
TO: Director, National Institute for Occupational Safety and Health

FROM: Iowa FACE Case no. 2009 IA 037 Report date: 10 October 2012

SUBJECT: Farmer caught in compression rollers of hay baler

SUMMARY

An 85-year-old farmer was caught in the compression rollers of a hay baler while baling cured hay on his farm in south central Iowa during the spring of 2009. He was seen by neighbors at approximately 11:45 AM, but when he did not arrive for lunch at 12:30 PM, his wife went out to the field and found him at the baler with both arms caught in the compression rollers. She ran to the house of a neighbor who called 911. Another neighbor, who was an emergency responder, heard the call on his scanner; he and his son arrived at the site and turned off the tractor and power takeoff (PTO), but the victim remained trapped. Rescue personnel arrived and while attempting to remove the victim determined he was not breathing. Rescue operations were stopped at 1:10 PM.

RECOMMENDATIONS

1. *Always disengage the PTO, set the brake, shut off the tractor, and pocket the key when dismounting a tractor that is attached to a baler.*
2. *Machine equipment users should identify in-running nip point hazards and understand the risks and how to control access to these locations.*
3. *Identify original and retrofitted machine guards and safety devices for all farming equipment currently in use and make sure they are installed.*
4. *Identify original and updated safety bulletins for existing farm equipment.*
5. *Before operating a piece of machinery, review the hazards associated with the operation of the machine.*

INTRODUCTION

Since his retirement over 20 years earlier, the victim had worked on his 20-acre family farm, which included two six-acre parcels of hay and corn. The morning of the incident the farmer was baling with his PTO-driven small round baler (Allis-Chalmers Roto-Baler). A neighbor had seen him baling at approximately 11:45 AM but the farmer did not return for noon lunch with his wife. By 12:30 PM, she went to the field and found him with his arms trapped in the baler, with both the tractor and baler running.

She went quickly to the house of a neighbor who called 911. Another neighbor who was an emergency responder heard the call on his scanner and ran to the scene with his son. They determined that the victim had no pulse or respiration and could not receive CPR as he was trapped face-down in the machine. They turned off the tractor and power takeoff and, after unsuccessfully attempting to extract the victim, waited for the emergency crew. Rescue personnel arrived, and attempted to remove the victim, and determined he was not breathing. Rescue operations were stopped at 1:10 PM.

Iowa FACE investigators were alerted to this incident by newspaper clippings and immediately initiated preliminary investigations. Additional information was obtained from the County Sheriff, first responders, and the Medical Examiner's Office. An interview was conducted within three months of the incident when an Iowa FACE investigator visited the site in late summer and interviewed the victim's spouse.

INVESTIGATION

An 85-year-old farmer was fatally crushed in spring 2009 when his arms were pulled into the compression rollers of a hay baler.

He was driving a Ford 901 PowerMaster pulling a PTO-driven small round baler (Roto-Baler) manufactured by Allis-Chalmers (Exhibit 1). Allis-Chalmers developed these balers in 1941 and they first came to the market in 1949 and were manufactured through 1974, with an estimated 74,500 units sold. This was a standard model manufactured pre-1970 (orange top, no "C" prefix on the serial number).

The farmer had purchased the Roto-Baler at a farm sale approximately 8 to 10 years before the event. Over the years, he had worked on this and other mechanical equipment, and his wife indicated he often purchased older machinery and fixed it up. Before his retirement 23 years earlier, the farmer worked in heating and air-conditioning repair, indicating a long life of working around mechanized equipment. The farmer had indicated to his family that this would be his last year of farming, and the family acknowledged that he had demonstrated reduced flexibility and balance in the month leading up to this incident, including more feet shuffling and leaning forward more than in previous years.

The family farm did not provide a significant source of income, but it did grow crops to feed their meat goats (approximately 20 per year sold at auction). Their 20 acres of irregular terrain was fenced into four areas, in addition to the farmstead located in the northeast corner, with two rectangular, six-acre fields usable for crops. In the field southwest of the farmstead where the incident took place, three acres were typically planted in grain (e.g., corn) and three in hay; during this season, the hay being cut and baled was a wheat-rye cross.

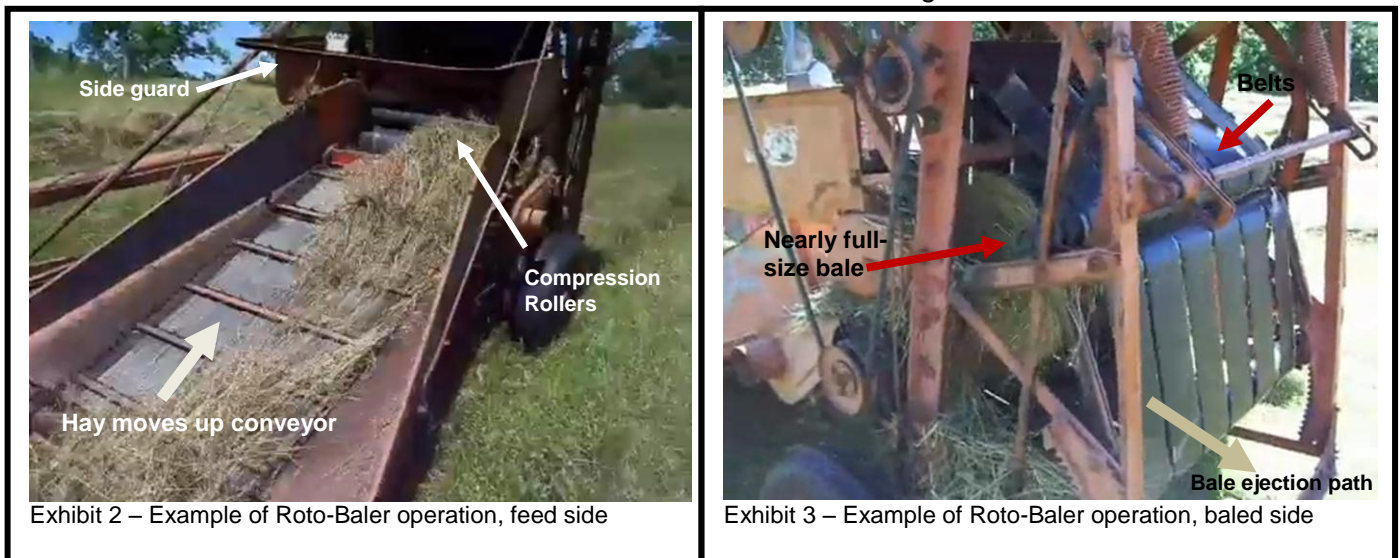
On the day of the incident, the farmer went to the field alone sometime in the morning. It was a clear day (92° F high), and he was wearing long khaki pants, short sleeved button-up shirt with a



Exhibit 1 – View of tractor and attached Roto-Baler involved in this incident

t-shirt underneath, and a straw hat. Unlike other farmers who cut and baled an entire field at once, he cut and cured portions of his field at a time, baling these small areas before cutting the next portion of the field. This process took weeks, but the victim was in no apparent hurry to finish the task.

Operation of this baler requires a tractor connection via a PTO. The baler is offset behind the tractor, so the driver looks left to align the baler with the cut hay. As the baler moves through cut hay raked into windrows, forks at the front lip pull the hay up a conveyor belt (Exhibit 2) to a rotating bar that feeds the hay between two compression rollers. A belt and roller system on the back side rolls the hay into small round bales (Exhibit 3). When the bale is the right size, the stringing mechanism automatically engages at which point the operator typically stops the tractor while twine wraps around the spinning hay bale. The bale is then automatically ejected from the back of the baler and the tractor and baler move forward again.



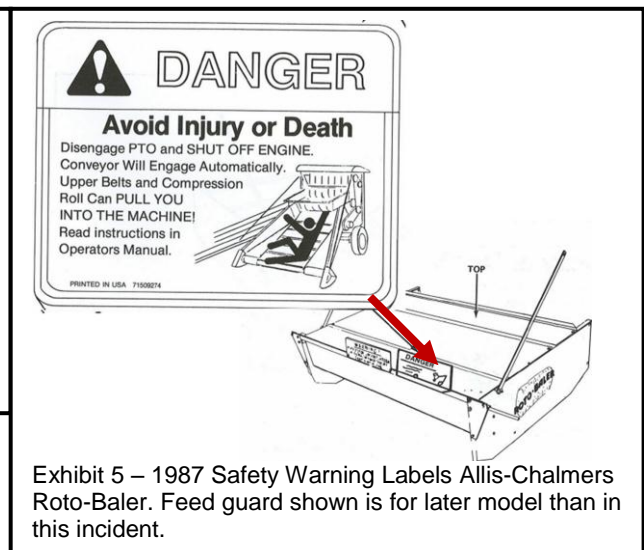
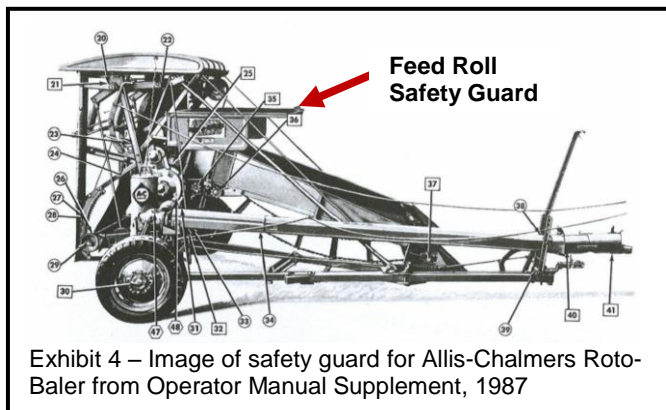
The morning of the incident, the farmer left for the field once the dew had burned off. A neighbor saw him riding the tractor at 11:45 AM. At some point between 11:45 AM and 12:30 PM, the farmer stopped the tractor (leaving it running), walked back to the back, left side of the baler, and got his hands pulled into the compression rollers at the top of the conveyor. This action pulled in his arms nearly to the elbow. As the rollers drew the victim into the baler, it pulled him into the sidewall of the conveyor, compressing and crushing his chest.

The farmer normally had lunch with his wife at noon, although he was often late. At approximately 12:30 PM, his wife went to look for him. She walked to the hayfield where she saw him leaning on the left side of the baler near the inlet to the compression bars. The tractor and baler were still running. When she found him trapped in the compression rollers, she ran to the house of a neighbor. He called 911 at 12:47 PM and then waited at the northeast corner of the victim's property to direct emergency crews.

The first responder to the scene was another neighbor, who was a local emergency responder. Hearing the call on his scanner, he and his son ran to the field where the victim was located. They found the victim with his arms still caught in the compression rollers and the tractor still running. They determined there was no pulse or respiration but the victim was trapped face-down in the machine and could not receive CPR. They turned the tractor and baler off and attempted unsuccessfully to pull him from the equipment. A short time later, the emergency

response team arrived and attempted to remove the victim from the baler. At 1:10 PM they stopped rescue operations when they confirmed the victim had no vital signs. The Sheriff's report indicated the body was removed from the hay baler at 1:59 PM.

The Roto-Baler was missing a feed roll safety guard that would prevent reaching over the sidewall of the conveyor and directly accessing the in-running nip point at the compression roller (Exhibit 4). The 1987 Operators Manual Supplement (from Deutz-Allis Corporation) for the Roto-Baler also indicates the placement of a warning label that reminds farmers to disengage the PTO and shut off the engine (Exhibit 5). This manual can be located and purchased through AGCO Technical Publications (<http://www.agcopubs.com/>, part 71509280). The company's interests in farm equipment manufacturing were sold to Deutz-Fahr in 1985, and the company was renamed Deutz-Allis. In 1986, letters from this newly named company were sent to Deutz-



Allis dealers regarding the potential hazards identified in the Roto-Baler as equipment was resold and safety shields and operator's manuals were lost. Advertisements in farm magazines, contacts with agricultural organizations, and interactions with dealers were all attempted to provide safety information to current owners of Roto-Balers (Deutz-Allis Corporation, 1986). The manufacturing businesses were dispersed in 1998 and the company doors officially closed in 1999, but their farm equipment remains in use to this day. The current distributor of information on Allis-Chalmers equipment is AGCO Corporation.

CAUSE OF DEATH

The county medical examiner's autopsy report lists asphyxia due to chest crush injury as the cause of death.

RECOMMENDATIONS AND DISCUSSION

Recommendation 1: *Always disengage the PTO, set the brake, shut off the tractor, and pocket the key when dismounting a tractor that is attached to a baler.*

Turning the power to the baler off before approaching it will prevent the operator from falling or reaching into a baler while it is still energized. Reaching into any moving equipment, even for a

second, has caused injuries on countless machines around the world. The first step to prevent injuries when working around these devices is to eliminate power before approaching hazardous areas of operation to avoid entanglement.

Recommendation 2: *Machine equipment users should identify in-running nip point hazards and understand the risks and how to control access to these locations.*

In-running nips can be created by (1) two or more pieces of equipment rotating in opposite directions with their axes parallel to each other (as in the compression rollers here), (2) a rotating and a tangentially moving part (such as a belt and pulley), or (3) a rotating part and a fixed surface (such as a screw conveyor). When a part is rotating, anything that contacts it will be moved in the direction of motion, which for in-running nips, results in the object moving between the rotating surface and the other rotating or fixed surface. The speed of rotation is often such that clothing, hair, or hands can be caught quickly and with such force as to drag a person into the machine. Guarding involves placing materials (metal, Plexiglas, etc.) sufficiently far from this surface so that someone cannot inadvertently reach into the hazardous nip point; either the guard has to be removed or the equipment must be stopped to gain access to the hazardous location. Consult OSHA's Machine Guarding eTool for an interactive educational tool (link provided in references).

Recommendation 3: *Identify original and retrofitted machine guards and safety devices for all farming equipment currently in use and make sure they are installed.*

Manufacturers may have installed original or retrofitted safety equipment to reduce the likelihood of injury or fatality on a piece of mechanical equipment, but used equipment may have had these devices removed by previous owners or may have not been retrofitted with updated guards or labels. Consult manufacturers, farm equipment suppliers, or the internet to locate manuals. If manuals cannot be found, identify in-running nip points and other hazardous motions and actions for the equipment (Recommendation 2) and examine similar equipment from other manufacturers to determine how they guarded similar hazards. (Note: the supplemental manual for Allis-Chalmers Roto-Balers is available at the following AGCO site: http://www.agcopubs.com/operator_manual/english/71509280/roto_baler_supplement_english_refer_to_detail_in_thumbnail_.)

Recommendation 4: *Identify original and updated safety bulletins for existing farm equipment.*

Purchases of old farm equipment seldom come with operator's manuals or safety bulletins. The beginning of each operating manual requires the operator to be familiar with all safety instructions, so it is critical to locate a manual. Local and regional farm suppliers can help search for manufacturer information, and an internet search can also provide the necessary information.

Recommendation 5: *Before operating a piece of machinery, review the hazards associated with that piece of machinery.*

While a person may not be injured every time a piece of machinery is used, it is important for the operator to note where the hazards exist before using a piece of equipment. This should only take a minute, but it helps the operator focus on safety and sets the right frame of mind at the start of a job. Instilled early, this habit will help the aging farmer remember shut-off sequences and hazardous areas.

Keywords: farmer, hay baler, baling, caught in equipment

REFERENCES

Deutz-Allis Corporation. Allis-Chalmers Roto-Baler Operators Manual Supplement (Part No. 71509280), February 1987.

Deutz-Allis Corporation. Letter to Deutz-Allis Dealers. 1986 Oct 13. 1 page, 3 attachments.

Hart, J. (2001) *Allis-Chalmers Innovation*, http://www.toytractorshow.com/ac_inovation.htm, Retrieved December 14, 2010.

History of Allis-Chalmers, http://www.allischalmerslawn.com/about_us/, Retrieved December 14, 2010

U.S. Department of Labor, Occupational Safety & Health Administration, Machine Guarding eTool, <http://63.234.227.130/SLTC/etools/machineguarding/intro.html>, retrieved December 14, 2010

Links to Baler Operation Videos: <http://www.youtube.com/watch?v=Q4bJM9pHxMY>

Report Prepared by:

T. Renée Anthony, PhD, CIH, CSP
FACE Investigator

Murray Madsen, MBA
FACE Investigator

Marizen Ramirez, PhD, MPH
Program Director

Fatality Assessment and Control Evaluation FACE

Fatality Assessment and Control Evaluation (FACE) is a program of the National Institute for Occupational Safety and Health (NIOSH), which is part of the Centers for Disease Control and Prevention of the US Department of Health and Human Services. Nationally, the FACE program identifies traumatic work-related deaths, conducts in-depth studies of select cases, makes recommendations for prevention, and publishes reports and alerts. The goal is to prevent occupational fatalities across the nation.

The NIOSH head office in Morgantown, West Virginia, carries out an intramural FACE case surveillance and evaluation program and also funds state-based programs in several cooperating states. The Iowa FACE program is conducted by the Injury Prevention Research Center at the University of Iowa working in conjunction with the Iowa Department of Public Health and its Office of the State Medical Examiner.

NIOSH combines its and the state programs' information for wide dissemination, in a variety of forms, among the industries involved. NIOSH publications are available on the web at <http://www.cdc.gov/NIOSH/FACE/> and from the NIOSH Distribution Center (1-800-35NIOSH).

Iowa FACE also publishes its case studies, issues precautionary messages, and prepares articles for trade and professional publications. In addition to postings on the national NIOSH website, the information is posted on the Iowa FACE website (www.public-health.uiowa.edu/FACE/).

The Iowa FACE team at the University of Iowa includes Marizen Ramirez, Director; Corinne Peek-Asa, Co-Investigator; John Lundell, Co-Investigator; T. Renée Anthony, Co-Investigator; and Murray Madsen and Stephanie Leonard, Field Investigators. Additional expertise is provided from the Iowa Department of Public Health, including Rita Gergely, Principal Investigator; Kathy Leinenkugel, Surveillance Specialist; and John Kraemer, Director, Forensic Operations at Iowa Office of the State Medical Examiner.

For additional information regarding this report or the Iowa FACE Program contact:

**Iowa FACE
The University of Iowa
Department of Occupational and Environmental Health
UI Research Park, 240 IREH
Iowa City, IA 52242-5000**

Toll free: 800-513-0998

Fax: (319) 335-4085

Internet: <http://www.public-health.uiowa.edu/FACE>

E-mail: stephanie-leonard@uiowa.edu