

FACE INVESTIGATION

SUBJECT: A 20 year old farmer dies after entering a silo recently filled with haylage.

SUMMARY:

A 20 year old white male college student who worked and lived on the family farm, died while working for a neighbor filling silo. This was the worker's fourth day at work, the farm had been in operation for 29 years. A load of fresh chopped haylage had been blown into the silo the night before the incident. The victim and the farm owner spent the morning inside the silo attempting to set up the silo unloader. According to the employer, a blower had been running in the morning primarily to cool the inside of the silo. The day was hot and muggy. They shut the blower system down at noon when they went to lunch. An hour later, the victim went up and entered the silo alone. Within minutes, the employer heard the victim cry out once and then heard nothing. The employer immediately called the EMT's who arrived 20 minutes later and went into the silo with self-contained breathing apparatus to effect a rescue. The worker was found face down inside the 64 foot silo 15 feet from the top (the silo was filled to 45 feet with haylage). CPR was done with no effect. A defibrillator provided a flat line reading. The body was removed by the fire department. When gas in air measurements were taken 4 hours after the incident, the door to the silo was open and a slight breeze was blowing. At that time oxygen level was 21%, methane 280 parts per million. The Wisconsin FACE investigator concluded that, in order to prevent future similar occurrences, employers should:

! Farm owners should become familiar with the hazards of silos as confined spaces and adopt written safety procedures for working in and around silos. All personnel need to be trained in these procedures and required to use them.

! Warning signs should be posted on all confined spaces. The procedures for entry should be posted where workers can see them.

! Ventilation equipment should be used prior and during all entry into silos.

! Farmers need to plan the work process with worker safety a priority. The plan should include having a 2 week supply of animal food available so the haylage in the silo has 2 weeks to off-gas before anyone enters.

INTRODUCTION:

On June 11, 1992 a 20 year old student who lived on the family farm, died while working for a neighbor fill silo. An Occupational Safety and Health inspector had seen an article in the newspaper and notified the FACE program on July 1, 1992. A death certificate was obtained as were reports from the sheriff's department and the county coroner. The sheriff was interviewed in person, the employer was interviewed on the phone. The FACE investigator viewed this farm and the silo on it from the road while in the area

doing another FACE investigation. Permission has not been obtained to enter the farm and a later phone call resulted in an interview over the phone but no on-site visit was made. The University of Wisconsin Department of Agricultural Engineering was asked to review the factors that lead to this death with the FACE director and provide assistance with developing preventive strategies.

The employer in this incident is a farmer who has been farming for 53 year, 29 years at the site where the death occurred. The worker had worked for him 4 days and was the only employee. The farmer sees himself as the safety officer. There are no written safety rules and procedures and there is no formal safety training provided. The employee was shown the job by the farmer as they worked together. The farmer reports that the victim was following the standard operating procedure used at the farm.

INVESTIGATION:

The victim and the owner of the farm had worked inside the 65 foot cement silo filled to 48 feet with haylage the morning of incident. The day was hot and muggy and a blower had been running all morning to keep it cool and ventilated. When they stopped for lunch, they turned the blower off and were away from the area for about an hour. When they returned, the victim went alone into the silo to start repair work on the auger. The blower was not re-started. The farmer was outside of the silo and heard the victim cry out once and then could get no verbal response. He immediately called to his wife to call the EMT's who arrived with self-contained breathing apparatus and entered the silo to rescue the victim. They attempted CPR, connected him to their defibrillator and received a flat line, continued CPR for a period of time with no response and then discontinued CPR. With the help of fire department personnel and a 100 foot aerial ladder, the victim was moved to the hospital where he was pronounced dead.

CAUSE OF DEATH: Asphyxiation secondary to silo gases

RECOMMENDATIONS/DISCUSSION:

Recommendation #1: Farm owners should become familiar with the hazards of silos as confined spaces and adopt written safety procedures for working in and around silos. All personnel need to be trained in these procedures and required to use them.

Discussion: Testing and monitoring of the air quality, ventilation, appropriate use of personal protective equipment, method of communication and rescue methods must be understood, written, taught to workers and the policy must be enforced. The NIOSH " A Guide to Safety in Confined Spaces 87113 should be used by the farmer to guide policy writing.

Recommendation #2: All confined spaces should be clearly posted and procedures for entry should be posted where workers can see them.

Discussion: The nature of farm work and the equipment used is so varied that farmers should use effective signs to help remind themselves and their workers of highly dangerous situations. Moreover the sign should include key information for safe procedure.

Recommendation #3: Ventilation equipment should be used prior to and during entry into silos at all times.

Recommendation #4: Farmers need to plan the work process with worker safety a priority.

Discussion: The plan should include: a decision not to make haylage when a wet period was preceded by dry conditions; having a 2 week supply of animal food available so that the haylage in the silo has 2 weeks to off-gas before anyone enters the silo to set up the unloader.

The following recommendations were offered by the University of Wisconsin Department of Agricultural Engineering. Highest priority recommendation is to stay out of the silo. Silos may have silo gas (nitrogen dioxide) present for up to 2 weeks after filling a silo. Farmers should maintain an alternative feed supply for use during this time so that they do not have to enter the silo. Nitrous oxide/nitrogen dioxide are more likely to form in plant material after a wet period that was preceded by dry conditions. Farmers should not fill a silo under these conditions. Silo gas can be measured by sampling tubes and meters. Farmers should also be aware that nitrogen dioxide has a yellowish brown color and has a bleach like odor, usually occurs 48 hours after filling has started and can exist for up to two weeks. Silo blower should be used to ventilate silos before entry. The UW reviewers did not find practical a recommendation to teach workers to know when and how to use appropriate personal protective equipment because this would require EMS level training and owning self contained breathing apparatus. The time and cost would be prohibitive.