

TO: Director, National Institute for Occupational Safety and Health

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

SUBJECT: Forklift operator dies when his straddle fork overturns and crushes him in California

SUMMARY
California FACE Report #99CA009

A 49-year old male forklift operator (decedent) died when the canopy of a straddle fork that overturned crushed him. A straddle fork is a forklift-like machine that has forks for lifting fruit bins up to a hydraulic stacking system on the front of the machine and straps that come over the top to secure the bins. The decedent was moving bins of lemons during harvest. He was moving the bins from the orchard to an area where they were later retrieved by hydraulic trailer. The decedent decided to move four bins of lemons down a hill using the straddle fork. This was not an area in which the straddle fork was intended to be operated. As he was traveling down the hill, the straddle fork picked up speed and went off the road into a ravine. The straddle fork had no seat belt and the decedent was thrown from the operator's seat. The employer had no operator's manual for the straddle fork. Training documentation was available but it did not specifically address emergency actions necessary to regain braking control. The employer had a written Injury and Illness Prevention Program (IIPP). The CA/FACE investigator determined that, in order to prevent future occurrences, employers should as part of their Injury and Illness Program:

- Ensure straddle forks are equipped with seatbelts for the use of the operator.
- Ensure straddle forks are equipped with a rollover protective structure (ROPS).
- Ensure employees are formally trained in all aspects of straddle fork use including emergency procedures.
- Ensure employees operate machinery only in their designated areas.
- Provide an operator's manual with the equipment and use it for training purposes.

Additionally, manufacturers should:

- Design straddle forks with properly engineered rollover protective structures and equip them with seatbelts.

INTRODUCTION

On June 28, 1999 at approximately 5:15 p.m. a 49-year-old male forklift operator was fatally injured when the canopy of a straddle fork that overturned crushed him. The decedent was operating the straddle fork down a hill when it picked up speed and went into a ravine beside the road when it failed to negotiate a curve. The CA/FACE investigator learned of this incident on July 29, 1999 from the local legal office of the California Department of Industrial Relations, Division of Occupational Safety & Health (Cal/OSHA). On August 2, 1999 the CA/FACE investigator conducted a phone interview with the Cal/OSHA safety engineer and the company owner. On September 3, 1999 the CA/FACE investigator traveled to the main office where he interviewed the company owner and his son.

The employer is a farming operation that often transports produce for other farms. They had been in business for 10 years at the time of the incident. The number of employees in the company, although it varies with the agricultural season, was 150 at the time of the incident with one employee working on site. The decedent had worked for the company for 2 years at the time of the incident. He had worked on this particular farm during his entire 2-year employment and was familiar with the job. The decedent, according to the owner, had worked in the farming/produce transport industry from 15 to 18 years prior to his employment.

The company had a complete written Injury and Illness Prevention Program. They also presented a training document for forklift drivers. At the time of the incident, the employer did not have an operator's manual for the straddle lift. The owner stated that a representative of his workers' compensation insurance company conducted forklift-training classes once a year. The owner indicated that he was responsible for safety in the company. It is unknown if regularly scheduled safety meetings were held.

INVESTIGATION

The scene of the incident is a 400-acre farm that grows lemons commercially. The lemon groves are situated on a hill with a grade of approximately 7 to 8 percent. The trees are planted in rows. The pathways between the rows are stepped and the straddle fork moves between the rows to pick up bins that had been filled with lemons by pickers. The bins were offloaded at the edge of a paved road. This road was the one on which the decedent drove the straddle fork and was 23 feet wide.

The straddle fork used by the decedent was specifically designed for operation in orchards. It is used to deposit empty bins and pick up full bins. In this incident, it was used to pick up full bins of lemons. This is done by driving the straddle fork down the pathways between the rows and using forks on the bottom of the machine to engage a bin. The bin is placed on the automatic stacking device on the front of the machine. The straddle fork has a maximum capacity of 4 full bins. A securing device is used to keep the bins from falling.

On the day of the incident, it was the decedent's job to pick up the 1,000 pound bins filled with lemons and deliver them to a transport point approximately four tenths of a mile from the picking location. He could stack up to 4 bins on top of one another on the forks. The pickup point had been laid out with bolsters, square metal tubing on which the 4-foot by 4-foot bins were placed.

When the bolsters were full of bins, in this case 24 bins, a specially designed,

hydraulically actuated trailer would pick up the bins off the bolsters. The bins then would be transported for distribution to the packing or processing facility. The bolsters were located at the top of the hill at the edge of the paved road that the decedent later decided to navigate.

It is unknown why the decedent, who had 4 bins stacked on his straddle fork, decided to drive down the paved road. The road is steep, with a grade of between 7 and 8 percent. There is a turn of 90 degrees at the bottom of the hill.

It is unknown if the decedent drove the straddle fork down the hill forward or in reverse. With the bins stacked in front, reverse would be the appropriate direction of travel. Evidence indicates that the decedent was backing down the hill with the forks and bins following.

As the straddle fork continued down the grade, it picked up speed. The decedent most likely was swerving side to side as a number of lemons were lost on the paved roadway during the straddle fork's decent. As the straddle fork approached the 90-degree turn at the bottom of the hill, a witness estimated that it was going between 25 and 30 miles per hour. This is a two-wheel or four-wheel drive machine that has a top speed of 6 miles an hour in four-wheel drive and 12 miles an hour in two-wheel drive. It is unknown if the decedent had the straddle fork in four-wheel drive while descending the hill. The operator's manual indicates that four-wheel drive should be used on hills. It also indicates that no more than 2 bins should be used when traveling hills.

The straddle fork failed to negotiate the turn and went through a chain link fence. It fell into a ravine, approximately 20 feet deep, adjacent to the roadway. The straddle fork overturned, ejecting the decedent who was pinned under its canopy. Several workers and nearby residents saw or heard the crash and came to the decedent's aid. A resident who lives in a nearby home called 911. The paramedics arrived and pronounced the decedent dead at 5:35 p.m.

The straddle fork's engine may have lost its power. This particular straddle fork loses its braking system, because it loses its hydraulic power, when the engine loses power. The hydrostatic braking system is activated when the operator's foot is removed from the foot pedal for forward or reverse. The left foot pedal is used for forward (pressing down with toe) and reverse (pressing down with heel). The right foot pedal is for engine speed. The emergency procedure when engine power is lost is to pull the parking brake lever that locks the front disc brakes. In addition, an auxiliary pump is activated to regain hydraulic power. This is done automatically as long as the ignition key is left in the "on" position. The decedent may have tried to restart the engine and failed to return the key to the "on" position. It is unknown why the engine lost power if it, in fact did. It is also unknown if the parking brake was activated because no failure analysis was performed on the straddle fork because of the damage it sustained.

CAUSE OF DEATH

The death certificate stated the cause of death to be crushing chest and neck injuries.

RECOMMENDATIONS/DISCUSSION

Recommendation #1: Employers should ensure forklifts are equipped with seatbelts for

the use of the operator.

Discussion: The straddle fork involved in this incident was not equipped by the manufacturer with seatbelts. Employers should buy forklifts that are equipped with seatbelts. Because in overturn situations it is most often safer to stay in the machine, seatbelts, if missing, should be retrofitted by the employer for the protection of the operator. Unbelted operators have a high probability of being crushed by some part of the machine if it overturns and they are ejected. If the operator was wearing a seatbelt, this fatality may not have happened.

Recommendation #2: Employers should ensure forklifts are equipped with a rollover protective structure (ROPS).

Discussion: The straddle fork was not equipped by the manufacturer with a rollover protective structure. In the event a machine overturns, the ROPS is designed to protect the operator. It is designed to withstand a rollover without crushing. Employers should buy straddle forks equipped with a ROPS. If missing, a ROPS should be retrofitted in order to protect the operator in case of a rollover. If a ROPS had been installed on this straddle fork, and the operator was wearing a seatbelt, it is unlikely that this fatality would have occurred.

Recommendation #3: Employers should ensure employees are formally trained in all aspects of forklift use including emergency procedures.

Discussion: The employer provided general forklift training and certified his operators once a year using an outside contractor from his insurance company. However, specific training on the machines the operators had to use was not done. Emergency training was of paramount importance on the straddle fork involved in this incident since loss of engine power necessitates specific actions. If the engine did quit running or there is hydraulic motor failure, the procedure is to activate the parking brake, and keep the ignition switch in the "on" position. This allows the auxiliary pump to automatically activate so the machine maintains hydrostatic braking. If the engine did lose power and the decedent had been trained to institute emergency procedures and was able to perform them, he may have been able to slow down and avoid this incident.

Recommendation #4: Employers should ensure employees operate machinery only in their designated areas.

Discussion: The owner of the company stated that the decedent was out of his work area when the incident happened. He also stated that they have another machine that is used on hills, although if the work was carried out normally it would not have been needed in this instance. The operator's manual discourages using this model of straddle fork on hills, but offers precautionary measures if used on a hill. If the decedent had stayed in his work area and had not tried to negotiate the hill, this incident most likely would not have happened.

Recommendation #5: Employers should provide an operator's manual with the equipment and use it for training purposes.

Discussion: The employer did not have an operator's manual prior to the incident. It is

of paramount importance to obtain an operator's manual when purchasing new or used equipment. The operator's manual gives safety precautions, operating procedures, and often, important maintenance procedures for the specific piece of equipment. This is an invaluable training tool. If the decedent had been trained on the contents of the operator's manual and acted in accordance with its dictates, this incident may not have happened.

Recommendation #6: Manufacturers should design straddle forks with properly engineered rollover protective structures and equip them with seatbelts.

Discussion: The straddle fork involved in this incident was not equipped with a ROPS or seatbelts. Because of the possibility of overturn, ROPS and seatbelts should have been part of the design package when the machine was manufactured. The operator's manual included many precautions that, if not followed, could result in overturn. If this straddle fork had been manufactured with ROPS and seatbelts, this incident most likely would not have happened.

References:

Barclays Official California Code of Regulations, Vol. 9, Title 8, Industrial Relations, South San Francisco, 1998

Essentials of Material Handling, U.S. Department of Labor, Occupational Safety and Health Administration, 1978

Forklift Safety Training, *Professional Safety*, American Society of Safety Engineers, January 1993

The New Professionals, Rules for Safe Industrial Truck Operation, Clark Equipment Company, Battle Creek, MI, 1983

Straddle Fork, Kornylak Corporation, Hamilton, OH

Straddle Fork Operator's Manual, AG Automation, Camarillo, CA

Straddle Fork Pallet Bin Handler, AG Automation, Inc., Oxnard, CA

For general information regarding forklift operation and safety refer to:
<http://www.dir.ca.gov/title8/3328.html>; [/3650.html](http://www.dir.ca.gov/title8/3650.html); [/3651.html](http://www.dir.ca.gov/title8/3651.html); [/3653.html](http://www.dir.ca.gov/title8/3653.html); [/3664.html](http://www.dir.ca.gov/title8/3664.html). These safety orders may not specifically apply to this incident, but may be helpful in preventing future incidents.

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FATALITY ASSESSMENT AND CONTROL EVALUATION PROGRAM

The California Department of Health Services, in cooperation with the California Public Health Institute, and the National Institute for Occupational Safety and Health (NIOSH), conducts investigations on 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, Maryland, Massachusetts, Maryland, Minnesota, Missouri, Nebraska, New Jersey, Ohio, Oklahoma, Texas, Washington, West Virginia, and Wisconsin.

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

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