THE UNIVERSITY OF IOWA
Iowa City, Iowa 52242

TO: Director, National Institute for Occupational Safety and Health

FROM: Iowa FACE Program Case No. 01IA005 Report Date: July, 2001

SUBJECT: Farmer Caught and Killed by Input Shaft of Roller Mill.

SUMMARY

A 64-year-old Iowa cattle farmer was killed when his hooded sweatshirt became entangled in the power shaft of a roller mill, which was grinding corn. The roller mill was powered from a 15 kW (20 hp) electric motor via two V-belt transmission pulleys and a power take off shaft approximately 50 mm (2") in diameter. This shaft was connected to the mill power intake shaft by a U-joint on the side of the mill. A protective master guard over the U-joint had evidently been removed in the past, leaving this joint exposed. There were no witnesses to the event, and from the circumstances, it appeared possible that the man slipped and/or fell onto the rotating shaft. There was no obvious reason for him to be in that position near the roller mill. There was an oilcan on the floor, which could have been used at the time for oiling chains, but the chains were on the other side of the mill. The controls for the incoming and outgoing corn were on the other side of the mill as well. The were nine sacks of feed next to the door, close to the mill, and there were several objects on the floor and around the space next to the mill where the victim would have been standing. It is possible that he stepped on or was caught by something, which made him loose his balance. The farmer died from cervical fractures.

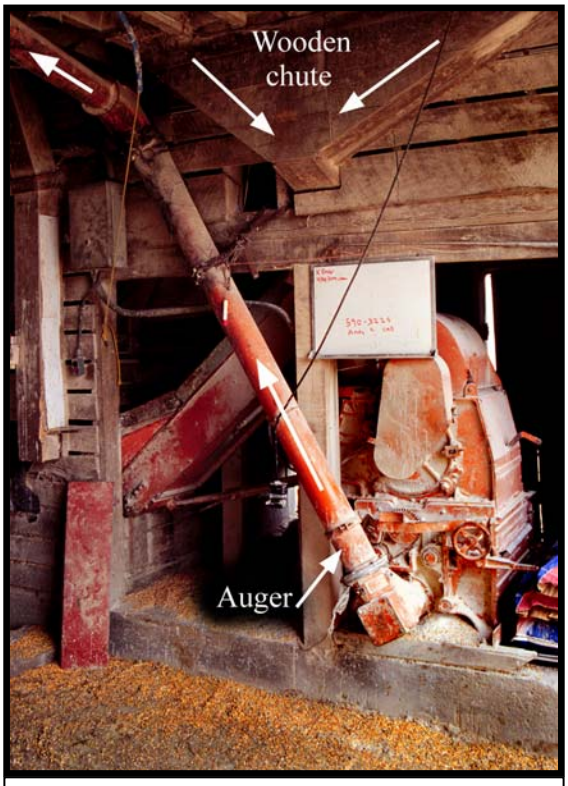

Photo 1 -- View of roller mill from inside the corncrib showing gravity-fed chute and auger.

RECOMMENDATIONS based on our investigation are as follows:

- *Moving machinery parts such as belts, pulleys, chains, gears, and shafts, must be guarded to protect workers*
- *Good housekeeping practices should be followed to maintain work areas in safe condition.*

INTRODUCTION

In January, 2001 a 64-year-old cattle farmer was killed while checking on a roller mill that was operating at his farm. The Iowa FACE program was notified of the incident a few weeks later by the State Medical Examiner, and an investigation was initiated. Information was received from the County Sheriff, who also had taken photographs. A site visit was conducted in April, 2001 by two Iowa FACE investigators. We talked with the victim's son, who worked on the farm and first found his father entangled in the roller mill. We took photographs of the machine, the building, and grain bins in the area.

Photo 2 -- View of corncrib door with mill immediately inside.

The victim was a life-long farmer in a family cattle operation. The farm had 245 ha (600 acres) of corn, beans, and alfalfa, and capacity to feed 800 head of cattle. There were 2-3 employees on the farm consisting of family members, but the farmer was working alone on the day of his death.

There was no specific safety program in existence at the farm. Safety concerns were discussed as they came up, and there were no written procedures or formalized training. The farmer was very familiar with the roller mill, having used it daily.

INVESTIGATION

The roller mill was installed as a stationary machine on the ground level of a wooden old corn crib where shelled corn was stored (see photo). Four times each day the roller mill would be started to grind about 0.75 m^3 (1 cubic yard) of corn to feed cattle. Shelled corn was gravity-fed from storage on the second level through a wooden chute directly to the top of the roller mill. Then ground corn was sent through an auger to a grain wagon parked next to the mill inside the corn crib.

The roller mill was purchased new 20 years earlier, and was always in its present location It was powered by a 15 kW (20 hp), 3-phase electric motor through a V-belt transmission; a smaller pulley on the motor and a larger pulley on the power shaft driving the mill (see photo). The ~50 mm (2”) diameter shaft was covered by a guard but the U-joint and shear bolts section attached to the mill power intake shaft was exposed for about 250 mm

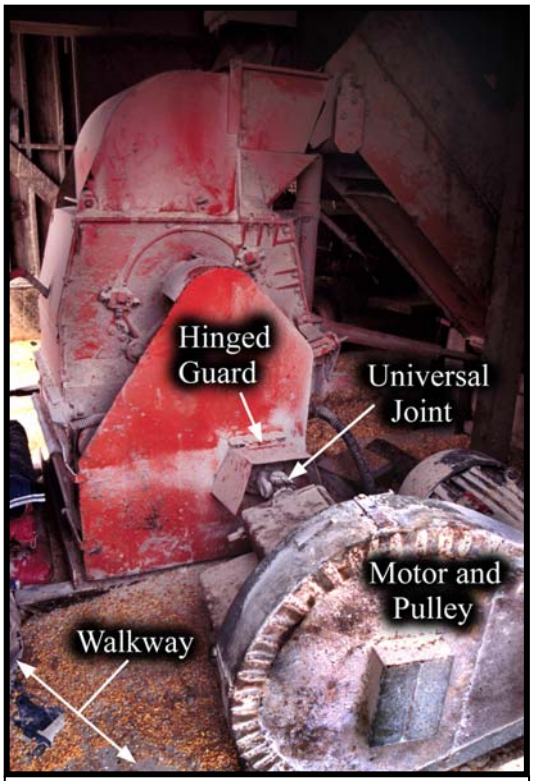

Photo 3 -- Mill as seen from side doorway.

(10“) on the side of the mill. During the investigation visit, this U-joint section of the shaft had a metal master guard hinged above it, to shield the joint from debris, and protect from accidental contact with the spinning U-joint. At the time of the injury, the photographs suggested that the cover was missing.

When the farmer was found, the roller mill had stalled and tripped a breaker, yet corn continued to fall from the overhead bin, burying the victim. The man's son noticed the problem, tore off the outside door of the building, and soon found his father buried under the corn and wrapped up in the universal joint. When he was dug out, it was evident that the strings on the man's hooded sweatshirt had become caught by the spinning U-joint, which pulled the man head-first into the spinning joint, causing cervical fractures. The man was obviously dead at the scene, and photographs were taken by the County Sheriff before he was extricated from the machine.

Photo 4 -- View of roller mill from inside corner of corncrib.

An oilcan was found buried in the corn, and it was suggested that the farmer may have been servicing the machine prior to the accident. This is possible, for there are many chains and moving parts on the opposite side of the roller mill. However there are no serviceable parts on the side of the mill where he became entangled. The mill did not appear to malfunction, and the V-belts did not appear to be slipping, which could have possible caused maintenance work on this side of the mill. There would be no obvious reason for his head or neck to be close to the exposed and spinning shaft. There were various objects on the floor and 9 sacks near the door opening and the mill. It is possible that the man may have stepped on an object or slipped, tripped, or bumped against an object between the doorways, next to the machine, causing him to loose balance and fall.

CAUSE OF DEATH

The official cause of death from the Medical Examiner's report was, "*Cervical fracture at C1 + C2, due to clothing around neck pulled into power takeoff unit / machinery*"

RECOMMENDATIONS / DISCUSSION

Recommendation #1 *Moving machinery parts such as belts, pulleys, chains, gears, and shafts, must be guarded to protect workers.*

Discussion: The hinged guard over the universal joint appeared (from photographs) to be out of place at time of the incident The guard was in place during the investigation. The metal guard (see photo) was light duty and hinged on the top, with no other attachment points. This guard, if down in the operating position, would likely be adequate to help protect workers

from getting entangled in the rotating shaft. As this was a stationary machine, this shaft and the U-joint could have a more permanent guard, covering all sides of the shaft and the U-joint, and not only the top and the sides, as did the existing guard. This case underscores the fact that machine guards should always be left in place. Even if rotating machine parts are in an area unfrequented by workers, there is always the possibility of a worker slipping and/or falling into a dangerous area.

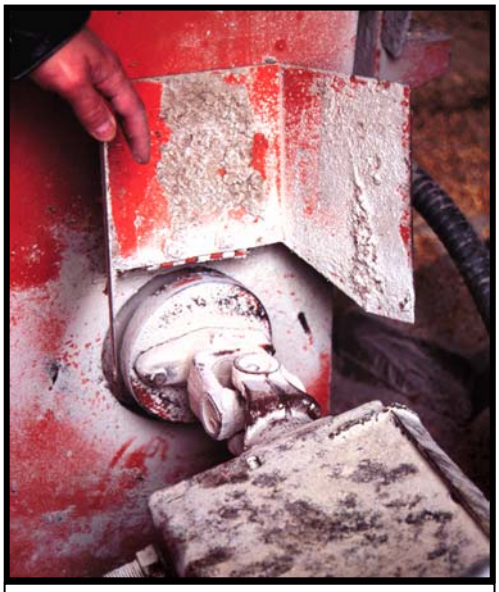

Photo 5 -- Close-up of universal joint and flimsy guard hinged above it.

Recommendation #2 *Good housekeeping practices should be followed to maintain work areas in safe condition.*

Discussion: The mill was located inside a corncrib building near a door opening where the feed wagon was parked during grinding and loading. On the other side of the mill, there was another door opening. There was adequate room to walk around the mill, and conduct maintenance and control of the mill, however, there were feed sacks, objects, corn, and dust around the floor and the area, making it more hazardous for the workers. This mill was used four times every day to grind feed for cattle. It was therefore a very frequently used work area, and such areas require frequent cleanup and housekeeping. It is possible that some objects on the floor or around the mill contributed to the worker loosing his balance and falling into the power shaft of the mill. Housekeeping is a basic requirement for safe working conditions in all work areas.

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Fatality Assessment and Control Evaluation

FACE

FACE is an occupational fatality investigation and surveillance program of the *National Institute for Occupational Safety and Health* (NIOSH). In the state of Iowa, *The University of Iowa*, in conjunction with the *Iowa Department of Public Health* carries out the FACE program. The NIOSH head office in Morgantown, West Virginia, carries out an intramural FACE program and funds state based programs in Alaska, California, Iowa, Kentucky, Maryland, Massachusetts, Minnesota, Missouri, Nebraska, New Jersey, Ohio, Oklahoma, Texas, Wisconsin, Washington, and Wyoming.

The purpose of FACE is to identify all occupational fatalities in the participating states, conduct in-depth investigations on specific types of fatalities, and make recommendations regarding prevention. NIOSH collects this information nationally and publishes reports and Alerts, which are disseminated widely to the involved industries. NIOSH FACE publications are available from the NIOSH Distribution Center (1-800-35NIOSH).

Iowa FACE publishes case reports, one page Warnings, and articles in trade journals. Most of this information is posted on our web site listed below. Copies of the reports and Warnings are available by contacting our offices in Iowa City, IA.

The Iowa FACE team consists of the following: Craig Zwerling, MD, PhD, MPH, Principal Investigator; Wayne Johnson, MD, Chief Investigator; John Lundell, MA, Coordinator; Lois Etre, PhD, Co-Investigator; Risto Rautiainen, MS, Co-Investigator.

Additional information regarding this report or the Iowa Face Program is available from:

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