CALIFORNIA
State FACE Program
Fatality Assessment & Control Evaluation

Occupational Health Branch • California Department of Public Health
850 Marina Bay Pkwy, P-3, Richmond, CA 94804
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REPORT#: 23CA005 **REPORT DATE:** April 10, 2025

A Welder Dies from Methylene Chloride Exposure While Removing Oil Residue from the Inside of a Motor Oil Tank — California

INCIDENT HIGHLIGHTS

DATE:
December 4, 2023

TIME:
12:29 p.m.

VICTIM:
54-year-old welder

INDUSTRY/NAICS CODE:
Petroleum Bulk Stations and Terminals / 424710

EMPLOYER:
Lubricant oil manufacturer

SAFETY & TRAINING:
No policies, procedures, or SOPs to perform work in the motor oil tank (a confined space

SCENE:
Motor oil tank at oil manufacturing facility

LOCATION:
California

EVENT TYPE: Exposure to harmful substances or enviroments.

SUMMARY

On December 4, 2023, a 54-year-old male self-employed welder (the victim) working at a motor oil and lubricating products manufacturing facility, died from inhalation exposure to methylene chloride. The victim entered a 20 ft high by 10 ft wide empty motor oil storage tank to repair one of the blades inside. The victim was working by himself and used a product containing methylene chloride to remove oil residue at the bottom of the tank. The tank was not adequately ventilated, the victim was not trained in confined space entry, there was no attendant at the tank opening to monitor the work process inside, and there was no rescue plan in place. A company employee later located the victim at the bottom of the oil tank. The victim was removed from the tank and pronounced dead at the scene. … READ THE FULL REPORT> (p.3)

CONTRIBUTING FACTORS

- Using a product containing methylene chloride
- Lack of confined space entry and rescue procedures
- Lack of chemical hazard communication program
- Lack of adequate respiratory protection…LEARN MORE> (p.6)

RECOMMENDATIONS

California FACE (CA/FACE) investigators determined that, in order to prevent similar incidents, oil manufacturing companies should:

- Avoid purchasing, storing and/or using products that contain methylene chloride
- Ensure oil tanks are identified as permit-required confined spaces when methylene chloride is used inside the tank
- Ensure a chemical hazard communication program is developed and implemented…LEARN MORE> (p.7)

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Fatality Assessment and Control Evaluation (FACE) Program

This case report was developed to draw the attention of employers and employees to a serious safety hazard and is based on preliminary data only. This publication does not represent final determinations regarding the nature of the incident, cause of the injury, or fault of employer, employee, or any party involved.

This case report was developed by the California Fatality Assessment and Control Evaluation (FACE) Program. California FACE is a NIOSH-funded occupational fatality surveillance program with the goal of preventing fatal work injuries by studying the worker, the work environment, and the role of management, engineering, and behavioral changes in preventing future injuries. The FACE program is located within the Occupational Health Branch, California Department of Public Health.

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INTRODUCTION

On Monday, December 4, 2023, at approximately 12:29 p.m., a 54-year-old male self-employed welder (the victim) working at a motor oil and lubricating products company died after using a liquid product containing methylene chloride inside an empty motor oil tank. The CA/FACE investigators received notification of this incident on January 23, 2024, from the weekly summary from the California Department of Industrial Relations Public Information Office. On May 1, 2024, the CA/FACE investigators contacted the oil company facility where the incident occurred. A site inspection and interview with the oil manufacturer's employees and two witnesses from another company were conducted in person on May 8, 2024. A call with the warehouse cleaner employed by the oil company was conducted on May 10, 2024. The police, coroner, and fire department reports, with employee statements, were received and reviewed.

EMPLOYER

The company that hired the victim (a self-employed contractor) manufactured vehicle and motorcycle motor oils and other lubricating products. The company had five full-time employees and hired the victim periodically over the last 13 years specifically to service, repair, and maintain the motor oil tanks. On the day of the incident, two of the company's full-time employees were onsite in the vicinity of the oil tank — the supervisor and the warehouse maintenance worker. Two other employees from a different company were also onsite at the time of the incident.

WRITTEN SAFETY PROGRAMS and TRAINING

The company did not have a health and safety program, policies, procedures, or standard operating procedures (SOPs) to perform work in the motor oil tank. They did not have a chemical hazard communication or confined space entry and rescue program. The oil company's full-time employees were trained in forklift operation and site evacuation in case of fire or earthquake. The victim did not receive any training from the oil company.

WORKER INFORMATION

The victim was a 54-year-old male welder and independent contractor. According to the oil company's owner, the victim had been hired by the oil company periodically to maintain the motor oil tank. His typical job duties included installing, repairing, and servicing the tank. On the day of the incident, the victim was to repair one of the blades inside the tank. The victim's primary language was English.

INCIDENT SCENE

The incident scene was an empty motor oil tank located at an oil manufacturing facility (Exhibit 1). The tank was 20 feet high by 10 feet wide and was used to prepare motor oils. The tank did not have a ladder, and the only entrance was through a manhole located on the top of the tank. There were no confined space warning signs on or around the tank.

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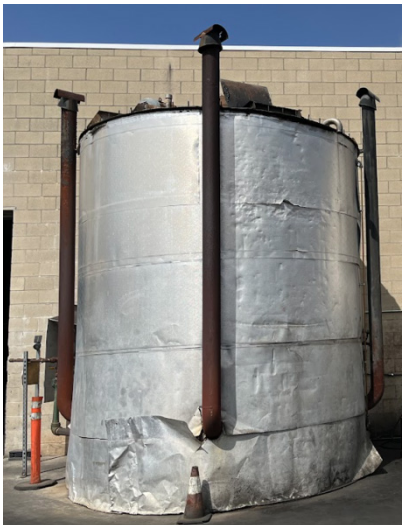

Exhibit 1: Exterior of the oil tank. Photo courtesy of the CA/FACE program.

WEATHER

The weather on the day and time of the incident was approximately 68 degrees Fahrenheit, with an average wind speed of about 5.0 mph [Weather Underground]. The weather is not believed to have been a contributing factor in this incident.

INVESTIGATION

A few days prior to the incident, an oil company employee (oil mixer) noticed a bolt came through a hose, indicating that a blade inside the tank may have come loose (Exhibit 2). The victim was called by the oil company to inspect and repair the blades. On the day of the incident, the motor oil tank was empty, and

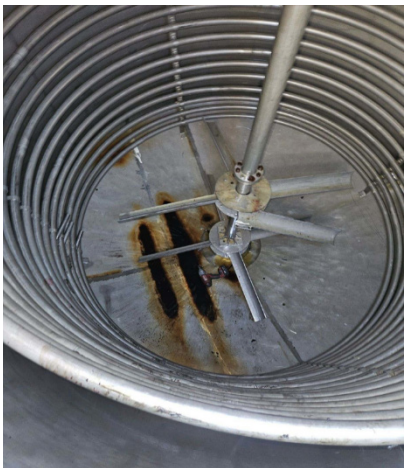

Exhibit 2: Blades inside the motor oil tank. Photo courtesy of the oil company.

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power to the blades was turned off. The victim arrived at the facility at approximately 10:00 a.m. The victim's primary task that morning was to inspect and secure the blades inside the tank. A warehouse cleaner used a forklift with a steel cage to lift the victim to the top of the tank. The victim entered the tank through the manhole and climbed down the pipes inside the tank to reach the bottom.

The victim inspected the work area and told the warehouse cleaner that he was slipping on the oil residue left at the bottom of the tank. The victim requested a liquid product to remove the oil residue. The cleaner gave the victim a 5-gallon container (product name unknown) that contained methylene chloride that had been purchased more than 1.5 years prior to the incident and was stored onsite. There was a warning label on the outside of the container (Exhibit 3). Based on the police report, the warehouse cleaner mentioned to the victim that the container was almost empty and an alternative procedure to clean the oil tank (self-heating system to evaporate the residual oil) could be used instead. However, this procedure was not implemented on the day of the incident, and the victim used the product with methylene chloride. According to the warehouse cleaner, the victim used approximately two cups of the methylene chloride product to clean the bottom of the tank.

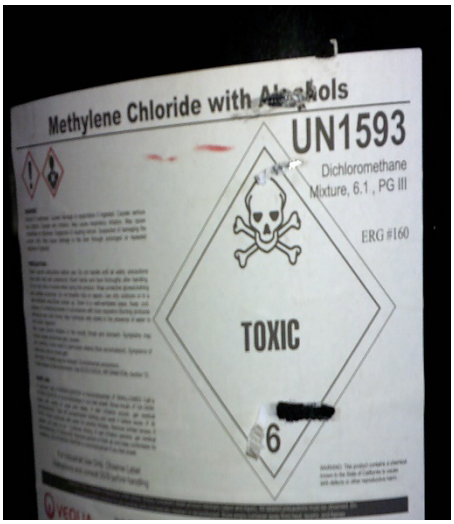

Exhibit 3. Label on the outside of the container. Photo courtesy of the police department.

At approximately 11:20 a.m., the victim exited the oil tank and told the warehouse cleaner he was feeling lightheaded and asked him to get his respirator from his truck. The victim put on a half-face respirator that appeared in police photographs to have organic vapor cartridges and went back inside the tank to continue maintenance. The police report stated that the victim banged on the side of the tank to communicate with the warehouse cleaner when he was inside the tank. The warehouse cleaner then banged multiple times on the side of the tank without getting any response back. He immediately notified his supervisor. The warehouse cleaner asked his supervisor to lift him to the top of the tank so he could get a visual of the victim. He looked through the manhole and saw the victim unresponsive at the bottom of the oil tank. The cleaner immediately

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went inside the oil tank trying to get the victim to wake up. Soon after, the cleaner started feeling lightheaded and was having trouble breathing so he climbed out of the tank. His supervisor called 911.

According to the police report, police officers arrived on the scene at 11:42 a.m. They were dispatched to respond to a man down inside an oil tank. Multiple fire engines and personnel responded and arrived on the scene at 11:46 a.m. Emergency responders, along with the employees of the oil company, used a forklift, tie-down straps and a cage to successfully extract the victim (Exhibit 4). The victim was pronounced dead at the scene at 12:29 p.m.

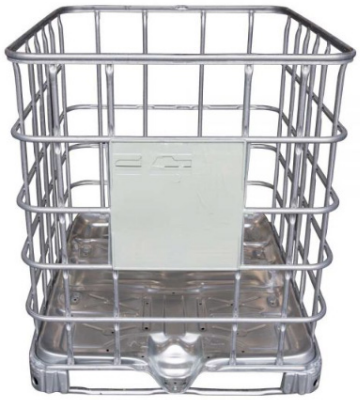

Exhibit 4: A steel cage like the one used to lift the victim up and down with a forklift. Photo courtesy of Global Industrial.

CAUSE OF DEATH

According to the county coroner, the cause of death was effects of methamphetamine. Post-mortem blood toxicology studies showed the methamphetamine level was 2.9 ug/mL, and the dichloromethane (methylene chloride) level was 25 mcg/ml. The level of carboxyhemoglobin was < 10% saturation.

The level of methylene chloride on the post-mortem autopsy in this case is similar to the levels that have been found in other work-related acute deaths from this chemical, including CA/FACE investigations of previous fatalities. Therefore, it is likely that methylene chloride was a contributing factor to the cause of death.

CONTRIBUTING FACTORS

Occupational injuries and fatalities are often the result of one or more contributing factors or key events in a larger sequence of events that ultimately result in the injury or fatality. CA/FACE investigators identified the following unrecognized hazards as key contributing factors in this incident:

- Using a product containing methylene chloride to remove the oil residue at the bottom of the tank
- Lack of hazard assessment, which would have identified the motor oil tank as a permit-required confined space. There was no confined space entry and rescue procedures, including SOPs, monitoring data, control measures, and worker training

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- Lack of a chemical hazard communication program for employees and contractors
- No respiratory protection program was developed and implemented
- Lack of general safe work practices and instructions to communicate hazards and protective measures

RECOMMENDATIONS/DISCUSSION

The CA/FACE investigator concluded that, to prevent similar incidents, oil manufacturing companies should:

Recommendation #1: Avoid purchasing, storing and/or using products that contain methylene chloride.

Discussion: Methylene chloride is an extremely volatile chemical that evaporates readily when sprayed, brushed, or poured, and the chemical vapors build up quickly in the air. Moreover, because methylene chloride vapors are heavier than air, very high levels will collect in the lower spaces of a confined space such as a tank. Methylene chloride enters the body when inhaled and it can be absorbed through unprotected skin. It can immediately irritate the eyes, nose, and throat. Symptoms of acute exposure to methylene chloride include dizziness, fatigue, headaches, weakness and irritation of the upper respiratory tract and eyes. At high levels methylene chloride can act as an anesthetic and switch off the respiratory centers of the brain. In the body, methylene chloride is metabolized to carbon monoxide which binds with hemoglobin and interferes with the blood's ability to carry oxygen. Methylene chloride can also starve the heart of oxygen, causing a myocardial infarction (heart attack).

The immediately dangerous to life or health (IDLH) exposure limit for methylene chloride is 2300 parts per million (ppm). In this case, the victim used approximately 2 cups (473 milliliters) of the product inside the tank. Assuming the product contained 60% methylene chloride, the estimated concentration of methylene chloride inside the tank was 2437 ppm, above the IDLH level for methylene chloride. The toxicology report after death found 25 micrograms per milliliter (mcg/mL) of methylene chloride in the victim's blood. This level of methylene chloride is consistent with the levels that have been found in other workplace fatalities. The carboxyhemoglobin level was < 10% saturation indicating that there was not a very high level of interference with oxygen delivery to his tissues. In many cases of immediate death due to methylene chloride vapors, the carboxyhemoglobin level was less than 10% saturation. In these cases, it is likely that methylene chloride acts directly on the brain as an anesthetic, and/or causes the amount of oxygen in the workplace air to be reduced. In addition, the victim had methamphetamine in his body on post-mortem testing. It is possible that methamphetamine may have made the victim more susceptible to the effects of methylene chloride by causing his heart to have an irregular heartbeat (ventricular tachycardia) that led to his death.

At the time of this incident, companies were permitted to purchase methylene chloride for commercial use. The oil company and the victim may not have been aware of Environmental Protection Agency (US EPA) rulemaking warning of the dangers of methylene chloride that was published in 2019. At that time, the US EPA issued a final rule to prohibit the manufacture (including import), processing, and distribution of methylene chloride for consumer paint and coating removal. This rule was issued because of the acute fatalities that resulted from exposure to the chemical in consumer paint and coating removal. After November 22, 2019, all persons were prohibited from manufacturing (including importing), processing, and distributing in commerce,

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including distribution to and by retailers, methylene chloride for consumer paint and coating removal. In May 2024, the US EPA issued a final rule that requires companies to rapidly phase down manufacturing, processing, and distribution of methylene chloride for all consumer uses and most industrial and commercial uses. Consumer use will be phased out by 2025, and most industrial and commercial uses will be prohibited by 2026.

It is not known why the oil company had methylene chloride stored on site in a large drum, but it may have been used for various degreasing tasks. The victim also may not have been aware of the dangers of using methylene chloride inside the tank, especially if he had used this chemical without incident in the past. If the oil company and the victim had been aware of the dangers of using methylene chloride in an enclosed space, a safer alternative (such a product containing benzyl alcohol) and/or the self-heating system may have been used to remove the oil residual inside the tank.

Recommendation # 2: ***Ensure oil tanks are identified as confined spaces, and a permit required confined space program is implemented if methylene chloride is used inside the tank***

Discussion: In this incident, the victim was hired by the employer to perform repairs in a confined space. As the host employer, they should have ensured that all the elements of a confined space program were implemented. A confined space is defined as (1) is large enough so an employee can bodily enter and perform assigned work; and (2) has limited or restricted means for entry or exit; and (3) is not designed for continuous employee occupancy. The oil tank was considered a confined space, which becomes a *permit required confined space* if it meets all three of the requirements of confined spaces and has one or more of the following characteristics (1) Contains or has a potential to contain a hazardous atmosphere; (2) Contains a material that has the potential for engulfing an entrant; (3) Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross-section; or (4) Contains any other recognized serious safety or health hazard. In this incident, the oil tank had the potential to contain a hazardous atmosphere due to the presence of methylene chloride vapors.

If entrance to an oil tank is necessary, employees must follow established confined space entry procedures and include fall protection programs as deemed pertinent. Warning signs to alert workers of the hazards associated with confined spaces should be posted at all entrances. Ideally, an oil tank should be ventilated, and the atmosphere within the tank should be tested prior to entry and monitored continuously while work is being performed. These procedures also include the presence of an attendant stationed outside the tank in direct contact with the worker inside the tank and a supervisor. A viable rescue plan must be established, discussed, and understood by workers before entry into the oil tank. Personnel attempting rescue operations within a confined space should be properly equipped and trained in the use of the equipment and methods required for rescue.

In this incident, an oil company employee went inside the tank to rescue the victim. No rescue plans were in place, no proper respiratory protection was used. He could also have collapsed inside the tank. Therefore, employers and/or independent contractors should develop and implement a confined space entry program as

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outlined in the Cal/OSHA confined spaces standards when personnel are required to enter confined spaces. If the victim and /or the lubricating oils manufacturer had a confined space program for workers performing maintenance, repair, or any work inside the oil tank, they would have used the proper procedures to safely perform the repair work, and this incident may have been prevented.

Recommendation #3: Ensure a chemical hazard communication program is developed, implemented, and maintained for employees and contractors working onsite.

Discussion**:** Employers should develop, implement, and maintain a chemical hazard communication program when any hazardous chemical is known to be present in the workplace and employees and/or contractors may be exposed under normal conditions of use or in a reasonably foreseeable emergency resulting from workplace operations. The program should include information about inventory, labeling, safety data sheets (SDS) and training plans to ensure employees know what chemicals available, and what dangers are present. If such a communication program was developed and implemented, the victim and oil company employees would have recognized and understood the hazards of using methylene chloride and may have chosen an alternative product and this incident would have been prevented.

Recommendation #4: If a product containing methylene chloride is used, the work area must be well ventilated, and a supplied-air respirator and polyvinyl alcohol (PVA) or Viton gloves must be worn.

Discussion: Employers should ensure that a written SOP is in place, and appropriate engineering controls and personal protective equipment (including compatible gloves) are available before using products containing methylene chloride. In this case, the oil tank was not well ventilated. The methylene chloride vapors should have been continuously flushed out of the tank by using a mechanical fan to provide clean air. In addition to effective ventilation, an appropriate full-face air supplying respirator should have been worn when working in the tank, especially if the methylene chloride concentration exceeded or could have reasonably exceeded the exposure limits. Since methylene chloride can induce skin irritation, hand protection is required when handling the product. PVA or Viton gloves are well suited for application with this chemical. In this incident, the oil company employee entered the tank to rescue the victim. He could also have died since proper controls were not in place. If the victim had set up an effective ventilation system, used a supplied-air respirator and gloves, this fatality may have been prevented.

Recommendation #5: ***Employers with fewer than ten employees should develop, implement, and maintain a log of instructions to communicate hazards and protective measures unique to job assignments.***

Discussion: Employers, regardless of the size of their workforce, have a legal obligation to provide a safe workplace for their employees. This includes implementing safety protocols, training employees, and ensuring compliance with relevant regulations. Employers should provide specific instructions related to hazards unique to each employee's job assignment. These instructions should cover safety procedures, emergency protocols, and protective measures. For smaller employers (fewer than ten employees), substantial instruction can be provided without extensive paperwork. However, maintaining a log of instructions is still essential. Host employers are responsible for communicating potential job hazards to employees and contractors as well as any precautions or procedures implemented when work is performed on-site. Independent contractors should

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coordinate any work with the host employer and adhere to health and safety procedures to protect themselves and others working in or near the area of concern. Lack of documentation related to general safe work practices, no proper training records, and the absence of documented instructions may result in compliance issues and potential safety risks.

DISCLAIMER

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REFERENCES:

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California Code of Regulations, Title 8, General Industry Safety Orders Group 16. Control of Hazardous Substances Article 109. Hazardous Substances and Processes §5194. Hazard Communication

California Code of Regulations, Title 8, General Industry Safety Orders Group 16. Control of Hazardous Substances Article 110. Regulated Carcinogens §5202. Methylene chloride.

California Code of Regulations, Title 8, General Industry Safety Orders
Group 16. Control of Hazardous Substances Article 107. Dusts, Fumes, Mists, Vapors and Gases §5144. Respiratory Protection.

California Code of Regulations, Title 8, Subchapter 7. General Industry Safety Orders
Group 1. General Physical Conditions and Structures Orders §3203. Injury and Illness Prevention Program
Hoang A, Fagan K, Cannon DL, et al. Assessment of Methylene Chloride–Related Fatalities in the United States, 1980-2018. *JAMA Intern Med.* 2021;181(6):797–805.

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