEIVES MULTIPLE BURNS IN EXPLOSION

Incident Tracking	*OSHA Incident Profile*
Incident Title:	Employee Receives Multiple Burns In Explosion
Incident (Accident) ID:	201702156
Report Date:	06/26/2006
Report ID (OSHA):	1054115
Incident Description:	On June 26, 2006, Employee #1 was filling a delivery truck from a bulk storage tank. A high pressure line at approximately 180 psi burst at the compressor. The rupture in the line occurred just as Employee #1 was shutting off the compressor pump. The building exploded into a fireball, and he was thrown approximately 10 ft. He received burns on approximately 16 to 19 percent of his body and was hospitalized.
Inspection Number:	309814499
Establishment Name:	Ferrellgas Lp
(State-Zip):	OR 97741
Fatalities:	0 **Injuries:** 1
Keywords (OSHA):	fire, explosion, burn, smoke, compressor, tank, truck

EMPLOYEE IS KILLED BY FLYING OBJECT

Incident Tracking	*OSHA Incident Profile*
Incident Title:	Employee Is Killed by Flying Object
Incident (Accident) ID:	200812121
Report Date:	06/24/2006
Report ID (OSHA):	627400
Incident Description:	Employee #1 was changing out the O-ring on a line heater. Employee #1 had shut the line heater by closing the upstream valve at the well head but, contrary to procedure, had not closed the downstream valve in front of the separator. The end blew off the line, struck Employee #1, and killed him. Average pressure of the gas from the well had been 8,500 psi.
Inspection Number:	310017025
Establishment Name:	TETRA PRODUCTION TESTING SERVICES
(State-Zip):	TX 79754
Fatalities:	1 **Injuries:** 0
Keywords (OSHA):	STRUCK BY, FLYING OBJECT, GAS WELL, VALVE, PRESSURE PIPING, PRESSURE RELEASE, GAS FITTING, CONTUSION

EMPLOYEE DIES AFTER PRESSURIZED PIPE FAILURE

OSHA Incident Profile

Incident Title:	Employee Dies after Pressurized Pipe Failure
Incident (Accident) ID:	200262848
Report Date:	05/03/2006
Report ID (OSHA):	627100
Incident Description:	On May 3, 2006, Employee #1 was in a trench (approximately 37 in. deep and 44 to 46 in. wide), digging dirt from around a 10-in.-diameter PVC water pipeline to locate a water leak. The pipeline was pressurized to approximately 125-130 psi with compressed air. When a section of the pipe failed, Employee #1 was blown from the trench onto the upper ground surface approximately 24 ft. away. He died in an ambulance, while being transported to a nearby hospital.
Inspection Number:	309946341
Establishment Name:	KLAASMEYER CONSTRUCTION COMPANY
(State-Zip):	AR 72033
Fatalities:	1 **Injuries:** 0
Keywords (OSHA):	PIPE, PIPELINE, PRESSURE RELEASE, AIR PRESSURE, LEAK, REPAIR, TRENCH, ABRASION, CONTUSION, EXCAVATION

BOILER OPERATOR DIES AFTER BEING BURNED IN BOILER EXPLOSION

OSHA Incident Profile

Incident Title:	Boiler Operator Dies after Being Burned in Boiler Explosion
Incident (Accident) ID:	200452019
Report Date:	04/10/2006
Report ID (OSHA):	418600
Incident Description:	On April 10, 2006, Employee #1 and some coworkers were working as boiler operators, in the process of bringing a pulp mill power boiler online. Employee #1 was the regular outside operator. This particular boiler was the standby boiler for a powerhouse. The heatup went smoothly for approximately four hours, according to boiler DCS records and operator statements. An outside operator went to the boiler to open the main steam header valve to place the boiler online. A few minutes later, Employee #1 went to the boiler to assist the first operator. He closed the free flow valve to allow the pressure in the boiler to build. An internal tube of the boiler ruptured and breached the outside wall of the boiler, dumping the hot water and steam into the boiler room. Employee #1 was behind the header and could not escape being exposed to the steam. According to other operators, Employee #1 stated that he crawled out from under the header and went upstairs, but not before he was burned over approximately 70 percent of his body. He died as a result of his burns.
Inspection Number:	309577310
Establishment Name:	ROCK TENN CO.
(State-Zip):	AL 36732
Fatalities:	1 **Injuries:** 0
Keywords (OSHA):	BOILER, EXPLOSION, PAPER, EQUIPMENT FAILURE, PRESSURE RELEASE, BURN, STEAM, WATER

EMPLOYEE FRACTURES JAW WHEN STRUCK BY LID

OSHA Incident Profile

Incident Title:	Employee Fractures Jaw When Struck by Lid
Incident (Accident) ID:	201069812
Report Date:	02/08/2006
Report ID (OSHA):	950632
Incident Description:	At approximately 4:55 p.m. on February 8, 2006, Employee #1, a mechanic, was repairing a tortilla dough making machine, called the Boleadoras vessel. Employee #1 was supervised by his supervisor, while he was pressuring the Boleadoras vessel to ensure that the lid and gasket were not leaking. This was the third attempt to pressurize the vessel. Employee #1 was up on a 0.5-ft stepladder over the top of the lid, which was located on the top of the Boleadoras vessel, when the lid exploded and struck Employee #1 under the chin. Employee #1 fractured his jaw, broke teeth, and possibly lost sight in one eye. Employee #1 had two surgeries and was hospitalized. The lid blew off the top of the lower portion of the Boleadoras vessel and then came down, hitting a coworker in the middle of his back. He was treated with medication for his back pain and required physical therapy for his mid back injury.
Inspection Number:	125879684
Establishment Name:	CIRCLE FOOD PRODUCTS INC
(State-Zip):	CA 92102
Fatalities:	0 **Injuries:** 1
Keywords (OSHA):	REPAIR, MAINTENANCE, PRESSURE VESSEL, STEPLADDER, STRUCK BY, FLYING OBJECT, FRACTURE, FACE, EYE, LOCKOUT

EMPLOYEE IS INJURED WHEN HELIUM TANK EXPLODES

OSHA Incident Profile

Incident Title:	Employee Is Injured When Helium Tank Explodes
Incident (Accident) ID:	201167582
Report Date:	11/10/2005
Report ID (OSHA):	950641
Incident Description:	At approximately 4:25 p.m. on November 10, 2005, Employee #1 was filling a tank of helium at a party store. The tank was 19 inches high and 8 inches in diameter, was constructed of aluminum, and was manufactured by Kiddee. It had a CGA 580 fitting designed for helium. As he filled the tank, he heard a hissing sound so he stopped the filling process. Thinking that it was a faulty rupture disc, he removed the original disc, which was rated for 3500 psi, and replaced it with another disc rated at 3775 psi. He then used a wrench to tighten the transfill hose to the valve. When he be began fill the tank again, it exploded. He was struck by a piece of the tank approximately 10 inches long by 8 inches wide by 4 inches thick and suffered a compound fracture of his femur. He was hospitalized with his injury.
Inspection Number:	126062520
Establishment Name:	SIMS WELDING
(State-Zip):	CA 90232
Fatalities:	0 **Injuries:** 1
Keywords (OSHA):	HIGH PRESSURE, TANK, COMPRESSED GAS, EXPLOSION, STRUCK BY, CYLINDER, LEG

EMPLOYEE IS KILLED WHEN STRUCK BY FLYING OBJECT

OSHA Incident Profile

Incident Title:	Employee Is Killed When Struck by Flying Object
Incident (Accident) ID:	201391117
Report Date:	11/02/2005
Report ID (OSHA):	552652
Incident Description:	Employee #1 was operating a bladder-type forming machine. As air was directed from the regulator through an air hose attached to the dome of the lid, the pressure inside the lid increased. The lid blew off and a piece of the lid struck the employee in the neck, killing him.
Inspection Number:	308852565
Establishment Name:	LEON PLASTICS INC
(State-Zip):	MI 49548
Fatalities:	1 **Injuries:** 0
Keywords (OSHA):	FORMING MACHINE, HIGH PRESSURE, BLADDER, STRUCK BY, FLYING OBJECT, MACHINE OPERATOR, AIR PRESSURE, NECK

FOUR EMPLOYEES BURNED WHILE SERVICING STEAM UNIT

	OSHA Incident Profile
Incident Title:	Four employees burned while servicing steam unit
Incident (Accident) ID:	201858180
Report Date:	10/18/2005
Report ID (OSHA):	452110
Incident Description:	On October 18, 2005, Employees #1 through #4, of Hussung Mechanical Contractors, Inc., and two coworkers were trying to bring a steam unit online. A joint blew out and all six workers sustained burns from the steam. Employees #1 through #4 were hospitalized.
Inspection Number:	309116986
Establishment Name:	HUSSUNG MECHANICAL CONTRACTORS
(State-Zip):	KY 40202
Fatalities:	0 **Injuries:** 4
Keywords (OSHA):	CONSTRUCTION, BURN, STEAM, HIGH TEMPERATURE, HOT WATER, UNSECURED, HIGH PRESSURE, PRESSURE RELEASE, ACCIDENTAL DISCHARGE

TWO EMPLOYEES ARE BURNED BY STEAM

	OSHA Incident Profile
Incident Title:	Two Employees Are Burned by Steam
Incident (Accident) ID:	201858719
Report Date:	10/18/2005
Report ID (OSHA):	452110
Incident Description:	On October 18, 2005, six employees were working to bring a steam unit online. When an expansion joint failed, steam blew out onto the employees. Employees #1 and #2 were hospitalized with burns.
Inspection Number:	309117026
Establishment Name:	ARROW ELECTRICAL CONTRACTORS
(State-Zip):	KY 40202
Fatalities:	0 **Injuries:** 2
Keywords (OSHA):	HEAT, STEAM, STEAM LINE, EQUIPMENT FAILURE, BURN

EMPLOYEE'S HAND IS BURNED WHEN AMMONIA ESCAPES

OSHA Incident Profile	
Incident Title:	Employee's Hand Is Burned When Ammonia Escapes
Incident (Accident) ID:	200801447
Report Date:	10/03/2005
Report ID (OSHA):	523300
Incident Description:	On October 4, 2005, Employee #1 was working as a refrigeration mechanic. An ammonia system valve in freezer Number 7 was being turned, when the bonnet came loose with the wheel, releasing approximately 100 to 200 lbs of ammonia. Employee #1 was 35 feet up without fall protection, and he had to slide down racking to escape. He gave notification to shut the system down and summoned the city's hazard materials team. The plant and the surrounding businesses were evacuated without incident. Employee #1 sustained first and second degree chemical burns on his left hand. He was not hospitalized. This was not the first time that the bonnet of that Hansen 1.25 in. shut off valve had come off when the valve was turned. This type of valve is now made with a bolt to prevent the bonnet from turning.
Inspection Number:	308382324
Establishment Name:	CENTRAL STORAGE & WAREHOUSE COMPANY
(State-Zip):	WI 53716
Fatalities:	0 **Injuries:** 1
Keywords (OSHA):	VENTING, AMMONIA, REFRIGERANT, VALVE, REFRIGERATOR, FALL PROTECTION, STORAGE RACK, CHEMICAL BURN, HAND

EMPLOYEE IS BURNT FROM PRESSURIZED HOT WATER LINE

	OSHA Incident Profile
Incident Title:	Employee Is Burnt From Pressurized Hot Water Line
Incident (Accident) ID:	201086998
Report Date:	09/30/2005
Report ID (OSHA):	0950625
Incident Description:	At approximately 9:15 a.m. on September 30, 2005, Employee #1, of Ca Corrections, was replacing a check valve on a pressurized condensate line in the B complex area. He opened the condenate line and was sprayed with hot water. Employee #1 was transported to the hospital, and treated for second and third degree burns to his back and the side of his body.
Inspection Number:	125755199
Establishment Name:	CA Corrections
(State-Zip):	CA 93204
Fatalities:	0 **Injuries:** 1
Keywords (OSHA):	back, burn, water, valve

EMPLOYEE SUFFERS HAND FRACTURES FROM EXPLODING AIR PRESSURE

OSHA Incident Profile

Incident Title:	Employee Suffers Hand Fractures From Exploding Air Pressure
Incident (Accident) ID:	201506060
Report Date:	09/29/2005
Report ID (OSHA):	0950614
Incident Description:	On September 29, 2005, Employee # 1, of Big O Tires, tried to inflate a 16-in. tire mounted on the Corghi tire-mounting machine. Since the tire bead was not sitting on the rim, at 40 psi air pressure, Employee #1 bypassed the system and instead connected an independent air hose line direct from the compressor, with a working pressure of 160 psig. He held the airline chuck with both his hands. The uncontrolled released air pressure exploded and raised the tire to a height of 14 ft, which hit the roof and fell on Employee #1. He was taken to Kaiser Hospital in Oakland to treat fractures in both of his hands.
Inspection Number:	307339895
Establishment Name:	Big O Tires
(State-Zip):	CA 94601
Fatalities:	0 **Injuries:** 1
Keywords (OSHA):	fracture, hand, air pressure, hose, explosion

EMPLOYEE IS BURNED WHEN VALVE ON STEAM PIPING RUPTURES

	OSHA Incident Profile
Incident Title:	Employee Is Burned When Valve on Steam Piping Ruptures
Incident (Accident) ID:	201037520
Report Date:	08/03/2005
Report ID (OSHA):	950635
Incident Description:	On August 3, 2005, an employee, who was a steam engineer, went near the sight glass to replace the seals near the two valves at the two ends of the sight glass in the boiler room. In the boiler room, there were three steam generators. The accident happened in Steam Generator Number 2. The exact location of the accident was in front of the 0.5-in. diameter, 2.5 ft long sight, glass which indicates the level of water and steam. The sight glass steam pressure and temperature were 60 psi and 350 degree F, respectively. In order to inspect the sight glass, one has to go up the ladder and stand on a platform at a height of about 6 ft from the ground level. The sight glass and some other valves of the system of Generator Number 2 could only be accessed while standing on the platform. While repairing the steam end of the valve, the employee was facing the sight glass. As the employee once turned back, his backside faced the sight glass and the valves on the platform. Suddenly, the sight glass steam end valve, on the steam piping, ruptured, resulting in hot steam jet from the spot of the pipe and valve leakage. The employee was standing at the moment, approximately 1 ft in front of the leaked valve, and there was not much free space in front of him, due to the existing layout. However, to avoid the jet of steam, the employee quickly bent down and then crawled out of hand railing in front of him in order to land on the ground level. The employee suffered second degree burns on his back. The employee was hospitalized and treated for burns.
Inspection Number:	125945626
Establishment Name:	KAISER PERMANENTE
(State-Zip):	CA 90706
Fatalities:	0 **Injuries:** 1
Keywords (OSHA):	BURN, STEAM, VAPOR, BACK, GAS

THREE EMPLOYEES ARE BURNED WHEN BOILER RUPTURES

	OSHA Incident Profile
Incident Title:	Three Employees Are Burned When Broiler Ruptures
Incident (Accident) ID:	200758118
Report Date:	07/26/2005
Report ID (OSHA):	522500
Incident Description:	At 9:34 a.m. on July 26, 2005, Employees #1, #2, and #3, of Warwood Armature Repair Company, were performing repair work on the motor of the 5 East induced fan at the First Energy Corp., R.E. Burger Plant. When a boiler tube in boiler Number 5, Unit Number 3 ruptured, it released a large quantity of steam and hot gas from the boiler interior, escaping out of openings into the boiler walls and roof. All three employees sustained steam burns. At the time of the rupture, the boiler was operating with two forced fans and one induced fan running. Employee #1 was hospitalized for six days. The other two employees were treated for steam burns and released.
Inspection Number:	112531207
Establishment Name:	WARWOOD ARMATURE REPAIR COMPANY
(State-Zip):	OH 43947
Fatalities:	0 **Injuries:** 3
Keywords (OSHA):	BURN, OVERHEATED, RUPTURE, STEAM, PRESSURE VESSEL, FAN

EMPLOYEE IS KILLED WHEN COMPRESSED AIR TANK EXPLODES

OSHA Incident Profile

Incident Title:	Employee Is Killed When Compressed Air Tank Explodes
Incident (Accident) ID:	201146958
Report Date:	07/23/2005
Report ID (OSHA):	950631
Incident Description:	On July 23, 2005, Employee #1 was a full-time, permanent employee at an automated car wash. One day earlier, Employee #1 and three other people replaced the flow electronics, all the brushes, and the soap system for the car wash. Those three people were his employer, who was also Employee #1's immediate supervisor; a friend of the employer, who would be present at the accident; and a vendor, who would also be present at the accident. Two operating air compressor systems, along with several containers of soaps, the soap system, and the controls, were in the storage room at the car wash. There were two air tanks, at least one of which, an 80-gallon tank, was in the car wash's equipment room. Both air tanks had current Cal/OSHA permits. After the work had been performed, the air tanks were operated while tests were made to the soap system. The two assistants who would be present at the accident stated that they did not notice anything out of the ordinary. Rather, they heard the air cycle on and off throughout the day. The air compressor was set to cycle on at 110 psi and off at 150 psi. On the date of the accident, the two assistants to the project and Employee #1 had plans to finish up the work they had started the previous day. Employee #1 was in the storage room cleaning up. The two assistants were walking away from the building, when they heard a tremendous explosion. The vertical 80-gallon air tank in the equipment room had exploded, killing Employee #1. He died of exsanguination (blood loss) caused by the injuries to his abdomen and pelvic region. The tank that exploded was rated for 200 psi. It was manufactured by Roy E. Hanson Jr. in 1982. It had Serial Number 42453 and Cal/OSHA Number A009641-85. The system's second air tank was manufactured by Falcon. It was of similar size to the Hanson tank. The Falcon tank was 24 inches in diameter and 44 inches tall. The serial number for this air tank was not available. The pressure relief valve from the Falcon air tank and the pressure relief valve from the compressor that had been attached to the air tank that exploded were tested by the National Board Testing Laboratory and found to be functioning properly. The regulator, safety relief valve and head of the exploded tank were not found. No corrosion was seen during a visual inspection of the remains of the air tank that exploded. The motor oil and air filter on the compressor appeared to have been changed recently.
Inspection Number:	125951368
Establishment Name:	ORANGE AUTO HANDWASH
(State-Zip):	CA 92868
Fatalities:	1 **Injuries:** 0
Keywords (OSHA):	EXPLOSION, COMPRESSED AIR, TANK, AIR PRESSURE, LOSS OF BLOOD, ABDOMEN, PELVIS

TWO EMPLOYEES ARE BURNED WHEN CLAMPS ON BOILER FAIL

	OSHA Incident Profile
Incident Title:	Two Employees Are Burned When Clamps on Boiler Fail
Incident (Accident) ID:	201106267
Report Date:	05/10/2005
Report ID (OSHA):	950624
Incident Description:	Employee #1 and Employee #2 were trying to replace failed clamps on a low pressure boiler.The hose blew off the pipe, and both employees were burned by steam and boiling water. Both employees were hospitalized.
Inspection Number:	300818572
Establishment Name:	VALLEY GOLD LLC
(State-Zip):	CA 95322
Fatalities:	0 **Injuries:** 2
Keywords (OSHA):	BURN, EQUIPMENT FAILURE, HOSE, BOILER, HEAT, STEAM, HOT WATER

EMPLOYEE IS KILLED WHEN TANK EXPLODES

OSHA Incident Profile

Incident Title:	Employee Is Killed When Tank Explodes
Incident (Accident) ID:	200690717
Report Date:	05/04/2005
Report ID (OSHA):	112600
Incident Description:	On May 4, 2005, Employee #1 was killed when a tank exploded.
Inspection Number:	308348275
Establishment Name:	"L.W. TANK REPAIR
(State-Zip):	MA 01569
Fatalities:	1 **Injuries:** 0
Keywords (OSHA):	TANK, EXPLOSION, REPAIR, WELDING, TORCH

EMPLOYEE IS KILLED WHEN STRUCK BY VALVE

	OSHA Incident Profile
Incident Title:	Employee Is Killed When Struck by Valve
Incident (Accident) ID:	201862737
Report Date:	04/28/2005
Report ID (OSHA):	830100
Incident Description:	On April 28, 2005, Employee #1 was with a crew performing hydrostatic testing of a run of pipe. The test required that the pipe be under a pressure of 1,850 psig for 4 hours. At approximately 3.5 hours into the test, the valve located between the tester header and the high pressure/low volume pump failed. Other crew members found Employee #1, indicating that he had been struck in the back and was in need of medical treatment. He was transported by private vehicle to a local hospital, and then transferred to a large Regional hospital. Employee #1 died of his injuries.
Inspection Number:	308300623
Establishment Name:	CENEX PIPELINE
(State-Zip):	MT 59323
Fatalities:	1 **Injuries:** 0
Keywords (OSHA):	STRUCK BY, VALVE, FLYING OBJECT, HIGH PRESSURE, HIGH PRESSURE PIPE, PRESSURE RELEASE, PUMP, BACK, CONTUSION, ABRASION

EMPLOYEE IS KILLED IN FIRE BOX EXPLOSION

Incident Tracking	*OSHA Incident Profile*
Incident Title:	Employee Killed in Fire Box Explosion
Incident (Accident) ID:	200373496
Report Date:	03/30/2005
Report ID (OSHA):	454510
Incident Description:	Employee #1 was tending a coal-fired boiler that was used to generate steam for a solvent recovery process. When he opened the door to rake ash from fire box, the fire box exploded and killed him.
Inspection Number:	308239136
Establishment Name:	INTERTAPE POLYMER GROUP
(State-Zip):	SC 29250
Fatalities:	1 **Injuries:** 0
Keywords (OSHA):	EXPLOSION, BURN, FIRE, COAL, TORSO, BOILER, PRESSURE VESSEL

OSHA Incident Profile

Incident Title:	Employee Is Injured When Struck by Blanking Plate
Incident (Accident) ID:	200651024
Report Date:	03/04/2005
Report ID (OSHA):	521100
Incident Description:	On March 4, 2005, Employee #1 (leadman) was performing a hydrostatic pressure test on a large stainless steel pressure vessel at a plant which manufactures pressure vessels. The tank was cylindrical, about 14 in. diameter and 24 in. long. The tank was pressurized to 150 number for the test. Upon successful completion of the test, he was draining the water from the tank. He soon discovered that the water would not drain very quickly, as the internal configuration of the tank was such that a vacuum was being created here were inadequate air openings to displace the draining water. After consultation with the plant supervisor and plant manager, it was decided that compressed air would be pumped into the tank to force the water out for a short time, then more openings would be exposed and the water could drain by itself. The110 number air was pumped into the tank by Employee #1 and supervisor, and the water began draining. The supervisor turned the job back to Employee #1. Sometime later, the air hose was disconnected, and the compressed air was also allowed to bleed off. About an hour after the draining began, Employee #1 ordered another coworker to close the drain valve. Employee #1 then went to the area of the drain valve and is presumed to have begun to remove the quick-closure clamps used to seal a tank portal several inches higher than the drain. Normally, the water would be pumped from an opening near, but above the drain when the water levels had dropped to near the drain level. This employee apparently had seen air bubbling out in the drain line and assumed (correctly) that the water level had dropped to near the drain level. The air pressure, however, had not completely off, and when the clamp was loosened, it flew off at him accompanied by a massive air pressure release. Employee #1 received head and neck injuries when being struck by the blanking plate and when his head was snapped back from the release. Employee #1 was paralyzed in the hospital for several days before he died of respiratory and other complications. The employee and the supervisor were very experienced at hydrostatic pressure testing, but pneumatic pressure testing was extremely rare at the plant. They had never had to pump in air to drain a tank before. The company had procedures for both hydrostatic and pneumatic tests, and each employee was trained several years earlier on these procedures. Several days earlier, an attempt to fill the tank with water for the test was unsuccessful, as the same lack of tank openings near the top of the tank would not allow for this to be filled. An extra hole was drilled to allow for filling. Quick-closure clamps are very rarely used during these tests, but the type of clamp used for the test is dependent on the type of clamp that will be used once the tank is put into production. A witness said that the employee was hurried during the draining process. It was Friday, and the tank needed to be shipped on Monday, and there was more work to be done on the tank. He was also working on another tank nearby. The tank had two pressure gauges mounted at the high point of the tank, these both should have read water and air pressure as well. Both were working before and after the test. The gauges were on the same line as was used to force compressed air into the tank. To read these gauges, the worker would have to walk to the end of the tank away from the drain and climb up a shortstepladder. There was no procedure or training for doing the work in this particular manner. How long to pump in the air, what steps were needed to ensure that the pressure was dissipated, what measures were needed to avoid reintroduction of pressure or how safely release the pressure was not specified? The normal hydrostatic test calls for the employee to make sure that the pressure is at zero before opening the tank. In a normal hydrostatic test, the tank pressure would drop to zero very shortly after the tank draining began. Because air was used, tA1 200651024 0521100 20050304 0900 Employee Is Injured When Struck by
Inspection Number:	306798869
Establishment Name:	APACHE STAINLESS EQUIPMENT CORP
(State-Zip):	WI 54467
Fatalities:	0 **Injuries:** 1
Keywords (OSHA):	NECK, FALL, HAND, LEG, DRAIN PIPE, AIR PRESSURE, TANK, STRUCK BY, HEAD

FOUR EMPLOYEES BURNED WHILE SERVICING STEAM UNIT

OSHA Incident Profile

Incident Title:	Four employees burned while servicing steam unit
Incident (Accident) ID:	201858180
Report Date:	10/18/2005
Report ID (OSHA):	452110
Incident Description:	On October 18, 2005, Employees #1 through #4, of Hussung Mechanical Contractors, Inc., and two coworkers were trying to bring a steam unit online. A joint blew out and all six workers sustained burns from the steam. Employees #1 through #4 were hospitalized.
Inspection Number:	309116986
Establishment Name:	HUSSUNG MECHANICAL CONTRACTORS
(State-Zip):	KY 40202
Fatalities:	0 **Injuries:** 4
Keywords (OSHA):	CONSTRUCTION, BURN, STEAM, HIGH TEMPERATURE, HOT WATER, UNSECURED, HIGH PRESSURE, PRESSURE RELEASE, ACCIDENTAL DISCHARGE

EMPLOYEE IS INJURED IN EXPLOSION

	OSHA Incident Profile
Incident Title:	Employee Is Injured In Explosion
Incident (Accident) ID:	201634862
Report Date:	12/02/2004
Report ID (OSHA):	1054112
Incident Description:	On December 2, 2004, Employee #1, a maintenance worker, was installing a pressure regulator on a high pressure compressed gas tank when the regulator exploded. Employee #1 was hospitalized and treated for severe facial injuries. The accident investigation revealed that the cause of the explosion was due to a low pressure regulator was being connected to a high pressure compressed gas cylinder.
Inspection Number:	308247352
Establishment Name:	Micro Systems Engineering Inc
(State-Zip):	OR 97035
Fatalities:	0 **Injuries:** 1
Keywords (OSHA):	explosion, face, regulator valve, high pressure, compressed gas, tank, cylinder, struck by, flying object, untrained

BOILER VESSEL EXPLOSION DURING INSPECTION PROCESS

	OSHA Incident Profile
Incident Title:	Boiler Vessel Explodes During Inspection Process
Incident (Accident) ID:	200980522
Report Date:	11/01/2004
Report ID (OSHA):	0855610
Incident Description:	On November 1, 2004, Employee #1, a systems operator, and Employee #2, a supervisor, working for Viking Explosives and Supply Inc., were present at the job site while Employee #3, a technician working for the O'Connor Co., was performing inspections on a boiler in Gillette, WY. Viking Explosives and Supply Inc. purchased the replacement boiler from the O'Connor Co. On November 29, 2004, the boiler installation was performed by a third party, Powder River Heating and Air Conditioning Inc. During the final installation check up, the third party reported that the boiler would not light off. As part of the purchase contract, the O'Connor Co. sent Employee #3 to perform start-up checks on the boiler. During this process, the boiler exploded. Employee #1 was instantly killed, Employee #2 was seriously injured and Employee #3 was critically injured.
Inspection Number:	307812784, 307812867
Establishment Name:	Viking Explosives & Supply, Inc.; O'Connor Company
(State-Zip):	WY 82718
Fatalities:	1 **Injuries:** 2
Keywords (OSHA):	boiler, explosion, installing, vessel--container, puncture, laceration, concussion

TWO EMPLOYEES ARE KILLED AND ONE INJURED FROM BURNS

	OSHA Incident Profile
Incident Title:	Two Employees Are Killed And One Injured From Burns
Incident (Accident) ID:	201923281
Report Date:	09/02/2004
Report ID (OSHA):	0626700
Incident Description:	On September 2, 2004, three employees were working on a boiler feed-water pump. A failure occurred and the employees were exposed to steam and hot water. Employees #1 and #3 died from serious burns and Employee #1 was hospitalized and treated for his injuries.
Inspection Number:	306482266
Establishment Name:	Bp Products North America, Inc.
(State-Zip):	TX 77590
Fatalities:	2 **Injuries:** 1
Keywords (OSHA):	hot water, steam, burn, equipment failure, boiler, pressure vessel, pump, repair

EXPLOSION CAUSED BY FLASHING LIQUID IN A PROCESS VESSEL

Summary

On August 3, 2004, an explosion occurred at a polyvinyl chloride (PVC) resin manufacturing plant. The explosion originated at an atmospheric storage vessel when it received a slurry discharge from a suspension polymerization reactor. The pressure rise caused by the uncontrolled flashing of superheated liquid vinyl chloride resulted in a complete separation of the roof from the tank shell. The hazard of flashing liquid vinyl chloride was not recognized.

Lessons Learned

Liquid trapped under pressure above its normal boiling point represents an overpressure hazard. To avoid exceeding the design pressure of the receiving vessel, the superheated liquid must by discharged slowly so that the vapor production rate caused by flashing does not exceed the venting rate of the receiving vessel.

Source

http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6TGF-4D10M4V-1&_user=1722207&_rdoc=1&_fmt=&_orig=search&_sort=d&view=c&_acct=C000053990&_version=1&_urlVersion=0&_userid=1722207&md5=5437dfbeee251135afbe81b4adc1cf29

EMPLOYEE IS KILLED WHILE FILLING SCBA CYLINDER

	OSHA Incident Profile
Incident Title:	Employee is killed while filling SCBA cylinder
Incident (Accident) ID:	201352556
Report Date:	07/27/2004
Report ID (OSHA):	419700
Incident Description:	On July 27, 2004, Employee #1, a fill station operator, was filling a diving cylinder (SCUBA tank) with 98-percent oxygen. After picking up the cylinder and connecting the oxygen filling hose to it, she then apparently lost her grip on the cylinder, and dropped it onto the concrete floor. The cylinder ruptured at the neck/thread area, and a piece of the cylinder struck her abdomen and knocked her backwards about 10 ft. Employee #1 sustained numerous lacerations and fractures, and died while being transported to a hospital. The cylinder was manufactured by Luxfer Gas Cylinders, constructed of Aluminum Alloy 6061, and engineered to hold 30 cubic feet of gas at a pressure of up to 3,000 pounds per square inch. The cylinder was labeled "oxygen", had a visual inspection certification sticker, dated June 2004, and had an oxygen preparation certification sticker, dated June 2004. The hydrostatic test date was determined to be September 2002.
Inspection Number:	306752585
Establishment Name:	Cave Excursions, Inc
(State-Zip):	FL 32060
Fatalities:	1 **Injuries:** 0
Keywords (OSHA):	DIVING, CYLINDER, COMPRESSED GAS, FLYING OBJECT, STRUCK BY, SCBA, RUPTURE, FRACTURE, LACERATION, ABDOMEN

TWO EMPOLOYEES ARE BURNED AND KILLED IN BOILER EXPLOSION

OSHA Incident Profile

Incident Title:	Two Employees Are Burned And Killed In Boiler Explosion
Incident (Accident) ID:	200757839
Report Date:	07/11/2004
Report ID (OSHA):	0522500
Incident Description:	On July 11, 2004, Employees #1 and #2 and were assigned work at an electrical power generation company. The assignment may have involved freeing a boiler's frozen slag tap. An ash/slag tank of a coal-fired boiler exploded, shearing the boiler's blow down headers and exposing the employees to live steam. Both employees were burned and killed.
Inspection Number:	307882589
Establishment Name:	Columbus Southern Power Company
(State-Zip):	OH 43811
Fatalities:	2 **Injuries:** 0
Keywords (OSHA):	explosion, burn, steam, boiler

EMPLOYEE IS KILLED WHEN HOT WATERLINE RUPTURED

	OSHA Incident Profile
Incident Title:	Employee is killed when hot waterline ruptured
Incident (Accident) ID:	201923190
Report Date:	06/04/2004
Report ID (OSHA):	626700
Incident Description:	On June 4, 2004, an employee was walking towards the control room when a hot waterline, under approximately 280 psig and 250-300 degrees F, ruptured at an expansion joint. The water blast hit the employee and carried him towards a mechanical building, next to a forklift. Employee was found dead with facial contusions, broken leg and broken arm.
Inspection Number:	306480856
Establishment Name:	Taylor & Hill, Inc.
(State-Zip):	TX 77075
Fatalities:	1 **Injuries:** 0
Keywords (OSHA):	WATER PIPE, RUPTURE, FACE, CONTUSION, FRACTURE, ARM, HEAT, BURN, STRUCK BY, VAPOR

EMPLOYEE IS KILLED BY STEAM RELEASE

	OSHA Incident Profile
Incident Title:	Employee Is Killed By Steam Release
Incident (Accident) ID:	202023453
Report Date:	04/23/2004
Report ID (OSHA):	0316100
Incident Description:	On April 23, 2004, Employee #1, a superintendent, was turning on a 10-in. valve to resupply pressurized steam to a building. The 10-in. drip blew off, exposing him to 250 psi steam at 408 degrees, and killing him.
Inspection Number:	306695974
Establishment Name:	Grunley-Walsh
(State-Zip):	DC 20006
Fatalities:	1 **Injuries:** 0
Keywords (OSHA):	steam, pressure release, high pressure, high temperature, burn, valve

FOUR EMPLOYEES ARE BURNED WITH STEAM, ONE LATER DIES

OSHA Incident Profile

Incident Title:	Four Employees Are Burned With Steam, One Dies Later
Incident (Accident) ID:	200840999
Report Date:	04/17/2004
Report ID (OSHA):	0524530
Incident Description:	On April 25 2004, Employees #1, #2, #3 and #4 were working in the powerhouse structure to replace a section of a 14-in.water line. One of the steam fitters, a 12 inch header steam line, ruptured at the boiler house. It was believed that the line was less than 200 psi pressure at 500 degrees F. All four employees were severely burned replacing water line in close range of the rupture. The coordinator also received burn injuries. Employee #1 died from the burns. Employees #2 and #3 were hospitalized and treated for burns, while Employee #4 was treated and released.
Inspection Number:	303819833, 303819841
Establishment Name:	United States Steel Corporation Granite City Works; Icon Mechanical, Llc
(State-Zip):	IL 62040
Fatalities:	1 **Injuries:** 3
Keywords (OSHA):	burn, water, steam line, boiler, rupture

EMPLOYEE IS INJURED IN FLASH FIRE

	OSHA Incident Profile
Incident Title:	Employee is injured in flash fire
Incident (Accident) ID:	201144979
Report Date:	04/04/2004
Report ID (OSHA):	950631
Incident Description:	At approximately 9:00 p.m. on April 4, 2004, Employee #1 was operating a steam locomotive at the Disneyland resort. As the train approached block light Number 8, the engine lost fire to the boiler. The employee went through relighting procedures and then placed a burning wick into the fire box and opened the fuel line. Due to the position of the wick, more fuel vapor than normal entered the box before the fire lit. This caused a flash fire that came out of the firebox door and struck the employee. He suffered second-degree heat burns through his clothing on both knees and first- and second-degree flash burns on his wrist and face. He was hospitalized for 2 days with his injuries.
Inspection Number:	305353740
Establishment Name:	Disneyland Resort
(State-Zip):	CA 92802
Fatalities:	0 **Injuries:** 1
Keywords (OSHA):	FIRE, BURN, AMUSE PARK/CARNIVAL, LOCOMOTIVE, KNEE, WRIST, FACE, EQUIPMENT OPERATOR, FLAMMABLE VAPORS

EMPLOYEE INJURED WHEN OXYGEN CYLINDER PROPELLED INTO FACE

OSHA Incident Profile

Incident Title:	Employee Injured When Oxygen Cylinder Propelled Into Face
Incident (Accident) ID:	201104825
Report Date:	03/18/2004
Report ID (OSHA):	950624
Incident Description:	On March 18, 2004, Employee #1, working as a nursing supervisor, was about to transport a patient who was on oxygen from her room to the Intensive Care Unit. The supervisor removed the oxygen cylinder from the cart and placed it on the patient's bed for easier transport. The cylinder fell from the bed and struck the floor. When it hit the floor, the valve was broken and the cylinder struck the wall, the window frame and the supervisor in the face. Employee #1 was sent to the emergency room for treatment and was released within 24 hours. She sustained a broken nose, broken teeth, and a concussion.
Inspection Number:	300817046
Establishment Name:	MERCY MEDICAL CENTER
(State-Zip):	CA 95340
Fatalities:	0 **Injuries:** 1
Keywords (OSHA):	WORK RULES, OXYGEN, CYLINDER, FACE, CONCUSSION, NOSE, MOUTH, STRUCK BY, HEALTH CARE WORKER, FLYING OBJECT

THREE EMPLOYEES BURN BODIES BY STEAM LEAK

	OSHA Incident Profile
Incident Title:	Three Employees Burn Bodies By Steam Leak
Incident (Accident) ID:	201751229
Report Date:	02/23/2004
Report ID (OSHA):	0830600
Incident Description:	On February 23, 2004, Employees #1, #2, and #3 were responding to a report of a steam leak. A steam line carrying a 50-psi superheated steam ruptured at an expansion joint, resulting in a rapid release of energy. Employees #1, #2, and #3 sustained burns to their bodies and were hospitalized.
Inspection Number:	306229329
Establishment Name:	Coors Brewing Company
(State-Zip):	CO 80401
Fatalities:	0 **Injuries:** 3
Keywords (OSHA):	burn, leak, steam, rupture, heat

ONE EMPLOYEE DIES, OTHER EXPOSED TO HEAT STRESS IN VESSEL

OSHA Incident Profile

Incident Title:	One employee died, other exposed to heat stress in vessel
Incident (Accident) ID:	200211423
Report Date:	02/03/2004
Report ID (OSHA):	626000
Incident Description:	On February 3, 2004, Employees #1 and #2 were working inside a refinery's reactor vessel that was cleared previously by the site employer for a planned turnaround. Employee #1 and #2 were part of a specialist contractor, assigned to remove spent catalyst from the vessel's beds. Outdoor conditions were cold, between 55 and 65 degrees Fahrenheit, with mild humidity. Employee #1 and #2 were dressed in multiple clothing layers, including a Tyvek suit for winter conditions. The temperature inside the vessel was over 100 degrees Fahrenheit. The ventilation of the space was lacking. Employee #1 was unable to maneuver the cable ladder to rescue himself from the lengthy vertical ascent, once he became affected by the heat stress. Employee #2, who was not working so long in this confined space, sustained heat stress symptoms but was able to exit. Rescue time for Employee #1 was extended, and he showed no signs of life when he was removed from the processed vessel.
Inspection Number:	307225656
Establishment Name:	Cat-Spec Ltd
(State-Zip):	TX 78407
Fatalities:	1 **Injuries:** 1
Keywords (OSHA):	REFINERY, REACTOR, CLOTHING, HEAT EXHAUSTION, HEAT, CONFINED SPACE, LADDER

OVER-PRESSURIZATION OF GLASS CARBOY

Summary

On January 29, 2004, a near-miss occurred during a nitrogen gas stream experiment in Laboratory 158 of the 331 Building, when over-pressurization caused a 45-liter pyrex glass carboy to burst. No personnel were in the laboratory at the time of the even and there were no personnel injuries. Work involving carboys coupled to gas lines was stopped.

Lessons Learned

It is essential that qualified person be involved in the design of pressure relief or venting systems on closed containers.

Source

Pacific Northwest National Laboratory. Occurrence Report Number: SC-RL--PNNL-PNNLBOPER-2004-0002.

EMPLOYEE DIES WHEN STRUCK BY 150-POUND SECTION

Incident Tracking	*OSHA Incident Profile*
Incident Title:	Employee Dies When Struck By 150-Pound Section
Incident (Accident) ID:	202344271
Report Date:	01/29/2004
Report ID (OSHA):	0420600
Incident Description:	At approximately 8:00 p.m. on January 29, 2004, Employee #1, a 49-year-old worker, and a coworker were attempting to open a suction valve for a boiler circulating water system pump to bring the pump back on-line after it had been out of commission during repairs. For some reason, a 150-pound section of the motor operated valve actuator housing blew off, striking Employee #1 in the head and upper torso. Emergency services were contacted and Employee #1 was transported to Tampa General Hospital, where he died the following day due to injuries sustained.
Inspection Number:	307293456
Establishment Name:	Progress Energy, Inc.
(State-Zip):	FL 34428
Fatalities:	1 **Injuries:** 0
Keywords (OSHA):	struck by, head, torso, repair, fracture, flying object, boiler, pressure vessel

EMPLOYEE'S LEGS BURNED FROM GAS CYLINDER ACCIDENT

OSHA Incident Profile

Incident Title:	Employee's legs burned from gas cylinder accident
Incident (Accident) ID:	201145042
Report Date:	01/13/2004
Report ID (OSHA):	950631
Incident Description:	On January 13, 2004, an employee received his daily instructions from his Forman for the installation of copper water pipes for the new two story residence being constructed. The employee then proceeded to the Lot three and began installing the water line. He was standing on the third rung of a 6-foot A Frame step ladder in an open garage below a second story room. He was using a torch attached to a small 16 ounce Methylacetylene Propadiene (MAPP) gas aluminum cylinder from SURE FIRE to solder the joints of two pipes. He finished a section of the pipes and placed the torch cylinder on a horizontal wood beam on top of a doorframe. The torch rolled off the beam and fell on the cement garage floor. The cylinder neck cracked approximately 0.5 in. The MAPP gas escaping from the cylinder ignited, and the flame engulfed the employee's lower legs. He jumped off the ladder and ran out the garage door. The employee sustained third degree burns to both legs from below the knees. He was hospitalized and underwent two skin graft operations.
Inspection Number:	125950394
Establishment Name:	Horizon Plumbing Inc
(State-Zip):	CA 92668
Fatalities:	0 **Injuries:** 1
Keywords (OSHA):	BURN, CYLINDER, TORCH, SKIN, LEG, LADDER, FIRE, GAS, GAS LEAK

EMPLOYEE INJURED AFTER PRESSURE VESSEL EXPLODED

	OSHA Incident Profile
Incident Title:	Employee injured after pressure vessel exploded
Incident (Accident) ID:	201035383
Report Date:	11/13/2003
Report ID (OSHA):	950635
Incident Description:	At approximately 5:15 a.m. on November 13, 2003, Employee #1 submerged the spherical unit, MOT part Number 2341591-1, at Station 4 of Work Cell 5 in a water tank designed to protect against explosion to check for air leaks. He then pressurized the unit with nitrogen to 244 psi. Shortly after that a coworker heard the motor of the tank's lift arm as Employee #1 raised the unit above the water, upon which the clarifier exploded, with part of the debris striking Employee #1 on the left side of the head. He suffered a severe left side head injury from an exploding ozone clarifier, a 20-inch-long football- shaped inconel part placed partway along a pilot's air supply line to remove ozone, during a pressurized test. Employee #1 was taken to UCLA Harbor General Hospital in extremely critical condition on life support.
Inspection Number:	305474629
Establishment Name:	Honeywell International
(State-Zip):	CA 90504
Fatalities:	0 **Injuries:** 1
Keywords (OSHA):	EXPLOSION, STRUCK BY, FLYING OBJECT, HEAD, NITROGEN

FLASH FIRE BURNS EMPLOYEE

Incident Tracking	*OSHA Incident Profile*
Incident Title:	Flash Fire Burns Employee
Incident (Accident) ID:	201084852
Report Date:	11/06/2003
Report ID (OSHA):	950625
Incident Description:	At approximately 10:00 a.m. on November 6, 2003, Employee #1 was cleaning the threads of an oxygen compressed gas cylinder with a wire brush on an electric drill. As Employee #1 cleaned the threads, a flash fire occurred and he sustained burns to his arms and flash burns to his face. Employee #1 was hospitalized.
Inspection Number:	306356494
Establishment Name:	Jorgensen Company
(State-Zip):	CA 93706
Fatalities:	0 **Injuries:** 1
Keywords (OSHA):	BURN, FIRE, COMPRESSED GAS, CYLINDER, CLEANING, OXYGEN, ELECTRIC DRILL, ARM, FACE

EMPLOYEE BURNS LEG WHILE REPAIRING STEAM PIPE

	OSHA Incident Profile
Incident Title:	Employee Burns Leg While Repairing Steam Pipe
Incident (Accident) ID:	200372936
Report Date:	10/22/2003
Report ID (OSHA):	0454510
Incident Description:	Employee #1 was setting up to repair a leaking steam pipe. The pipe had not been blocked and bled and the valves were not locked out. A coworker turned on the valve and steam sprayed onto the leg and foot of Employee #1. He received first, second, and a small area of third degree burns and was hospitalized.
Inspection Number:	306838517
Establishment Name:	Kiswire, Inc.
(State-Zip):	SC 29108
Fatalities:	0 **Injuries:** 1
Keywords (OSHA):	steam, repair, pipe, lockout, struck by, burn, leg, foot, work rules

RUPTURE OF GLASS FLASK

Summary
On September 16, 2003, a mercury generator glass flask ruptured resulting in a research technician receiving a very slight cut on his hand. The incident occurred during startup activities of a modified experimental system designed to study removal of elemental and oxidized forms of mercury from simulated off gas using sorbents or gas scrubbing. Oil, mercury and glass were scattered in the hood and some exited the hood.

Lessons Learned
Management and individual workers are responsible for integrating environmental, safety, health and quality assurance measures in their work. The researchers involved in this event were in the best position to review their design, detect and mitigate any hazard source.

Source
Idaho National Laboratory. Occurrence Report Number: EM-ID--BBWI-INLLABS-2003-0004

EMPLOYEE IS BURNED BY AMMONIA

	OSHA Incident Profile
Incident Title:	Employee Is Burned By Ammonia
Incident (Accident) ID:	201486065
Report Date:	08/04/2003
Report ID (OSHA):	0950627
Incident Description:	On August 4, 2003, an employee was performing maintenance on an ammonia service valve. The valve had been isolated and the pipeline drained. A small amount of residual ammonia left in the pipeline splashed on the employee when he worked the valve. He suffered burns to his face but was not hospitalized.
Inspection Number:	125779629
Establishment Name:	California Controlled Atmosphere
(State-Zip):	CA 93230
Fatalities:	0 **Injuries:** 1
Keywords (OSHA):	burn, ammonia, face, pipeline, valve

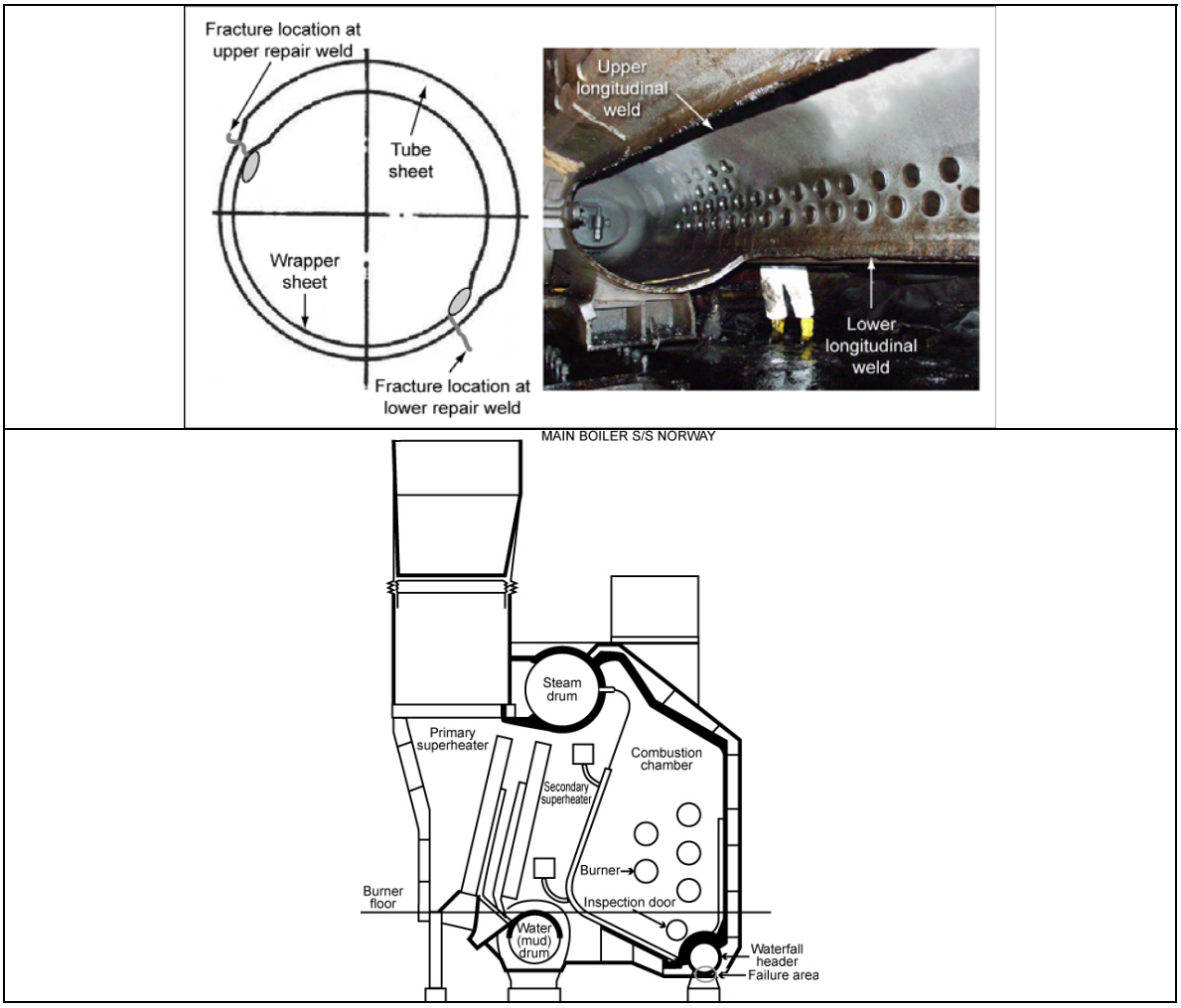
EMPLOYEE IS BURNED WHEN HOT WATER PIPE RUPTURES

	OSHA Incident Profile
Incident Title:	Employee Is Burned When Hot Water Pipe Ruptures
Incident (Accident) ID:	201096708
Report Date:	07/24/2003
Report ID (OSHA):	0950645
Incident Description:	At approximately 5:00 p.m. on July 24, 2003, Employee #1 was repairing a 2-inch-diameter copper pipe coming out of a 10,000-gallon hot water tank. The pressure in the tank was approximately 120 to 140 psi and the temperature of the water was approximately 185 degrees Fahrenheit. The employee released the pressure and turned off the boiler. He used a scissor lift to access the 12-foot-high area where he removed the leaky pipe section. He repaired the pipe in the shop and returned to the boiler and soldered the pipe section into place. He turned on the boiler and later noticed another leak. He used the scissor lift to check the leak and saw the pipe was leaking at the new solder joints. As he was coming down on the scissor lift, the joint ruptured and hot water sprayed the left side of his body. He jumped approximately 10 feet off the scissor to the ground. He was hospitalized with burns.
Inspection Number:	126110667
Establishment Name:	Edna Valley Vineyard
(State-Zip):	CA 93401
Fatalities:	0 **Injuries:** 1
Keywords (OSHA):	rupture, boiler, water pipe, plumbing, hot water, burn, struck by, leak

EMPLOYEE BURNED BY HOT WATER RELEASED FROM PIPES

Incident Tracking	*OSHA Incident Profile*
Incident Title:	Employee burned by hot water released from pipes
Incident (Accident) ID:	201104155
Report Date:	07/09/2003
Report ID (OSHA):	950624
Incident Description:	On July 9, 2003, a foreman was conducting a walk around looking for problems. The foreman noticed water coming from a hot water pipe in the area of a Tri-Clover clamp. Using a crescent wrench, the foreman was about to tighten the clamp when it failed. The clamp released the two pipes, allowing 180-degree water to splash onto the foreman who sustained second and third degree burns to the right side.
Inspection Number:	300816618
Establishment Name:	California Dairy Inc
(State-Zip):	CA 95380
Fatalities:	0 **Injuries:** 1
Keywords (OSHA):	BURN, WATER PIPE, HOT WATER

EIGHT DIE IN BOILER EXPLOSION ON A CRUISESHIP



Summary

On May 25, 2003 the ship S/S Norway suffered a boiler rupture in the aft (rear) of the ship. The accident resulted in eight deaths and 17 injuries. The investigation of the accident revealed that the engineers in charge were not following the proper shutdown procedure. Apparently the proper shutdown process for a boiler of this type requires about 3 hours in order to avoid excess stress on the metal. The boiler in question was repeatedly shut down in as little as 1 to 2 hours causing the metal to become brittle. To make matters worse inspection of the boiler revealed problems before hand and was ignored.

Lessons Learned

- Always follow procedures for deactivation of equipment.
- Indication of problems in equipment is never to be ignored.

Source

http://www.ntsb.gov/publictn/2007/mab0703.pdf

EMPLOYEE INJURED WHEN CYLINDER FILLED WITH HELIUM EXPLODED

OSHA Incident Profile

Incident Title:	Employee Inured When Cylinder Filled With Helium Exploded
Incident (Accident) ID:	201796901
Report Date:	05/23/2003
Report ID (OSHA):	950644
Incident Description:	At approximately 3:00 p.m. on May 23, 2003, a customer brought in a compressed gas cylinder to be filled approximately 30 minutes prior to the incident. Witness #3, the manager, put the cylinder to one side and instructed Employee #1, a part-time employee, to fill the cylinder. Witness #3 said when he returned from a delivery about 30 minutes later Employee #1 had connected the cylinder to a hose manifold and was filling the cylinder with helium. When the gauge pressure on the manifold read between 1,100 and 1,300 psi, the cylinder exploded, seriously injuring Employee #1. He said the label and markings on the dropped off cylinder were unreadable and the entire cylinder was paintedblack. Witnesses #2, who was not an employee, and #3 confirmed that the cylinder had been painted black and the marking were unreadable. Later a representative from a compressed gas supplier determined that the cylinder that exploded was a low pressure acetylene cylinder. Employee #1 was transported to St Francis Medical Center in Lynwood, California, where he remained at least five days with a compound fracture of his lower left leg and tendon damage to his left forearm.
Inspection Number:	126091388
Establishment Name:	Vanny'S Party Supply
(State-Zip):	CA 90241
Fatalities:	0 **Injuries:** 1
Keywords (OSHA):	EXPLOSION, FRACTURE, LEG, CYLINDER, COMPRESSED GAS

EMPLOYEE BURNED IN STEAM LINE VALVE EXPLOSION

	OSHA Incident Profile
Incident Title:	Employee Burned In Steam Line Valve Explosion
Incident (Accident) ID:	201103819
Report Date:	05/16/2003
Report ID (OSHA):	0950624
Incident Description:	At approximately 1:30 p.m. on May 16, 2003, Employee #1, a contractor, was removing the lockout on a 1968 10-inch cast-iron Stockham FG-G634 valve on one of the main steam lines feeding the cook area of a Del Monte Foods Plant in Modesto, CA. The steam piping for the cook area comes directly from the boiler which is set at approximately 150 psi at 364 degrees Fahrenheit. The main steam line piping and this valve were located between 20 and 30 ft above the floor. Employee #1 was using a 4-ft shock- absorbing lanyard and harness, and was tied off to the valve handle. After removing the lock and turning the valve open approximately three turns, the valve began to shake and then exploded. The explosion initial threw Employee #1 back, but he began swinging in his harness directly into the steam emitting from the main steam line. He was able to get himself out of the harness and fell to the ground. Employee #1 was assisted by Del Monte employees, who brought him to their on-site first-aid center. Emergency responders transported Employee #1 to Modesto Memorial Hospital. He was then transported by helicopter to the UC Davis Burn Center for treatment of second- and third-degree burns to over 60 percent of his body.
Inspection Number:	300816303
Establishment Name:	Del Monte Corporation Dba Del Monte Foods
(State-Zip):	CA 95355
Fatalities:	0 **Injuries:** 1
Keywords (OSHA):	steam, steam line, high pressure, high pressure pipe, pressure piping, pressure release, valve, fall protection, burn, lanyard

GLASS AMPOULES RUPTURE INSIDE FUME HOOD

Summary

On May 13, 2003, sealed glass ampoules, in a rocking furnace in laboratory 105 of the Applied Process Engineering Laboratory (APEL), lost containment and discharged their contents and pieces of glassware into a laboratory hood and on the floor near the hood. The glass ampoules contained mixtures of arsenic, selenium, sulfur, and silver and were at a temperature of approximately 800 to 900ºC. No one was hurt and there was insignificant property damage. No radioactive materials were involved.

Lessons Learned

- Minor changes in operating conditions or feed materials of standard processes/equipment/batch size can introduce new hazards that must be carefully evaluated and mitigated.
- The importance of the ability of research staff to self-identify and appropriately mitigate new hazards.
- The importance of following good laboratory practice such as keeping hood sashes lowered and use of GFCI circuits whenever possible.

Source

Pacific Northwest National Laboratory. Occurrence Report Number: SC-RL--PNNL-PNNLBOPER-2003-0008

EMPLOYEE DIES FROM CHEMICAL BURNS

OSHA Incident Profile

Incident Title:	Employee dies from chemical burns
Incident (Accident) ID:	200526705
Report Date:	04/15/2003
Report ID (OSHA):	751910
Incident Description:	On April 30, 2003, Employee #1 and a coworker filled an anhydrous ammonia nurse tank to be transported to farm fields. After filling the nurse tank, Employee #1 was hooking the tank to a pickup truck for transport when the tank ruptured along a weld seam on the bottom front side. Liquid ammonia was released through the approximate 40-in. split. The ammonia formed a cloud and a rapidly expanding, boiling-liquid blast enveloped Employee #1. The coworker assisted Employee #1 to and into a water tank. The Employee #1 died 1.5 weeks later from chemical burns.
Inspection Number:	305716649
Establishment Name:	River Valley Cooperative
(State-Zip):	IA 52729
Fatalities:	1 **Injuries:** 0
Keywords (OSHA):	AGRICULTURE, TANK, ANHYDROUS AMMONIA, AMMONIA, TRAILER HITCH, RUPTURE, CHEMICAL, CHEMICAL BURN, CHEMICAL VAPOR, BURN

EMPLOYEE KILLED WHEN STRUCK BY LID OF PRESSURIZED TANK

	OSHA Incident Profile
Incident Title:	Employee Killed When Struck By Lid of Pressurized Tank
Incident (Accident) ID:	201370756
Report Date:	03/28/2003
Report ID (OSHA):	317700
Incident Description:	On March 28, 2003, Employee #1 was assigned to refurbish a tank to get it ready to be re-installed into the transmitter room for installation in the radar unit. The SF-6 tanks were delivered to TOAD in wooden crates. When ready for refurbishing, the crate was opened and the unit was hoisted onto a shop cart. Employee #1 was killed when the lid on the SF-6 tank struck him when the tank became pressurized.
Inspection Number:	305250631
Establishment Name:	Tobyhanna Army Depot
(State-Zip):	PA 18466
Fatalities:	1 **Injuries:** 0
Keywords (OSHA):	STRUCK BY, PRESSURE VESSEL

EMPLOYEE IS KILLED WHEN STRUCK BY COVER PLATE

OSHA Incident Profile

Incident Title:	Employee Is Killed When Struck by Cover Plate
Incident (Accident) ID:	202064192
Report Date:	03/25/2003
Report ID (OSHA):	420100
Incident Description:	On March 25, 2003, two employees working for the Tennessee Valley Authority (TVA) were instructed to remove a cover plate from an electrical generator at the TVA Paradise power generation plant in Drakesboro, Kentucky. The hydrogen gas had been purged from the generator and replaced with air pressurized at approximately 40 psi. The generator was pressurized with air so that the workers could perform a leak test on the system. The cover plate was 11.5 inches thick and 19 inches in diameter. It was secured to the generator by 24 bolts, which were 21.5 inches long by 0.625 inches in diameter. The two employees were informed that the cover plate needed to be removed so that balancing weight could be removed from the shaft. It would be used as a guide to manufacture additional weights. The employees removed all 24 bolts while the system was under pressure. When the cover plate would not come loose, the employees got a pry bar and chisel to free it. They also reinstalled four of the bolts to prevent the heavy plate from falling on their feet. One of the employees used a hammer and chisel to break the cover plate loose. When the plate was loosened, the air pressure stripped the bolts from their anchor points. The plate struck one of the employees, hurling him into the air. He came to rest on a concrete floor several feet away. The employee had been killed.
Inspection Number:	106959216
Establishment Name:	Tennessee Valley Authority
(State-Zip):	KY 42337
Fatalities:	1 **Injuries:** 1
Keywords (OSHA):	ELECTRICAL, ELECTRICAL WORK, ELECTRIC GENERATOR, AIR PRESSURE, STRUCK BY, FLYING OBJECT, FRACTURE, E GI IV, E PTD, E GI III

EMPLOYEES INJURED WHEN STRUCK BY PRESSURIZED STEAM

	OSHA Incident Profile
Incident Title:	Employees Injured When Struck By Pressurized Steam
Incident (Accident) ID:	201406808
Report Date:	03/03/2003
Report ID (OSHA):	0552651
Incident Description:	Two pipe fitters were installing a valve on a live steam, water and airline that was still pressurized when the machines cycled. The employees were struck in the face and upper body with pressurized steam resulting in severe burns. One employee was hospitalized and the other was treated but not hospitalized. The original narrative did not specify which employee was hospitalized.
Inspection Number:	304900103
Establishment Name:	Profab Co Inc
(State-Zip):	MI 49201
Fatalities:	0 **Injuries:** 2
Keywords (OSHA):	burn, heat, steam, pressure piping, pressure release, face, torso

GLASS FLASK RUPTURES DUE TO FAILED PRESSURE REGULATOR GAUGE

Summary

On 02/24/2003 in CPP-749 facility of Idaho National Laboratory, a bubble leak test was being done on a portable sample station. The sample station was attached to a nitrogen bottle with an outlet regulator. The rubber stopper on top of the glass flask came out, when nitrogen flow was initiated and a system pressure of 12 psi as indicated on the regulator gage was obtained. Nylon zip ties were used to keep the rubber stopper in place but did not hold. Personnel reconvened at the facility on 20/25/2003 and decided to use a hose clamp to hold the rubber stopper in place. Nitrogen was used to pressurize the system to 12 psi using the nitrogen regulator gauge. Personnel heard a “whistle” coming from the outlet of the HEPA filter but continued the test. The glass flask shattered shortly after passing the bubble leak test causing shards from the flask to scatter over roughly a 10-foot radius. Personnel located inside the shatter area were not injured. A defect in the PI gauge was the cause of the flask to shatter because it didn’t give an accurate reading.

Lessons Learned

- This event demonstrates that changes to processes/equipment can introduce new hazards that must be carefully evaluated and mitigated. It also demonstrates that importance that personnel must follow approved procedures and process to appropriately mitigate the hazards.
- It is important to ensure rigors reviews to systems and components are properly evaluated to ensure the design and configuration of the systems is appropriate for continued and safe operation.

Source

Idaho National Laboratory. Occurrence Report Number: EM-ID--BBWI-FUELRCSTR-2003-0003

EMPLOYEE SUSTAINS BURNS WHEN STEAM RELEASES

OSHA Incident Profile

Incident Title:	Employee Sustains Burns When Steam Releases
Incident (Accident) ID:	201143187
Report Date:	02/18/2003
Report ID (OSHA):	0950637
Incident Description:	At approximately 2:00 p.m. on February 18, 2003, Employee #1 and a coworker were starting up the steam system to the 1391 Exchanger in the Steam Naphtha Reformer (SNR) Unit at the Chevron Refinery in El Segundo, California. While Employee #1 and the coworker were attempting to open a 10-in. rising stem gate valve isolating steam Number 150 from the 5 H2S Unit to the SNR Unit, the steam burst from the bonnet gasket of the valve, striking Employee #1 in the lower legs. Employee #1 sustained first to fourth degree burns to the full length of his left lower leg and first to third degree burns on a 5-in. by 5-in. section of his right shin. Employee #1 was initially treated at RFK Hospital and released the same day. The following day, Employee #1 was admitted to the Burn Ward of the Grossmont Hospital and received skin grafts.
Inspection Number:	120222963
Establishment Name:	Chevron Products
(State-Zip):	CA 90245
Fatalities:	0 **Injuries:** 1
Keywords (OSHA):	steam, steam line, valve, buried, leg, gasket

EMPLOYEE DIED DUE TO EXPLOSION DURING PESSURE TEST

Incident Tracking	*OSHA Incident Profile*
Incident Title:	Employee died due to explosion during pressure test
Incident (Accident) ID:	200811487
Report Date:	01/08/2003
Report ID (OSHA):	627400
Incident Description:	On January 8, 2003, Employee #1 was working in close proximity (about 10 feet) to a pipe undergoing a pressure test. The pipe was filled with nitrogen and measured approximately 25 feet in length and had a diameter of 12 inches. During the pressure test, the pipe reached a pressure of 1550 psi. For some reason, the pipe exploded. Employee #1 was hospitalized and pronounced dead due to injuries sustained in the explosion.
Inspection Number:	304121049
Establishment Name:	Schlumberger Oilfield Services
(State-Zip):	TX 79730
Fatalities:	1 **Injuries:** 0
Keywords (OSHA):	PIPE, PRESSURE PIPING, TEST EQUIPMENT, EXPLOSION

RUPTURE OF LABORATORY GAS DRYING UNITS

Summary

On December 19, 2002, a researcher was preparing an experiment in Lab A-10 of the INEEL Research Center (IRC) using compressed air. The researcher attached a regulator that he believed would fit the application. He thought the regulator was a two-stage regulator with a 0-300 psig delivery pressure gauge. The outlet pressure gauge was actually a 0-300 bar (0-4000 psi). The researcher then connected the regulator to an instrument system that included a set of laboratory gas drying units with a maximum working pressure of 90 psig. He opened the compressed air cylinder valve and noted the inlet pressure gauge on the regulator did not register a pressure and closed the gas cylinder valve. He stated the problem to his co-workers. They walked over to the compressed air cylinder and drying units to view the problem. The researcher opened the cylinder valve and observed both gauges suddenly indicate pressure. A moment later the drying units ruptured. Debris scattered throughout the lab. **All the workers were injured**.

Lessons Learned

- The company policies and procedures are the backbone of a safe and effective compressed gas system program. These policies and procedures must implement NFPA 45 (*Standard on Fire Protection for Laboratories Using Chemicals*) and 29 CFR 1910.101 (*Compressed Gases*) to ensure safety when assembling and using compressed gas systems.
- Compressed gas training should reflect compressed gas safety program required by the national standards.
- Inspection programs should include topics such as assembly suitability of the components in the systems and modification of components.

Source

Idaho National Laboratory. Occurrence Report Number: EM-ID--BBWI-INLLABS-2002-0005

EMPLOYEE BURNED IN CYLINDER EXPLOSION

OSHA Incident Profile

Incident Title:	Employee Burned in Cylinder Explosion
Incident (Accident) ID:	201115219
Report Date:	11/20/2002
Report ID (OSHA):	950643
Incident Description:	At approximately 2:00 p.m. on November 20, 2002, Employee #1 of Titeq was filling oxygen cylinders to 3,000 psi in a filling chamber. The filling chamber exploded resulting in Employee #1 sustaining multiple second and third degree burns to his body, face, and hands. He also sustained punctured ear drums. Employee #1 was transported to Antelope Valley Hospital and then transferred to Sherman Oaks Burn Center where he was hospitalized for approximately 12 days.
Inspection Number:	120311014
Establishment Name:	Titeq
(State-Zip):	CA 93550
Fatalities:	0 **Injuries:** 1
Keywords (OSHA):	OXYGEN, CYLINDER, EXPLOSION, BURN, FACE, HAND, EAR, PUNCTURE

EMPLOYEE BURNED WHEN WATER HEATER EXPLODES

	OSHA Incident Profile
Incident Title:	Employee burned when water heater explodes
Incident (Accident) ID:	201096146
Report Date:	10/18/2002
Report ID (OSHA):	950645
Incident Description:	At approximately 4:45 p.m. on October 18, 2002, Employee #1 was trying to light a water heater when it exploded. It was estimated that the pilot light had gone out six times in the last three and half weeks. A coworker in the front of the store heard Employee #1 scream and found her covering her face. The water heater had exploded and Employee #1 was hospitalized with second degree burns on her face and arms.
Inspection Number:	300813979
Establishment Name:	Bagel Cafe
(State-Zip):	CA 93401
Fatalities:	0 **Injuries:** 1
Keywords (OSHA):	BURN, EXPLOSION, FACE, ARM, PILOT LIGHT, WATER HEATER, GAS, FLAMMABLE VAPORS

EMPLOYEE KILLED WHEN STEAM LINE RUPTURED

	OSHA Incident Profile
Incident Title:	Employee Killed When Steam Line Ruptured
Incident (Accident) ID:	170390587
Report Date:	10/10/2002
Report ID (OSHA):	0551800
Incident Description:	On October 10, 2002, Employee #1 entered into a confined space, a manhole, without initiating any lockout or tag out procedures, and attempted to repair a high pressure, high temperature, steam trap line. Employee #1 apparently had tried to remove the trap and was moving within the manhole and apparently struck an internally deteriorated blow down line, causing it to separate from the steam line and releasing 700 to 800 degree Fahrenheit, 250 p.s.i. steam into the confined space. This resulted in blowing Employee #1 out of the manhole, and his receiving third degree full thickness burns over 95 percent of his body. Employee #1 died approximately 10 hours later at the hospital.
Inspection Number:	305206252
Establishment Name:	Citizens Thermal Energy
(State-Zip):	IN 46204
Fatalities:	1 **Injuries:** 0
Keywords (OSHA):	steam, burn, manhole, steam line, confined space, lockout

HYDROSTATIC TEST OF NEW VERTICAL VESSEL

Summary
An incident occurred in October of 2002.The cause of the incident is still unknown however the use of “cold water” for hydro-testing could have been a factor. No injuries occured.

Lessons Learned
Water temperature is important while testing.

Source
http://tefkuwait.com/HazardsofPressureTesting.pdf

FILLING OF A VERTICAL TANK

Summary

In October 2002, the top of the tank was blown off because the relief valve could not displace the air fast enough for the volume of water that was being pumped in (the filling of the tank was made from a fire hydrant).

Lessons Learned

Check specs on relief valve to make sure that it can displace the right amount of air for the water that is being pumped in.

Source

http://tefkuwait.com/HazardsofPressureTesting.pdf

EMPTYING OF A VERTICAL TANK

Summary
In October 2002, the vent was a trapped plastic sheet intended to protect the roof, this caused a vacuum. This incident occurred while the tank was being emptied and this type of incident isn't unusual.

Lessons Learned
It is important to inspect the venting system before filling and emptying operations.

Source
http://tefkuwait.com/HazardsofPressureTesting.pdf

FATAL SPHERICAL TANK COLLAPSE

Summary
During the filling of a 2000m^3 LPG sphere in October 2002, its legs collapsed. The tank was 80% full, killing one and seriously injuring another. The main cause for collapse was the severe corrosion of the legs under the concrete fire protection. The corrosion originated from water ingress between the steel legs and concrete. The poor design of the water caps over the fire-proofing concrete, vertical cracks, poor repairs, and salt water testing were contributing factors to the cause of the collapse. **One person was killed and one seriously injured.**

Lessons Learned
It is important to inspect vessels, nozzles, appurtenances, and supporting structures visually and with NDT because testing an old vessel.

Source
http://tefkuwait.com/HazardsofPressureTesting.pdf

TWO EMPLOYEES ARE KILLED AND ONE IS INJURED IN BOILER EXPLOSION

	OSHA Incident Profile
Incident Title:	Two Employees Are Killed And One Injured In Boiler Explosion
Incident (Accident) ID:	200901155
Report Date:	08/17/2002
Report ID (OSHA):	0418400
Incident Description:	On August 17, 2002, Employees #1 and #2 were attempting to relight the Number 2 recovery boiler. They were standing at the fuel oil gun ports on the first floor when the boiler exploded, spraying out steam and condensate, hot black liquor, smelt, and boiler parts over the surrounding area. Employees #1 and #2 suffered severe scalding and chemical burns and were killed. Employee #3, who was working in the basement approximately 50 feet west of the boiler, also suffered severe scalding and chemical burns, for which he was hospitalized.
Inspection Number:	303772065
Establishment Name:	Durango - Georgia Paper Company
(State-Zip):	GA 31558
Fatalities:	2 **Injuries:** 1
Keywords (OSHA):	boiler, explosion, burn, paper, mill--plant, chemical burn, flying object, process safety, pressure vessel, ppe

EMPLOYEE IS INJURED DURING HYDROSTATIC TEST EXPLOSION

OSHA Incident Profile

Incident Title:	Employee Is Injured During Hydrostatic Test Explosion
Incident (Accident) ID:	202044798
Report Date:	08/01/2002
Report ID (OSHA):	155010
Incident Description:	Employee #1 was monitoring a hydrostatic pressure test to a pressure vessel. When the pressure reached 4,700 pounds per square inch, the test failed and the employee was struck by high pressure water and debris that discharged from the detonation. He suffered massive trauma to his face and head and was hospitalized. He also suffered permanent loss of eye sight.
Inspection Number:	305530677
Establishment Name:	Hayward Tyler Inc.
(State-Zip):	VT 05446
Fatalities:	0 **Injuries:** 1
Keywords (OSHA):	PRESSURE VESSEL, EXPLOSION, STRUCK BY, FLYING OBJECT, FACE, HEAD, LACERATION, PRESSURE RELEASE, WATER, EQUIPMENT FAILURE

EMPLOYEE IS BURNED IN BOILER EXPLOSION, LATER DIES

	OSHA Incident Profile
Incident Title:	Employee Is Burned In Boiler Explosion, Later Dies
Incident (Accident) ID:	200920825
Report Date:	07/24/2002
Report ID (OSHA):	0355118
Incident Description:	On July 24, 2002, Employee #1 was trying to start the #2 boiler when a coworker put a jumper on an atomizer in an attempt to energize the circuit. The main fuel switch was controlled by this circuit. When it energized, fuel was fed into the boiler. The fuel ignited and the boiler exploded. Employee #1 sustained burns over 80 percent of his body. He was transported to a hospital, where he died several days later.
Inspection Number:	305358012
Establishment Name:	Prillaman & Pace, Inc.
(State-Zip):	VA 24115
Fatalities:	1 **Injuries:** 0
Keywords (OSHA):	burn, explosion, boiler, fire, combustible dust, fuel oil, work rules, communication

EMPLOYEE'S EYE IS INJURED WHEN COMPRESSED AIR LINE FAILS

Incident Tracking	*OSHA Incident Profile*
Incident Title:	Employee's Eye Is Injured When Compressed Air Line Fails
Incident (Accident) ID:	201142718
Report Date:	07/02/2002
Report ID (OSHA):	950631
Incident Description:	On July 2, 2002, Employee #1 was working for Advanced Ceramic Technology, a manufacturer of small ceramic parts for the defense industry. While he was turning off a compressed air line made of 0.75-in. PVC, it fractured. One piece struck Employee #1's left eye. He was hospitalized for treatment, and the eye was replaced with a prosthetic. PVC pipe is an inappropriate material for compressed air lines.
Inspection Number:	300855418
Establishment Name:	Advanced Ceramic Technology
(State-Zip):	CA 92866
Fatalities:	0 **Injuries:** 1
Keywords (OSHA):	COMPRESSED AIR, PRESSURE RELEASE, EQUIPMENT FAILURE, EYE, FLYING OBJECT, STRUCK BY

EMPLOYEE KILLED AFTER PRESSURE VESSEL EXPLODES

	OSHA Incident Profile
Incident Title:	Employee Killed After Pressure Vessel Explodes
Incident (Accident) ID:	200880706
Report Date:	06/28/2002
Report ID (OSHA):	215800
Incident Description:	At 5:15 p.m. on June 28, 2002, Employee #1 was operating a pressure vessel at Crucible Specialty Metals in Solvay, New York. The vessel exploded. After the explosion, Employee #1 was removed from the debris and was transported to a local hospital, where he died the following morning.
Inspection Number:	304591688
Establishment Name:	CRUCIBLE SPECIALTY METALS
(State-Zip):	NY 13209
Fatalities:	1 **Injuries:** 0
Keywords (OSHA):	PRESSURE VESSEL, EXPLOSION, CONCUSSION

ONE EMPLOYEE KILLED AND FIVE INJURED IN AN EXPLOSION

	OSHA Incident Profile
Incident Title:	One Employee Killed And Five Injured In An Explosion
Incident (Accident) ID:	200880698
Report Date:	06/11/2002
Report ID (OSHA):	0215800
Incident Description:	On June 11, 2002, six employees were operating a paper saturation drying system, consisting of six dryer cans. For some reason, a malfunction occurred, causing a steam explosion. One employee was killed and five were injured, four required hospitalization.
Inspection Number:	304591365
Establishment Name:	Knowlton Specialty Papers, Inc.
(State-Zip):	NY 13601
Fatalities:	1 **Injuries:** 5
Keywords (OSHA):	explosion, steam, paper machine

EMPLOYEE DIES FROM STEAM BURNS

	OSHA Incident Profile
Incident Title:	Employee Dies From Steam Burns
Incident (Accident) ID:	200271096
Report Date:	05/25/2002
Report ID (OSHA):	0524500
Incident Description:	On May 25, 2002, Employee #1 and his supervisor were slowly opening a 30-psi manual steam valve on a 30-in. steam line during plant start up procedures. When they heard what they believed to be a water hammer occurring in the line, they attempted to close the valve. The valve blew apart, the line separated, and Employee #1 was burned over 80 to 90 percent of his body. He died from his injuries on July 30, 2002.
Inspection Number:	303516322
Establishment Name:	Archer Daniels Midland Co.
(State-Zip):	IL 62526
Fatalities:	1 **Injuries:** 0
Keywords (OSHA):	burn, steam line, valve

ONE EMPLOYEE KILLED, ONE INJURED IN FARM EXPLOSION

OSHA Incident Profile

Incident Title:	One employee killed, one injured in farm explosion
Incident (Accident) ID:	200352417
Report Date:	04/23/2002
Report ID (OSHA):	453710
Incident Description:	Employees #1 and #2 were farm workers and were handling a pesticide cylinder. The cylinder contained 66 percent methyl bromide and 33 percent of chloropicrin and was rated to 200 psi. The cylinder was connected to a compressed gas cylinder full of nitrogen gas that was rated to 2500 psi. The pesticide cylinder detonated. Employee #1 was injured but there is no injury line. Employee #2 was killed in the accident.
Inspection Number:	305405813
Establishment Name:	Bailey Farms, Inc
(State-Zip):	NC 27565
Fatalities:	1 **Injuries:** 1
Keywords (OSHA):	FARM MACHINERY, AGRICULTURE, EXPLOSION, CYLINDER

FAILED FASTENERS AT HIGH PRESSURE LASER IGNITION APPARATUS

Summary

On January 15, 2002, in Building 84, Room 117, the High Pressure Laser Ignition Apparatus (HLIA) was charged to a pressure of 300 psi with a stoichiometric mixture of methane and air and ignited which resulted in a peak pressure several times greater than the design of the unit. Upon ignition, the sight glass flange set at the top of the HLIA separated from the vessel. The fasteners holding the flange set to the GLIA failed catastrophically. The fasteners failed in tension, completely shearing at the mid section. No personnel were seriously injured during the event; however, when the flange struck a shelf above the unit one of the cap screw socket heads from the sight glass flange broke free from the threaded shaft and struck the HLIA Lead Technician in the abdomen. First aid treatment was provided by the Occupational Health Unit.

Lessons Learned

Lack of careful hazard consideration (especially during design and after system modification) could lead to worker injury. In particular, equipment designed for use under high pressure conditions must be thoroughly evaluated (during design) to ensure that operating envelopes are not challenged under actual conditions.

Source

National Energy Technology Laboratory. Occurrence Report Number: FE-HQ--GOPE-NETLPIT-2002-0001

EMPLOYEES INJURED WHEN BOILER EXPLODES

	OSHA Incident Profile
Incident Title:	Employees Injured When Boiler Explodes
Incident (Accident) ID:	202329017
Report Date:	01/14/2002
Report ID (OSHA):	0352440
Incident Description:	On January 14, 2002, Employee #1 and Employee #2, building engineers for Chesapeake Bay Middle School of Anne Arundel County Schools were struck and burned when a boiler (Hurst Boiler number 2, Model 0200285, serial number FB2500-15-2) exploded. The boiler exploded when the accumulated fuel oil vapor was ignited inside of the boiler. The fuel oil vapor built up due to numerous resets by the employees that morning. Employee #1 received first degree burns on his face and second degree burns on his hands. Employee #2 received a concussion and damage to the neck.
Inspection Number:	305084758
Establishment Name:	Chesapeake Bay Middle School
(State-Zip):	MD 21122
Fatalities:	0 **Injuries:** 2
Keywords (OSHA):	boiler, explosion, concussion, neck, fuel oil, burn, face

FOUR EMPLOYEES INJURED IN CYLINDER EXPLOSION

	OSHA Incident Profile
Incident Title:	Four employees injured in cylinder explosion
Incident (Accident) ID:	202220232
Report Date:	01/13/2002
Report ID (OSHA):	111100
Incident Description:	On January 13, 2002, Employees #1 to #4, workers at Maine Oxy-Acetylene SupplyCompany, were burned when a MAPP gas cylinder exploded. Employees #1 to #4 were hospitalized with burns.
Inspection Number:	301669446
Establishment Name:	Maine Oxy-Acetylene
(State-Zip):	ME 04240
Fatalities:	0 **Injuries:** 4
Keywords (OSHA):	GAS, EXPLOSION, BURN, ACETYLENE

LIQUID NITROGEN TANK EXPLODES

Summary

On August 15, 2001, an exploding liquid nitrogen tank forced the evacuation of an Oak Brook office complex early Tuesday in an accident that caused more than $1 million in damage to a company's scientific equipment. The blast was contained to field offices leased by PerkinElmer Instruments, a unit of Boston-based PerkinElmer Inc. that produces high-technology analytical devices. No one was injured in the 7:20 a.m. explosion because most of the surrounding offices were empty.

A building engineer on duty at the time reported to fire officials that he heard and felt a large boom in the southern end of the Oak Brook Business Center, 2000 York Rd. About 200 employees of the various businesses were kept out of the building throughout the morning. Oak Brook fire officials responded to an automatic fire alarm. At the scene, they found no evidence of flame or smoke but discovered significant damage to a lab inside PerkinElmer's offices.

"There was an experiment going on with a liquid nitrogen cylinder inside the lab, and for some reason we don't know it exploded," said Fire Capt. Jim Bodony . "The cylinder turned into shrapnel that punctured the walls and the roof and severed electrical lines and fire sprinkler lines."

About 25 PerkinElmer employees work in the office, testing and demonstrating scientific equipment. The liquid nitrogen was being used for a gas chromatograph, a detection device that is worth about $1 million and was destroyed in the explosion. Computer equipment also was damaged. "Everything in that room is shot," said Bodony, who added that the blast also caused about $100,000 in structural damage.

Source

http://articles.chicagotribune.com/2001-08-15/news/0108150341_1_offices-blast-liquid-nitrogen

FATAL EXPLOSION OF PRESSURIZED TANK

Summary

On June 21, 2001, a 39-year old male **died** when a 500-gallon storage tank he had started to empty of waste oil and water exploded from its base striking him in the head. He had vacuumed the waste oil and water into the tank from a trench on the other side of the plant and transported it with a lift truck to the underground waste storage area for disposal at a later time. He was pressurizing the contents of the tank with air from a compressed airline located just inside the plant to speed the evacuation of the waste oil and water into the waster storage area. The tank was not approved for use as a pressurized vessel. Fittings on the tank had been adapted for the purpose of connecting them to the compressed airline. The force of the explosion propelled the tank 500 feet in the air over the plat fence and a nearby bank parking lot onto a bust east/west road. This was a maintenance task that had been conducted in this manner for over 6 years. No one witnessed the actual event. Statements from nearby workers and maintenance staff were relied upon to reconstruct what was presumed to have occurred. The deceased was found lying near the place where he had been last seen beginning to drain the tank. Emergency personnel confirmed that he was dead when they arrived at the site.

Lessons Learned

- Conduct job safety analyses and establish standard operating procedures for routine maintenance tasks and train the maintenance personnel in these procedures.
- Do not pressurize a container not approved as a pressure vessel.
- Inform employees that no equipment is to be altered or retrofitted. Establish a procedure for a qualified person(s) to review proposed equipment changes.

Source

http://www.cdc.gov/niosh/face/stateface/mi/01mi038.html

WINDOW FAILURE

Summary

The most direct cause of the window failure on June 14, 1999, was its exposure to high pressure when a substantial crack was readily visible. There is no reason to believe that the crack existed when the window was received from the vendor. The crack was presumably introduced by one or more of the following actions associated with repeated removal and re-installation of the window: mishandling, improper changes in window configuration, stresses introduced by improper use of gaskets and bolts.

Lessons Learned

The importance of adequate knowledge, skill, and equipment-specific instruction was particularly important to compensate for some inherent weaknesses in the design of the equipment.

Source

Occurrence Report ES Window ORPS 990614.

16-INCH PIPE'S LEAK CAUSES 1.5 MILE-LONG FIRE

Summary
On June 10, 1999 an oil pipeline ruptured releasing a large amount of gasoline into a creek in Bellingham, Washington. Approximately 90 minutes after the rupture the stream of oil ignited. This caused damage for 1.5 miles along the creek, and killed 3 people. One factor that contributed to this accident was a faulty repair job done in 1994 that weakened the pipe in the first place. A proper inspection of the pipeline could have noticed this damage. Also the control system malfunctioned at the time of the crisis requiring the people running it to switch to a back-up system. Unfortunately not all the information from the primary control system was transferred to the secondary system resulting in confusion among the people in charge.

Lesson Learned

- Periodic and effective inspection of equipment is a must.

Source
http://www.olympicpipeline.com/downloads/PAR0202.pdf

FAILURE OF COMPRESSED NATURAL GAS TRAILER TUBE

Summary
In October 1997, a failure of a Compressed Natural Gas Trailer Tube occurred in Litchfield, KY during the filling of the tube from a natural gas well. The tube was a DOT Type 3T (2725-psi) 22-inch diameter, approximately 40-feet long seamless tube for CNG service. It was made from A-372, Class 5, quenched and tempered steel with a tensile strength of 160-170 ksi. It had been in use for approximately one week. The failure involved the complete rupture of the tube. The failure investigation showed that the tube had failed from environmentally assisted cracking due to about 550 parts per million water and hydrogen sulfide in the gas. The fix for this problem actually required the use of a lesser quality steel.

Source
www.reliability.com

EXPLOSION OF LIQUEFIED NITROGEN STORAGE TANK

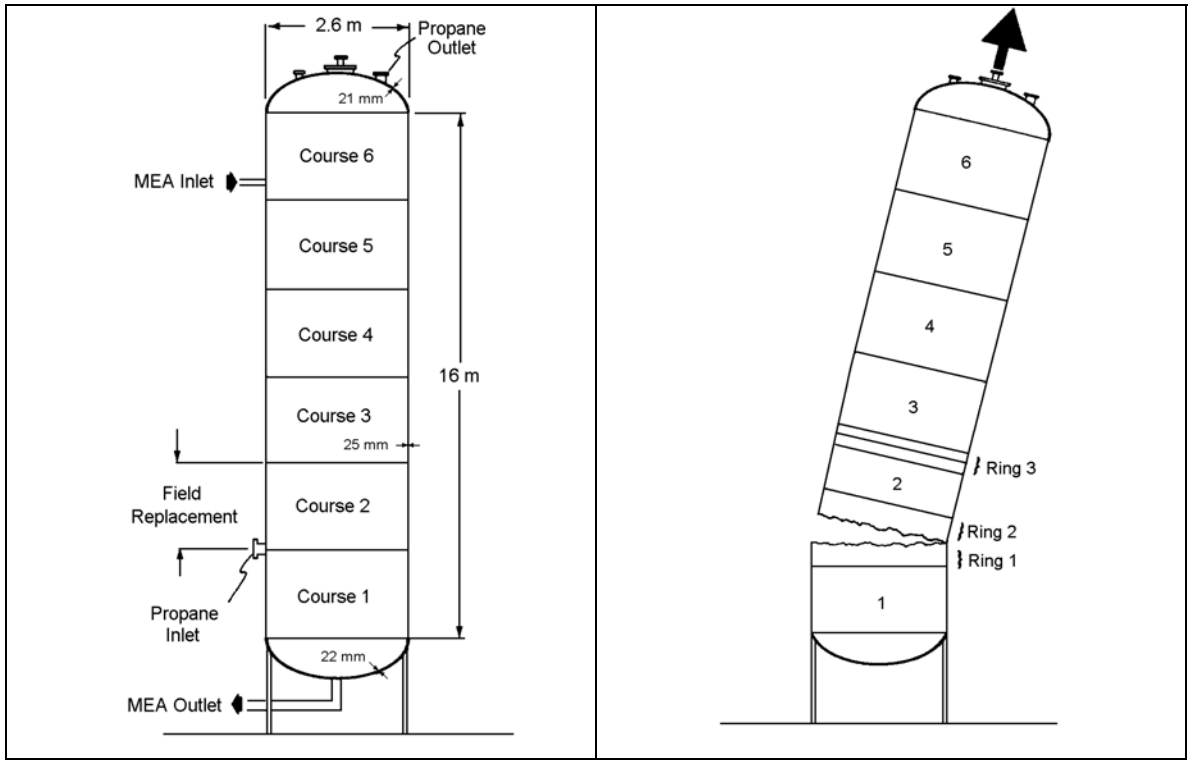
Summary
On August 28, 1992, a liquid nitrogen storage tank exploded in a food factory in Japan. The explosion caused the destruction of the upper half of the factory as well as some extent of damage to other facilities and structures within a 400 meter radius of the blast. The shutoff valve for the safety valve had been closed manually, causing the tank to close completely. The pressure of the tank increased gradually as a result of heat penetration, leading to the explosion which occurred more than a month later.

Lessons Learned

- Increasing the awareness of the importance of safety maintenance;
- Improving manuals and arrangement of valves.

Source
Failure Knowledge Database http://shippai.jst.go.jp/en/Search

ABSORBER IN CHICAGO EXPLODES AND KILLS 17



Summary

On July 23, 1984 an explosion and a fire occurred at a Chicago petroleum refinery that killed 17 people, and propelled debris up to 1 km away. The device in question was an amine absorber tower that strips hydrogen sulfide from a stream of propane and butane. Dimensions of the device were 18.8 m tall, and 2.6 m diameter. The material used in its construction was 25 mm thick plates of ASTM A516 Grade 70 steel.

Investigation yielded that there had been hundreds of cracks primarily along the inner surfaces along the welds between courses 1, and 2, as well as between 2, and 3. Metallography combined with stress corrosion cracking, hydrogen embrittlement tests and a fracture mechanics analysis reveled that a pre-existing crack had extended through more then 90% of the wall thickness and was approximately 800mm in length.

The vessel had been put into service in 1970, and had undergone numerous repairs, and modifications before the incident. The initial cracks formed along a repair welding of a replacement section. Hydrogen pressure cracking caused the cracks to grow. Once the depth of the cracks exceeded 90-95% of the wall thickness the tank ruptured, and leakage occurred. Finally the pressure caused a fracture at the vessel's circumference.

Lessons Learned

More attention must be paid to how hydrogen interacts with vessels, especially when repairs and modifications are involved.

Source

http://nvl.nist.gov/pub/nistpubs/sp958-lide/350-352.pdf

FATAL EXPLOSIONS AT LPG TERMINAL

Summary

On November 19, 1984, a major fire and a series of catastrophic explosions occurred at the government owned and operated PEMEX LPG Terminal at San Juan Ixhuatepec, Mexico City. As a consequence of these events some **500 individuals were killed and the terminal destroyed**. Three refineries supplied the facility with LPG on a daily basis. The plant was being filled from a refinery 400 km away, as on the previous day it had become almost empty. Two large spheres and 48 cylindrical vessels were filled to 90% and 4 smaller spheres to 50% full. A drop in pressure was noticed in the control room and also at a pipeline pumping station. An 8-inch pipe between a sphere and a series of cylinders had ruptured. Unfortunately the operators could not identify the cause of the pressure drop. The release of LPG continued for about 5-10 minutes when the gas cloud, estimated at 200m x 150m x 2m high, drifted to a flare stack. It ignited, causing violent ground shock. A number of ground fires occurred. Workers on the plant now tried to deal with the escape taking various actions. At a late stage somebody pressed the emergency shut down button.

Lessons Learned

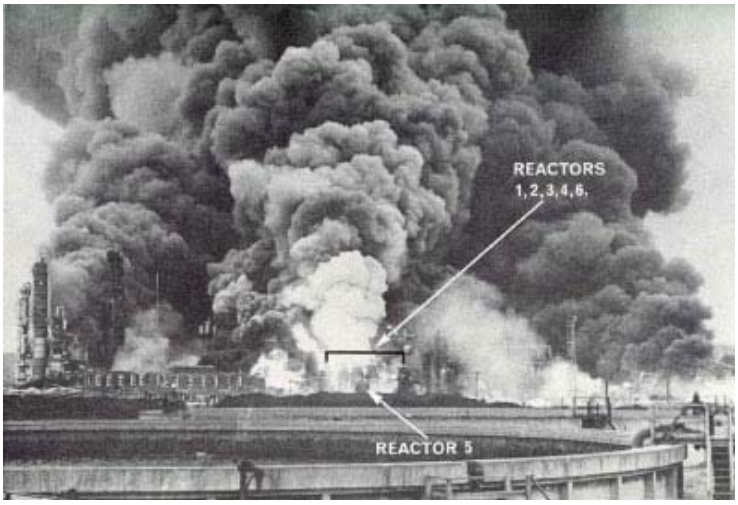
The importance of analyzing problems so they don't turn out into larger ones:

- The total destruction of the terminal occurred because there was a failure of the overall basis of safety which included the layout of the plant and emergency isolation features
- Plant Layout: positioning of the vessels
- Isolation: emergency isolation means
- The terminal's fire water system was disabled in the initial blast. Also the water spray systems were inadequate.
- Active / Passive Fire Protection: survivability of critical systems, insulation thickness, water deluge
- The installation of a more effective gas detection and emergency isolation system could have averted the incident. The plant had no gas detection system and therefore when the emergency isolation was initiated it was probably too late.
- Leak / Gas Detection: gas detection
- Hindering the arrival of the emergency services was the traffic chaos, which built up as local residents sought to escape the area.
- Emergency Response / Spill Control: site emergency plan, access of emergency vehicles

Source

http://www.hse.gov.uk/comah/sragtech/casepemex84.htm

FATAL EXPANSION BELLOWS FAILURE



Summary

In 1974, thirty tons of flammable cyclohexane was released due to the expansion bellows in the bypass line failing. The resulted vapor cloud flared up **killing twenty-eight and injuring eighty nine**. Three months prior to that accident, a reactor in series needed repairs. In order to minimize downtime and because of the rush to resume production, a temporary by-pass line, which was not tested before to start up, was installed using a pipe with an expansion bellows on each end and supported by scaffolding.

Lesson Learned

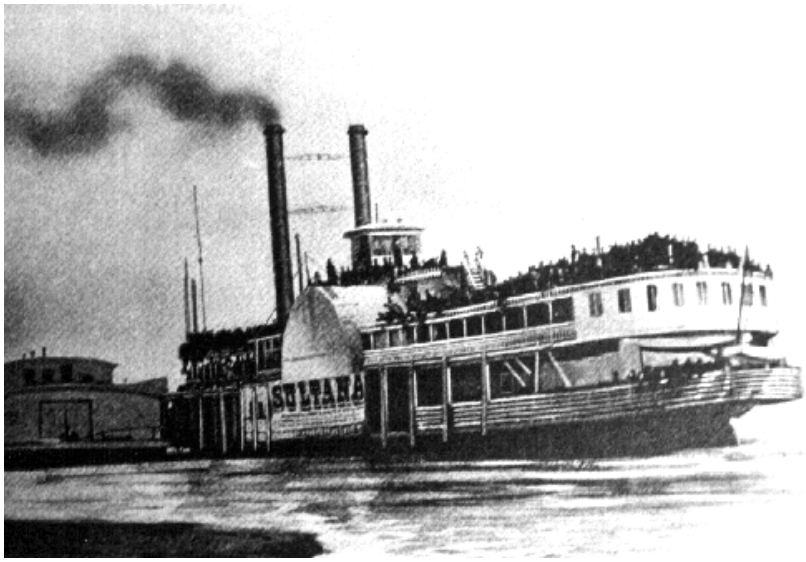
In order to prevent this from happening in the future:

- Use good engineering practices and manufacturer's recommendations,
- Make sure hazard reviews have been tested and approved by experts before making changes, and
- Follow the same safety procedure for a temporary change as with a permanent change.

Source

http://www.mti-global.org/mti/app/public_files/Hot%20Topic.pdf

STEAMBOAT EXPLOSIONS IN THE WEST



Summary
The greatest boiler explosion known to history was the destruction of the Sultana, April 27, 1865, **killing at least 1,238 people**. Before it took off, the ship had to go through a 33 hour repair process. The repairing consisted of putting on a “soft patch” of a quarter-inch iron plate. Despite of her condition, she took on carrying 1,866 soldiers, 70 cabin passengers, and 85 crew members a total of 2021 passengers in all. The specific cause of the explosion is still unknown, but it is likely that the actual pressure carried was 150 lbs. Since consistent operating guidelines and inspections for steam pressure systems were virtually nonexistent in this period of industrial and commercial activity, many boilers in use were unsafe.

Sources
http://www.disastercity.info/sultana/index.htm
http://www.pddoc.com/skedaddle/049/steamboat_explosions_in_the_west.htm

BOILER EXPLOSION IN MASSACHUSETTS

Summary

In Massachusetts, a boiler explosion set off a huge blaze at a clothing and upholstery fabric complex. A series of explosions followed the initial blast. They were caused by ruptured gas mains. **Many were injured** as well as in a critical condition. It took two hundred firefighters to battle the inferno.

Lessons Learned

Importance of checking on gas piping and accessories.

Source

http://www.emergency.com/massfir.htm

CORROSION CAUSES TANKS TO COLLAPSE

Summary

A tank was sucked in because the pallets in the pressure/vacuum valve corroded and failed to open when a transfer was made out of the tank. The valve was made of aluminum, which was corroded by the alcohol store in the tank.

In another case, a manufacturer supplied a new valve with a nickel value body plug instead of stainless steel even though they supplied a test certificate saying the valve was stainless steel. No checks were made on the material of construction.

Lessons Learned

The importance to provide correct material of construction.

Source

http://www.icheme.org/lpbUploadArea/pdfs/163/s2.pdf

FLEXIBLE METAL HOSE ASSEMBLY FAILURE

Summary

An ORNL researcher requested installation of a new argon gas line which would provide a continuous operation of uninterrupted supply of high-purity grade of argon gas for ultra-trace level metal analyses. At the time, an existing copper line had been used for nitrogen gas; the other line was an insulated line used for liquid nitrogen. The researcher suggested that the existing copper line be replaced with stainless steel for argon. The research staff member, task leader, and parts supplier representative participated in a walkthrough of the area and discussed what materials would be needed for the installation of the new argon line. A maintenance work plan was written to replace the copper tubing with stainless steel tubing for the argon supply. Funding delays necessitated that a new plan be written several months later. The new work plan included additional overhead work involving existing plumbing in the laboratory; installation of a pressure regulator on the argon supply manifold, and reconnection of the argon supply piping system (i.e., existing flexible metal hose assembly) to the argon tube trailer outside the building. To complete the work plan, two pipefitters reinstalled a pressure regulator on the building argon supply manifold and reconnected the argon supply piping system (i.e., existing flexible metal hose assembly) to the argon tube trailer outside the building. To leak test the reinstallation of piping, the workers slowly pressurized the system to 2100 PSIG using the needle valve located on the tube trailer. Workers applied 2100 PSIG to the flexible metal hose assembly and maintained it at that pressure for 3 to 5 minutes prior to workers initiating leak testing. Approximately 5 minutes after pressurizing the line and while the workers were performing the leak testing of piping joints, the flexible metal hose assembly failed near a fitting attached to the tube trailer. The flexible metal hose assembly struck one worker on the forehead resulting in a small cut and struck a second worker on his left hand. Medical services sent the **worker with the forehead injury** to a local hospital as precautionary measure. Local medical services evaluated the second worker on-site. Off-site and local medical services evaluated, treated, and released both employees.

Lessons Learned

Seemingly simple tasks can have hazards and complexities that need additional review.

Source

Oak Ridge National Laboratory, lesson ID: 2009-UTB-ORNL-0013.

FATALITY CAUSED BY UNLOADING THE WRONG CHEMICAL

Summary

A truck of sodium hydrosulfide-solution arrived at a factory at about 3:30 AM, and was to be unloaded to a storage tank in the area near the top center of the diagram (right picture above). The truck driver had never been to the plant before, and asked the plant shift supervisor for assistance. The shift supervisor had been told to expect a chemical shipment, and assumed that the chemical would be ferrous sulfate, which is the only chemical that he had ever received on his shift. He directed the truck driver to the unloading station for ferrous sulfate, where the truck is shown in the diagram. The shift supervisor did not verify the identity of the chemical in the truck, although the shipping papers did properly identify the contents as sodium hydrosulfide. The supervisor signed the shipping papers without reading them and left the area. No plant employees remained in the unloading area. The truck driver connected his truck to a hose which was connected to the ferrous sulfate storage tank as shown in the photographs. He began to unload the sodium hydrosulfide solution into the ferrous sulfate tank. Unfortunately, sodium hydrosulfide and ferrous sulfate react to form hydrogen sulfide, a highly toxic gas. Shortly after the unloading began, a plant employee in the basement of the building noticed a pungent odor and lost consciousness. He regained consciousness and made his way outside where he got help from other employees, who called emergency response personnel. They found the truck driver unconscious inside the building, and he was **pronounced dead at the scene**. He was determined to have been overcome by hydrogen sulfide gas.

Lessons Learned

- Always confirm the identity of any chemical which you add to any vessel.
- Never assume the contents of any raw material container which arrive at your plant without carefully checking all labels, vehicle placards, and shipping papers.
- Follow all of your plant's procedures for identifying materials including checking shipping papers, letters of analysis, or sampling and testing incoming materials.
- Remember that the consequences of accidently mixing incompatible chemicals can be severe
- Make sure that all unloading connections and pipes, as well as all storage tanks, are clearly labeled.

Source

http://159.238.91.226/osha/safetyalert/2009-03-Beacon.pdf

HYDROGEN TUBE TRAILER EXPLOSION

Summary
Without authorization, an employee did a faulty modification to a multiple-gas piping manifold allowing mixing of hydrogen and oxygen which resulted in a storage tube explosion in a hydrogen storage/use facility. An ignition occurred in the manifold piping system and a combustion front traveled into the hydrogen tube where the deflagration apparently transitioned to a detonation that ruptured the tube. Poor decision making and inadequate system monitoring and oversight were contributing factors to this incidence.

Lessons Learned
All personnel associated with potentially hazardous work should receive necessary training and should be properly supervised when on the job. They must adhere to established policies and procedures and their supervisors should be aware of their personnel's activities.

Source
http://www.h2incidents.org/incident.asp?inc=135

ICE RUPTURES UNUSED PIPE AND CAUSES FIRE

Summary

A section of piping in a refinery unit was taken out of service during a process modification. The unused piping was not physically removed, nor was it isolated from the active piping with slip blinds. Instead, it was isolated from the connected piping by closed isolation valves. The active piping contained liquid propane under high pressure, and the propane contained a small amount of liquid water entrained as a separate water phase. Debris jammed in the seat prevented one of the isolation valves from closing fully. This allowed wet liquid propane to leak from the active piping into the unused piping. The water, which is heavier than propane, accumulated at a low point in the unused piping. During the winter, the water which had accumulated in the unused piping froze. When water freezes it expands, and this expansion caused a crack in the unused pipe. When the weather warmed, the ice melted and propane leaked from the active piping through the leaking isolation valve, and then out through the cracked pipe. A large flammable vapor cloud formed and ignited. The resulting fire caused **four injuries**, the refinery had to be evacuated, and it was shut down for nearly two months. The fire caused major damage to other equipment and piping, resulting in additional release of flammable materials and escalation of the fire. More than two tons of chlorine was also released from containers impacted by the fire.

Lessons Learned

- Make sure that all process modifications, including removal of equipment or piping from service, have a management of change review.
- Make sure that all equipment in your plant which is not in routine use is either physically disconnected from active equipment and piping, or positively isolated using slip blinds or other reliable isolation systems.
- Consider potential hazards of accumulation of material in pipe branches which are not routinely used, or which have low flow rates.
- Be prepared for cold weather in winter. Make sure that you follow procedures to prepare the plant for winter, to prevent freezing of critical equipment.

Source

http://www.sache.org/beacon/files/2008/10/en/read/2008-10-Beacon-s.pdf

VIEW PORT IN PRESSURIZED CHAMBER BLEW OUT

Summary
At Stanford Synchrotron Radiation Laboratory, a 2-inch diameter view port on a pressurized chamber at Beamline 10-1 ruptured and pieces of glass struck a visiting researcher in the chest area, causing an abrasion and contusion. The chamber was pressurized to 110 psi of house air with no relief device installed as required.

GAS CYLINDER EXPLODES AT UNIVERSITY

Summary

At an unknown date a gas cylinder that contained hydrogen fluoride exploded in a University of California laboratory. The speculated cause of the explosion was that the hydrogen fluoride reacted with the metal container it was in, slowly forming iron fluoride. This weakened the inside of the cylinder until it finally gave way. The shelf life for cylinders storing HF is one to two years. The cylinder in question was at least seven years old.

Lessons Learned

- Inspection of cylinders containing certain hydrogen gases is a must, and possibly any reactive gases.

Source

http://or.ucsf.edu/ehs/8099-DSY/version/1/part/4/data/Csu13.pdf?branch=main&language=default

APPENDIX

Starting Natural Gas-fired Equipment - 10 Mistakes That Could Kill You

Purge points are pipe nipples installed at strategic locations in the piping system for the purpose of introducing or removing nitrogen and natural gas at various stages of the process.

When starting up gas-fired equipment, specific equipment concerns must be considered. Learn about the codes that apply, the basic techniques that must be followed, and hazards to avoid.

Several explosions within the past couple of years -- responsible for killing or maiming more than 50 people -- involved the startup of natural gas-fired equipment. As consultants, we have been involved in the aftermath of several of these incidents, trying to get plants running again. In reviewing the root causes of these events, we've concluded there is a huge misunderstanding about how special repairs to gas piping are, and how careful one must be when starting up new equipment.

This article seeks to provide the basics regarding codes that apply, basic techniques that must be followed, and hazards to avoid. This is a special area of practice that must be respected. Natural gas piping installations and repairs are not like any other piping repairs. They can be done safely if simple principles are followed. If these are not followed and not respected, the results can be devastating.

Several codes and standards apply to these kinds of situations, including OSHA 1910, NFPA 54 and equipment standards such as NFPA 85 or NFPA 86.

Two codes that apply to gas equipment startups are OSHA 1910 and NFPA 54. The first, OSHA 1910.147, addresses lockout/tagout (LOTO) of energy sources. A lot has been written about this code, and most people follow it conscientiously, at least on the electrical side. Unfortunately, for gas piping, steam and other things that could be dangerous in a pipe, it is complied with much less often. As consultants in a facility, for instance, we often have found a lock on a disconnect and a gas valve closed but not locked.

Even when people try to perform gas piping lockout/tagout correctly, we find they often do not understand the issues surrounding lubricated plug valves and their need to be sealed to hold properly. In the case of a plug valve, which represents 60 to 80 percent of all natural gas piping system valves, there is a space between the plug and the body. If sealant is not applied annually, as required by code, gas will leak past the plug and body even when they are in the closed position. We find that most plants do not have the knowledge or equipment to seal these and have never sealed them in the life of the valve. Hence, closing or locking out a valve in this condition does not necessarily isolate the energy source.

The second code that applies is NFPA 54, which also is called the National Fuel Gas Code. We have found that many firms have not heard of it and do not understand it. The lack of isolation points such as blanks, blinds and pancakes, and the lack of purge points installed in most industrial plants, supports this viewpoint. There seems to be little forethought given to the actual installation of the gas pipe, how the gas pipe will be put into service, and the equipment started up.

To help illustrate the points outlined in the codes, here are 10 common gas piping and equipment startup hazards as well as suggestions on how to avoid a problem. Of course, these tips and techniques should be incorporated into a comprehensive, documented procedure for natural gas piping purging, piping system design and equipment startups.

1. Purge Points
Purge points are pipe nipples installed at strategic locations in the piping system for the purpose of introducing or removing nitrogen and natural gas at various stages of the process. They generally are 1" schedule 80 nipples with natural-gas-rated ball valves on the ends. It is important to select locations or orientations that ensure the purge points are not susceptible to damage from things like vehicle traffic (being run into with a tow motor or scissors lift).

2. Isolation Points
You have to be careful that fuel trains are not exposed to excessive pressures that can damage components during pressure testing. This can be done with the use of line blinds. (Valves can be left open or leak through in the closed position, so they should not be used for pressure testing.) Blinds provide positive isolation and eliminate the possibility for damaging devices such as regulators in the fuel train that are not rated for the elevated test pressures. In some cases, blinds help perform pressure testing correctly. Also, in some situations, pressure testing cannot be performed against a valve.

3. Piping Support
During repairs, sections of piping may be disconnected to add tees or install blinds. It is important to ensure that adequate pipe supports exist so that sections of pipe will not fall when disconnected. Remember, the closest support may be on the other side of the disconnected joint.

4. Gaskets
Even if they appear to be in good shape, NFPA 54 does not allow flange gaskets to be reused. To ensure leak-free joints, new gaskets must be used as well as properly rated bolts for the flanges. Remember too that if you are mating up flanges, it is raised face to raised face, and flat face to flat face.

5. Material Specifications
It is important that only properly rated pipe and fittings are used. Validate that reputable suppliers are used, and the material is free from manufacturing and installation defects such as pinholes in cast-iron fittings, misaligned threads on the cast-iron fittings, and the improper grade of pipe.

6. Nitrogen

Make sure you have enough nitrogen. For instance, having a backup cylinder or liquid container is not

The air we breathe is 78 percent nitrogen, but two full breaths of pure nitrogen can kill you. This inert gas is nothing to fool with.

a bad idea.

Make sure everyone understands this hazard, and make sure nitrogen purge points are marked and located in well-ventilated areas. Also, verify pressure ratings of hoses and regulators: Large liquid nitrogen tanks are capable of producing high discharge pressures. When discharging nitrogen, the purge discharge areas need to be monitored. Everyone involved should be trained on the safe handling of nitrogen.

There are several kinds of purges, including trickle purges and slug purges. A slug purge is a good hard blast of nitrogen that is substantial in flow compared to the size of the pipe. In this case, there is not a lot of mixing, and the nitrogen-to-natural-gas interface is not large. If you introduce the nitrogen too slowly, you will get a lot of mixing and make for a large interface. This is not desired.

Make sure you have enough nitrogen. For instance, having a backup cylinder or liquid container is not a bad idea. (Think of it as cheap insurance.) If you run out of nitrogen during a purge or pressure test, it will cost you a lot more than the extra cylinder of nitrogen. Also, you'll never know how much you will need for chasing leaks. This part of the process throws all calculations and estimates of how much you will need out the window.

You also will need to discuss with your supplier the size of the regulator you will need, which will depend on the extent of the system you intend to work with. If you get the wrong regulator, you will spend a long time waiting for the lines to fill.

7. Discharge Locations

Make sure that purge end points where natural gas may be released are outside and at least 25' from any ignition source. Have areas roped off for security to keep ignition sources, including vehicles, and people away.

To bleed a line, never discharge gas into a building. Always have a way to get the gas out of the building. A garden hose works fine. Make sure that the hose is grounded, and that everything is at the same electrical potential.

8. Sampling Devices

During natural gas introduction and removal, do not use a combustion flue gas analyzer for sampling and monitoring. Instead, use a good quality, recently calibrated LEL (lower explosive limit) meter. For instance, a four-gas meter can be used to monitor oxygen levels during nitrogen post-repair purging.

During natural gas introduction and removal, do not use a combustion flue gas analyzer for sampling and monitoring. Instead, use a good quality, recently calibrated LEL (lower explosive limit) meter.

Make sure that at least two of each device are available and that they are calibrated. Stopping the process due to instrumentation error can cause a hazard. One meter can be used for barrier protector for the people near the purge end point, and the other meter (used with an at least a 6' long sensing tube) can monitor conditions at the actual discharge point. Don't actually stand at the discharge point in harm's way. Instead, perform a timed and measured discharge; then, with the flow stopped, carefully approach to do an LEL check in the end of the purge hose.

Never trust your nose. Gas utilities inject Mercaptan, a sulfur derivative, with a goal to obtain a 1 percent by volume detection threshold for the average person. However, as we age, our ability to detect smells fades.

Also, Mercaptan is absorbed by rust, new steel pipe and concrete. Hence, you can never trust the smell as a reliable gauge for when danger is imminent.

9. Piping Integrity

During repairs or additions, piping may not be installed properly or disturbed during work. NFPA 54 requires that you have documentation of pressure testing for new or repaired piping systems prior to introducing natural gas. The results of these tests should be retained for the life of the piping system.

Any section of piping that has undergone recent additions or repairs should be evaluated if no test records exist. Our firm has established as a best practice the use of pressure chart recorders. These paper and pen battery-powered recorders come with small pressure increment gradations (e.g., 1 psig) and provide excellent records of pressure and hold times of tests. The codes also call for reviewing a gauge to see no discernible loss. We like to install a gauge for this purpose in parallel with a chart recorder. This gives you some backup and cross verification. Make sure it is at least a 4" gauge. We try to use a 6" face just to error on the side of caution and quality.

10. Equipment Startups

There will be a “moment of truth” period where everyone believes that gas is actually at the burner. Remember, the only thing that an LEL meter can tell you at 100 percent indication is that you have reached 4.3 percent natural gas concentration in air. We try to go some specific timed amount past this point just to get higher than this at the burner.

These paper and pen battery-powered recorders come with small pressure increment gradations (e.g., 1 psig) and provide excellent records of pressure and hold times of tests.

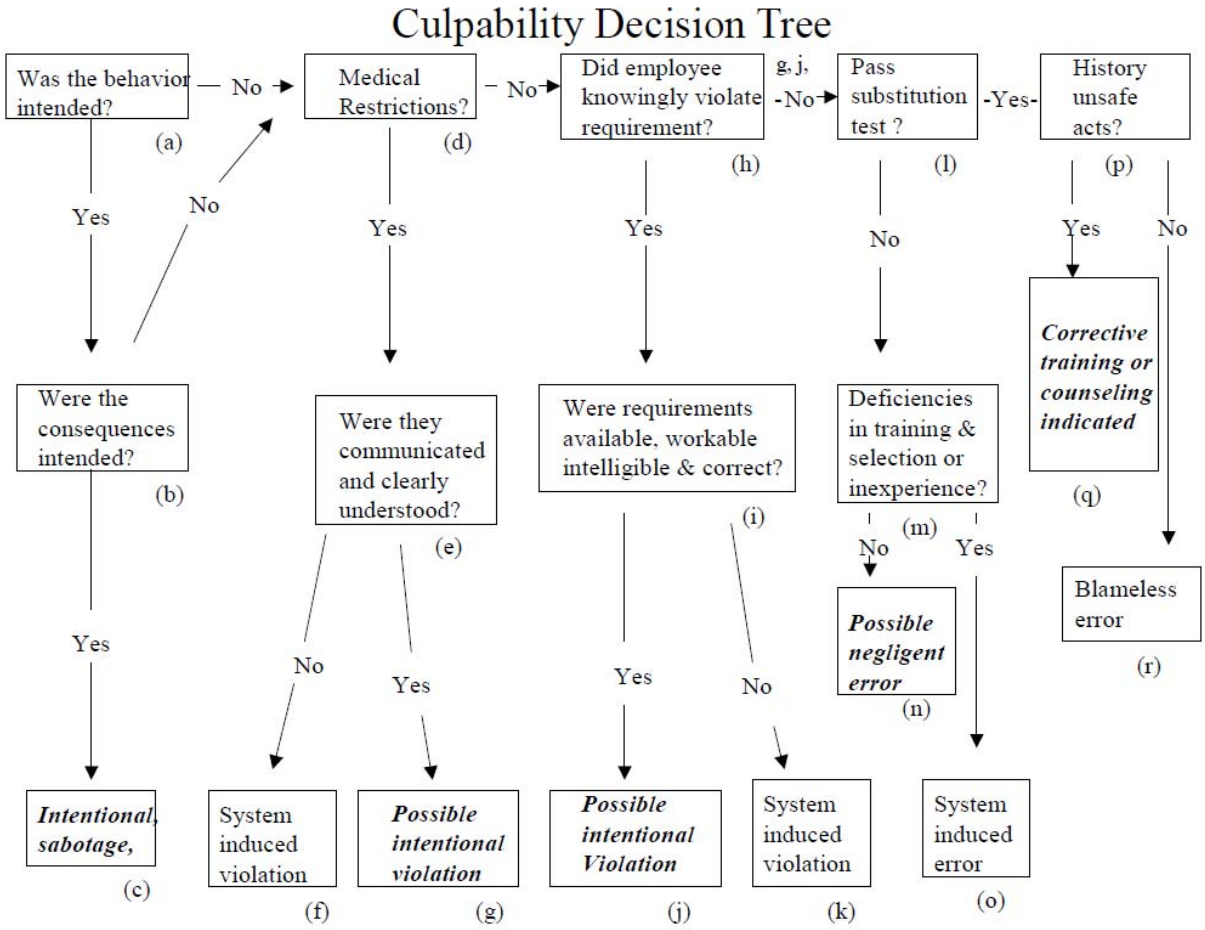
Once you actually try a relight, it is not likely that you will not start on the first try. We do this in a stepped and staged manner to avoid problems. In some cases for extensive gas piping systems, we light a portable burner at the ends of mains in a safe location. This establishes that we have proper gas concentrations at specific locations. In any case, we always shut the main gas off and only try to light pilots first. We also never do more than three light-off attempts without a dry run (no gas) to make extra sure we are clearing out the firebox.

Anytime natural gas piping systems are designed or worked on these potential hazards should be evaluated and addressed. While the process is not simple, it can be completed safely if planned and properly implemented.

Source

http://www.process-heating.com/Articles/Feature_Article/BNP_GUID_9-5-2006_A_10000000000000676828

CULPABILITY DECISION TREE (DOE HPI Volume 1)



Start with the assumption that the actions under scrutiny have contributed either to an accident or to a serious near-miss in which a bad outcome was only just averted. In an organizational accident, there are likely to be a number of different unsafe acts. The decision tree should be applied separately to each of them. The concern here is with individual unsafe acts committed by either a single person or by different people at various points in the accident sequence. Because of the subjectivity of the questions the Decision Tree should be used by a small team or committee vise a single manager or supervisor.

The questions of the inquiry relate primarily to intention. Unintended actions define slips and lapses, in general, the least blameworthy of errors. Unintended consequences cover mistakes and violations. The decision tree usually treats the various error types in the same way, except with regard to the violations question.

Start at the top left box on the logic diagram. The numbers below relate to the boxes left to right.

Were the actions as intended? The key questions relate primarily to intention. If both the actions and the consequences were intended, then we are likely to be in the realm of criminal behavior, which is probably beyond the scope of the organization to deal with internally. Unintended actions define slips and lapses—in general, the least blameworthy of errors—while unintended consequences cover mistakes and violations.

1. **Knowingly violating expectations?** If the individual was knowingly engaged in violating expectations at that time, then the resulting error is more culpable since it should have been realized that violating increases both the likelihood of making an error and the chances of bad consequences resulting. Violations involve a conscious decision on the part of the perpetrator to break or bend the rules (except when noncompliance has become a largely automatic way of working). Although the actions may be deliberate, the possible bad consequences are not—in contrast to sabotage in which both the act and the consequences are intended. Most violations will be non-malevolent in terms of intent; therefore, the degree to which they are blameworthy will depend largely on the quality and availability of the relevant procedures.

   Procedures are not always appropriate for the particular situation. Where this is judged to be the case (perhaps by a “jury’” of the perpetrator’s peers), the problem lies more with the system than with the individual. But, when good procedures are readily accessible but deliberately violated, the question then arises as to whether the behavior was reckless in the legal sense of the term. Such actions are clearly more culpable than “necessary” violations—the non-compliant actions necessary to get the job done when the relevant procedures are wrong or inappropriate or unworkable.

2. **Passes the substitution test?** The "substitution test," or something similar, is used to help in judging the culpability of organizationally induced violations. Could some well-motivated, equally competent, and similarly qualified individual make the same kind of error under those or very similar circumstances? If the answer provided by a jury of peers is "yes," then the error is probably blameless. If the answer is "no," then we have to consider whether there were any system-induced deficiencies in the person's training, selection, or experience. If such latent conditions are not identified, then the possibility of a negligent error has to be considered. If they are found, it is likely that the unsafe act was a largely blameless system induced error.

3. **History of Performance Problems?** Keep in mind that people vary widely and consistently in their liability to everyday slips and lapses. Some individuals, for example, are considerably more absentminded than others. If the person in question has a previous history of unsafe acts, it does not necessarily bear upon the culpability of the error committed on this particular occasion, but it does indicate the necessity for corrective training or even career counseling along the lines of "Don't you think you would be doing everyone a favor if you considered taking on some other job within the company?" Although absentmindedness has nothing at all to do with ability or intelligence, it is not a desirable trait in a pilot, a control room operator, a physician, or the like.

The line between acceptable and unacceptable behavior is more clear when the logic diagram is used. An intentional act to cause harm (lower left) is wholly unacceptable and should receive very severe sanctions, possibly administered by the courts rather than the organization. Knowingly violating expectations that were workable likely suggests reckless violation, a condition that warrants sanctions. The remaining categories should be thought of as blameless—unless they involve aggravating factors not considered here. Experience suggests that the majority of unsafe acts—perhaps 90 percent or more—fall into the blameless category.

NATIONAL BOARD OF BOILER AND PRESSURE VESSEL INSPECTORS REPORTS

The Violation Tracking Report identifies the number and type of boiler and pressure vessel inspection violations found among participating member jurisdictions by the National Board of Boiler and Pressure Vessel Inspectors. The Violation Tracking Report indicates problem areas and trends related to boiler and pressure vessel operation, installation, maintenance, and repair. Additionally, it identifies problems prior to adverse conditions occurring. This report can also serve as an important source of documentation for jurisdictional officials, providing statistical data to support the continued funding of inspection programs.

Report of Violation Findings for Fourth Quarter 2014

The National Board of Boiler and Pressure Vessel Inspectors has released its Fourth Quarter Report of Violation Findings for 2014. The data captures problem areas and trends related to boiler and pressure vessel operation, installation, maintenance, and repair; and also identifies problems before unsafe conditions occur.

Type of Pressure Equipment (stamp)	Total Number of Inspections	Total Number of Violations	Percent of Violations
High Pressure/High Temperature Boilers (S)(M)(E)	18,184	1,251	7%
Low Pressure Steam Boilers (H)	11,700	2,051	18%
Hot Water Heating/Supply Boilers (H)	62,526	8,900	14%
Pressure Vessels (U)(UM)	56,383	1,634	3%
Potable Water Heaters (HLW)	11,656	1,249	11%
Totals	160,449	15,085	9%

Statistics were derived from the fourth quarter tracking period 10/01/2014 – 12/31/2014.
Number of total jurisdictional reports: **29**

Source: http://www.nationalboard.org/NationaBoardNews.aspx?NewsPageID=641

NATIONAL BOARD OVERVIEW

When the National Board of Boiler and Pressure Vessel Inspectors standardized its reporting process for gathering incident statistics in 1991, it was with the objective of creating an accurate and consistent database that would, over time, yield a *bona fide* method of identifying and correcting the causes of boiler and pressure vessel accidents. The first composite evaluation of this data, published in 1997, covered a five-year period from 1992 to 1996. With a benchmark in place, the 1997 analysis provided a particularly useful perspective on incident cause and effect. Five years later, it can be stated that the overriding conclusion reached from the second five-year study reinforces the findings of the first: namely, that **human error remains the foremost cause of boiler and pressure vessel incidents** in North America.

Tragically, **a total of 127 people have lost their lives** as the result of boiler and pressure vessel accidents during 1992-2001 period in the U.S. That is almost 13 fatalities per year on average. The annual number of deaths has seesawed over the past 10 years, with the only sustained downward trend - over three years - taking place between 1999 and 2001. While this may appear to be a positive revelation, it must be considered in the context that 1999 saw the most deaths (21) over the 10-year period. The lowest number of fatalities over the reporting period, 8, was recorded in 1994.

In the category of injuries, a total of 720 were recorded between 1992 and 2001 — an average of nearly 72 per year. Again, 1999 was not only the most deadly in the boiler and pressure vessel industry, it also saw the highest number of injuries with 136. By comparison, the year 2000 experienced the lowest number of injuries at 27.
Each year during the 1992 to 2001 reporting period saw at least 2,000 accidents, with a total of 23,338 accidents. That averaged 2,334 accidents per year. The highest number of accidents (2,686) occurred in 2000, while the lowest number (2,011) took place in 1998.

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Injury-per-accident Ratio

While numbers may climb and fall each year, one true measure of how the industry is faring can perhaps best be found in a statistic not officially included as part of the reporting system: the injury-per-accident ratio. Since 1992, this ratio has ranged from one injury for every 99 accidents in 2000 (the safest year) to one injury for every 16 accidents in 1999 (the most dangerous). Last year's ratio of one injury for every 26 accidents was the third worst year for safety during the 10 year reporting period. The average ratio of injuries to accidents for the 10-year period was one injury for every 32 accidents.

Of the 23,338 accidents recorded in 1992-2001 10-year period, 83% were a direct result of human oversight or lack of knowledge (i.e., low-water condition, improper installation, improper repair, operator error or poor maintenance). Human oversight and lack of knowledge were also responsible for 69% of the injuries and 60%. Low-water condition and operator error or poor maintenance have stood atop the list of boiler accident causes for all 10 years (includes power boilers, steam-heating boilers, and water-heating boilers). While low-water condition has been the predominant cause during this time period, operator error or poor maintenance has surpassed its causal counterpart just three times: in 1998, 1999, and 2000. (After this three-year hiatus, low-water condition regained its position as leading cause last year.)
Other major causes of boiler accidents reflect a mixed combination of human oversight and mechanical breakdown. In five of the 10 years, burner failure was the third leading cause of incidents (1992, 1994, 1995, 1996, and 1997), followed by limit controls in 1993 and 2000. Improper installation was the third leading cause in 1998, with improper repair coming in third in 1999.

In what comes as a surprise to many, the combined third leading cause for both boiler and pressure vessel accidents last year (2001) was unknown/undetermined — a category introduced as part of the Incident Report in 1999. With unknown/undetermined accident causes exceeding 7% in 2001, then-National Board Executive Director Donald Tanner commented, “What we don’t know can hurt us. While being able to identify and isolate a problem may not necessarily give us complete comfort, it does provide certainty — the knowledge of understanding what needs to be corrected.”

When it comes to equipment categories, **unfired pressure vessels proved by far to be the deadliest**. During the 10-year reporting period, a total of 64 persons were killed by unfired pressure vessels, followed by power boilers (44 fatalities), water-heating boilers (14), and steam-heating boilers (5). Unfired pressure vessels were also the leading cause of injuries (289), followed again by power boilers (250), water-heating boilers (92), and steam-heating boilers (89).
The above listing is, however, reversed when it comes to total number of accidents over the 10-year period, with steam-heating boilers causing the most overall with 9,588 incidents, followed by water-heating boilers (6,928), power boilers (4,311), and unfired pressure vessels (2,511). Indeed, the yearly breakdown finds steam-heating boilers causing the most incidents in seven of the last 10 years, while unfired pressure vessels recorded the fewest incidents each year (see Figure 4).

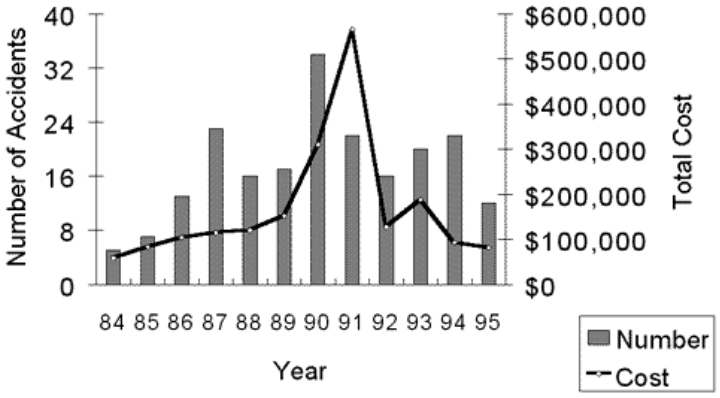
Additional observations from the 10-year reporting period reveal:

- A dramatic 40% increase in deaths during the 1997 to 2001 reporting period, as compared with 1992 to 1996.
- For the tenth year in a row, operator error or poor maintenance remains the leading cause of unfired pressure vessel accidents, usually followed by faulty design or fabrication and improper installation.
- In each of the equipment categories, incidents related to the safety relief valve were recorded least often over the 10-year period.

Source
http://www.achrnews.com/Articles/Feature_Article/926afa6ff9b5a010VgnVCM100000f932a8c0

COMPRESSED GAS CYLINDER INCIDENTS STATISTICS

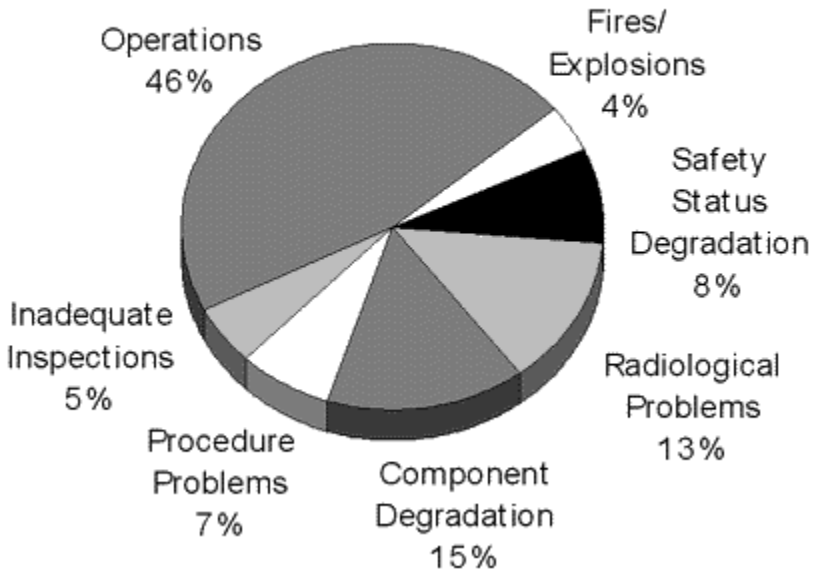
Computerized Accident Information Reporting System (CAIRS) data base lists 155 cylinder accidents with a cost to DOE in excess of $2.5 million. A review of the accidents indicates a downward trend in cost and number of accidents in 1984-1995 period:



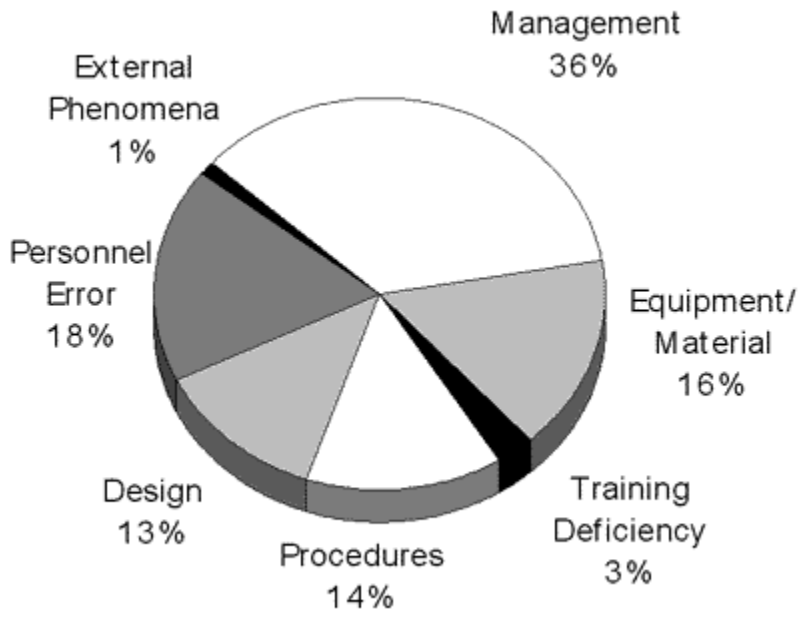
Lessons Learned

- Practically all gases, including inert gases, can act as simple asphyxiates by displacing oxygen in the air. Some gases also have a toxic effect on the human system either through inhalation or high vapor concentrations. Also, liquefied gas can be toxic on contact with the skin or eyes.
- Flammable gases present the potential for fire or explosion.
- Cylinders that rupture can result in injury or damage by becoming airborne or by forcefully ejecting contents.
- Because cylinders can be large, heavy, bulky, and difficult to handle, they can cause injury by falling or rolling on personnel. Approximately 80% of the injuries listed in the CAIRS data base are caused by lifting, maneuvering, or transporting cylinders.
- Because cylinders are often needed for cutting, welding, or respiratory protection, workers are usually allowed to transport them to most areas of a facility. These areas may have safety-related equipment and instrumentation. In many cases, the components were designed to have redundant instruments in separate control cabinets and spatial separation of redundant cable trays. Compressed gas cylinder missiles have sufficient force to traverse this spatial separation and damage redundant safety channels and equipment.
- Most cylinder events are avoidable. Only 16% of the cylinder-related events listed in ORPS involved equipment or material problems, and almost half occurred during normal operations or activities. Approximately 13% involved cylinders that were contaminated or caused contamination.

Figure below shows a breakdown by nature of occurrences:



Root causes of gas cylinder events:



Source

Nuclear and Facility Safety Notice No. 96-03 (Compressed Gas Cylinder Safety) from June 2, 2009.

CSB CHAIRMAN URGES STATES TO ADOPT ASME PRESSURE VESSEL CODE

On November 12, 2009, CSB Chairman John Bresland released a new video safety message today asking jurisdictions across the country to adopt the ASME Pressure Vessel Code to reduce the number of accidents involving catastrophic pressure vessel failures in process industries. In the safety message, Chairman Bresland warned that without appropriate safeguards, pressure vessels can pose lethal dangers. Chairman Bresland said, "Pressure vessels store tremendous amounts of energy and you should never become complacent about the risks." Particular danger exists when vessels are improperly installed, welded, or modified, or when they lack effective pressure relief systems. Mr. Bresland refers to several incidents investigated by the CSB including an explosion at a Louisiana natural gas well that killed four workers when a tank rated only for atmospheric pressure was exposed to gas pressure up to 800 pounds per square inch. Chairman Bresland stated that accidents can be avoided if states implement long-established codes for safe use. He said, "There are only eleven states that do not require companies to follow the Pressure Vessel Code of the American Society of Mechanical Engineers (ASME). I ask all jurisdictions to adopt the Pressure Vessel Code and related boiler standards. Lives will be saved as a result."

Source
http://www.csb.gov/