

TO: Director, National Institute for Occupational Safety and Health

FROM: California Fatality Assessment and Control Evaluation (CA/FACE) Program

SUBJECT: A Hispanic car wash supervisor died when an air tank exploded in a car wash equipment room.

SUMMARY
California FACE Report #05CA010

A 46-year-old Hispanic car wash supervisor died when an air tank exploded inside an equipment room of a car wash. The victim was inside the equipment room when the explosion occurred. The owner of the business and another employee were in the equipment room just prior to the explosion and had just exited the equipment room before the explosion. The business did not have any records or documentation on the air tanks in the equipment other than the Cal/OSHA inspection performed two years prior. At that time, the air tank passed all OSHA tests and inspections. The air tank that exploded was 23 years old. Testing performed by an independent laboratory found that there were products of combustion in the tank. Independent studies have shown that use of an improper oil type can lead to accumulation of oil residue in compressor receivers, and that this residue can lead to combustion and explosions. The CA/FACE investigator determined that in order to prevent future occurrences, employers, should:

- Ensure that air tanks and compressors are inspected regularly and maintained in a safe and operational condition, are serviced on a regular basis using OEM (original equipment manufacture) oil, and that all repairs and servicing are documented.

INTRODUCTION

On July 23, 2005, at approximately 9:20 a.m., a 46-year-old Hispanic car wash supervisor died when an air tank exploded inside an equipment room. The CA/FACE investigator learned of this incident on August 12, 2005, through the Legal Unit of the Division of Occupational Safety and Health (Cal/OSHA). Contact with the victim's employer was made on November 21, 2005. On January 19, 2006, the CA/FACE investigator traveled to the business where the incident occurred and interviewed the owner of the car wash, and took pictures of the facility. On January 27, 2006, copies of the OSHA, police, and fire reports were obtained. The investigative test results that were conducted on the pressure relief valves by the National Board of Boiler and Pressure Vessel Inspections were also obtained.

The employer of the victim was a combination car wash and gas station. The business had been purchased by the present owner in 1999. The victim had been employed by the business since it was purchased in 1999. He had worked for the owner of the car wash at another facility for 10 years prior to beginning work at the incident site. The victim was born in Honduras and had been in the United States for 22 years. The victim could speak, read, and write both English and Spanish. The business had a written Illness and Injury Prevention Program (IIPP) printed in English. The program had all the required procedures for employees to follow. Safety meetings were held monthly and were documented. The company had a training program that consisted of on-the-job training and classroom instructions on general and job-specific safety and health practices. Training was measured by supervisor observation.

INVESTIGATION

The site of the incident was a fully automated car wash. The car wash consisted of a vacuum area, a wash tunnel, and a finishing area. There was also an equipment room attached to the side of the tunnel. Air tanks in the equipment room were part of the pressure system used to propel chemicals and cleaning agents to various locations within the car wash. The air tanks were vertical 80-gallon air tanks rated for 200 pounds per square inch (PSI). The air tank that exploded was manufactured in 1982 and had been in service ever since. The owner of the business stated that the tanks were set to cycle on at 110 PSI and off at 150 PSI. The air tanks were bled daily of any compressed air or buildup of moisture. This was the victim's responsibility. Maintenance on the air compressors involved checking the oil and air filters on a regular basis. This was also the victim's responsibility and had been for the past six years. It is not known if OEM oil was used whenever the oil was changed or added to the compressor.

Prior to the day of the incident, the car wash was having new equipment installed in the tunnel and equipment room. The air compressors were being operated almost continuously while the testing was being conducted on the soap systems. On the day of the incident, the owner, victim, and a vendor were in the equipment room looking over the equipment and preparing to finish the testing they were doing the day before. The owner and the vendor walked out of the equipment room and over to the vendor's vehicle which was parked just outside the equipment room. Just as they reached the vehicle they heard a huge explosion. They turned around and saw the door to the equipment room damaged and the roof blown off. They ran to the equipment room and began to search for the victim. A fire station, located across the street from the business, heard a loud noise and immediately responded. The victim was transported to a nearby hospital where he later died.

The pressure relief valves from both compressors 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. A visual inspection of the remains of the air tank indicated that corrosion was not a factor. An evaluation performed by an independent failure analysis laboratory, paid for by the insurance carrier for the

compressor manufacturer, found products of combustion in the air tank and a rupture pattern of the tank walls that was consistent with an explosion rather than rupture.

CAUSE OF DEATH

The cause of death, according to the death certificate, was exsanguination, retroperitoneal, perivesical, and abdominal hemorrhage, fractured left acetabulum, and explosive force injuries.

RECOMMENDATIONS / DISCUSSION

Recommendation #1: Ensure that air tank and compressors are inspected regularly and maintained in a safe and operational condition, are serviced on a regular basis using OEM (original equipment manufacture) oil, and that all repairs and servicing are documented.

Discussion: The test results of a failure analysis laboratory concluded there were products of combustion in the air tank that were most likely caused by the wrong viscosity of oil being used in the air compressor. The oil in an air compressor serves two purposes. First is to lubricate the compressor as it operates and second, to help cool the compressor and the compressed air it produces. The oil must be of a certain type and viscosity in order to produce the desired results. Manufacturers of air tanks and compressors usually recommended what type of oil to be used in their product. When OEM oil is not used, studies have shown that the oil may leak past the seals and gaskets and form carbon deposits in the supply line. As the diameter of the supply line decreases because of the carbon deposits, the compressed air, which is already at a high temperature, will increase even more, to the point where it might be possible to ignite the carbon deposits. If this should happen, and a piece of ignited carbon gets into the air tank, it could cause an internal explosion. This type of explosion would vary in intensity based on the amount of oil vapor within the tank. Air tank relief valves are not designed for this type of activity, and the air tank could explode, causing severe damage and injury. Although this type of event is rare, it has happened in some businesses and industry throughout the country. The practical prevention measure to take to avoid such an incident is to maintain air compressor equipment in a safe operational condition and to use only the grade of oil recommended by the manufacturer.

References:

California Code of Regulations, Vol. 9, Title 8, Sections 461 through 466
<http://www.cdc.gov/niosh/docs/2004-101/chklists/r1n28a~1.htm>
AS/NZS3788

Babrauskas, Vytenis, Ph.D. - IGNITION HANDBOOK, Principles and applications to fire safety engineering, fire investigation, risk management and forensic science.

EXHIBITS:



Exhibit 1. The equipment room after the explosion.



Exhibit 2. The car wash tunnel entrance after the explosion.



Exhibit 3. The inside of the equipment room after the explosion.



Exhibit 4. The second air tank inside the equipment room, which did not explode.



Exhibit 5. A piece of the exploded tank



Exhibit 6. A piece of the exploded tank showing the inner wall and oily substance

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FATALITY ASSESSMENT AND CONTROL EVALUATION PROGRAM

The California Department of Health Services, in cooperation with the Public Health Institute and the National Institute for Occupational Safety and Health (NIOSH), conducts investigations of work-related fatalities. The goal of this program, known as the California Fatality Assessment and Control Evaluation (CA/FACE), is to prevent fatal work injuries in the future. CA/FACE aims to achieve this goal by studying the work environment, the worker, the task the worker was performing, the tools the worker was using, the energy exchange resulting in fatal injury, and the role of management in controlling how these factors interact. NIOSH-funded, state-based FACE programs include: Alaska, California, Iowa, Kentucky, Massachusetts, Michigan, Minnesota, Nebraska, New Jersey, New York, Oklahoma, Oregon, Washington, West Virginia, and Wisconsin.

Additional information regarding the CA/FACE program is available from:

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