

### **Preventing serious injuries and fatalities in managing bunker silos and drive-over piles**

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**Introduction.** In 2016 approximately 50 million metric tonnes of silage was produced in Brazil and 148 million metric tonnes in the USA. Few farming operations invite as many different opportunities for a serious injury or fatality as a silage program. Beginning with harvesting the forage in the field, followed by transporting the chopped material to the farm and placing it into storage, and subsequent feeding of the silage, employees and bystanders are exposed to numerous serious risks in every silage program. Silage-related tragedy knows no age boundary as persons of all ages have been injured or killed during silage harvest and feed-out. Although silage injury statistics are not easily collated, countless stories are told of PTO and harvest machine mishaps, highway collisions between farm equipment and automobiles, entanglements in self-unloading wagons and blowers, as well exposure to silo gas. Increasingly, stories about silage accidents involve bunker silos and drive-over piles (Bolsen and Bolsen, 2012 and Bolsen et al., 2015). Consistently protecting employees, equipment, and property in a silage program does not occur without thought, preparation, and training. The silage industry has nothing to lose by practicing safety but it has everything to lose by not practicing it. The objective is to present hazards encountered in managing silage coupled with case studies involving these hazards.

**Materials and methods** Three hazards in managing bunker silos and silage piles are: run-over by or entangled in machinery, fall from height, and buried by collapsing silage. A detailed account of case studies involving the hazards and ways to avoid each one are presented.

### **Results and discussion**

*Entangled in machinery.* A 55-year old man died in the night of March 29, after having his leg crushed in a forage chopper, used for silage making (Aconteceu no Vale, 2016). The accident occurred in the city of São João do Oriente, Minas Gerais State, Brazil. According to the local Fire Department, the victim, Lione José de Souza, tried to unclog the forage harvester using his foot. The machine was turned on and pulled the man's leg into the chopper, and he was entangled for about an hour. He was rescued alive, after the machine was dismantled, and taken to the hospital in Ipatinga. In spite of having his leg amputated, he succumbed to the injuries and died that night. Data collected on the Internet present another 16 cases of death in silage harvesting machinery in the last 2 years! Guidelines to reduce the chance of a similar accident include: 1) stopping the harvest machine and waiting for the cutter head to come to a complete stop before unplugging and 2) wearing snug-fitting clothes.

*Fall from height.* Alisdair Davidson was working with his father, William Davidson, on January 26, 2013 at Poldean Farm, Moffat, Scotland (Daily Record, 2014). At about 2:00 pm they accessed the silage shed via the rear door and walked along the top of the silage to the front of it. They began to remove the sandbags and peel back the plastic sheets. Alisdair was about 3 meters from the edge of the silage completing his work with the sandbags. William had taken hold of the top black sheets and was engaged in pulling them back. Alisdair was busy with his own task and did not directly see what led his father to lose his balance and fall. When he heard his father shout and looked, it appeared likely that William's feet become entangled in the sheets, and he toppled over the edge of the silage pile. He fell about 5 meters, striking his head on the concrete floor below. William died instantly. Guidelines to reduce the chance of a similar accident include: 1) installing guardrails on above ground level walls, 2) when removing plastic or oxygen-barrier film, tires, tire sidewalls or gravel bags, use caution and wear a safety harness tethered with a heavy rope or cable, 3) never standing closer to the feed-out edge than the height of the silage face, 4) use equipment operating from ground level to remove spoiled silage.

*Buried by collapsing silage.* On January 13, 2014, Jason Edward Leadingham was working in a bunker silo when a massive amount (10 to 15 tonnes) of maize silage collapsed on him (Tucker, 2014). Jason's body was not recovered from the silage until about 2 to 3 hours later, and it was determined that he died of mechanical asphyxia. He was clutching silage in his hands and had silage in his mouth, which suggest that Jason struggled to survive in the final moments of his life. The farm had no silage safety policies and procedures. In Brazil, a 9 y.o boy and his sister were playing in a bunker silo when the face collapsed. He died in the hospital (G1 Sul de Minas, 2016). Guidelines to reduce the chance of a similar accident include: 1) never allow people to approach the feed-out face, 2) never stand closer to the feed-out face than three times its height, 3) suffocation is a primary concern and a likely cause of death in any silage avalanche, so follow the 'buddy rule' and never work alone in a bunker or pile, 4) exercise caution when removing covering materials near the edge of the feed-out face, 5) never park vehicles or equipment near the feed-out face, 6) post warning signs, 'Danger! Silage Face Might Collapse', around the perimeter of bunkers and piles, and 7) never think an avalanche cannot happen to you.

**Conclusions** The global silage industry has a long way to go to before these senseless fatalities and serious injuries are eliminated. Every beef and dairy cattle operation should have written safety policies and procedures for their silage program and schedule regular meetings with their employees to discuss safety. If a silage program is not safe, nothing else about it really matters.

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