WASHINGTON State FACE Program
Fatality Assessment & Control Evaluation

FACE NIOSH National Institute for Occupational Safety and Health

INCIDENT FACTS

DATE:
February 9, 2018

TIME:
11:06 p.m.

WORKER:
39-year-old hay press operator

INDUSTRY/NAICS CODE:
Farm supplies merchant wholesalers, NAICS 424910

EMPLOYER:
Grower, processor, and wholesale seller of hay forage

SAFETY & TRAINING:
Company had a written safety program.

SCENE:
Hay processing plant

LOCATION:
Washington State

EVENT TYPE:
Struck by

REPORT #: 52-49-2021
REPORT DATE: 10/04/2021

Hay Press Operator Struck by Machine's Guillotine Blade

SUMMARY

On February 9, 2018, a 39-year-old hay press operator died when he was struck by the machine's steel guillotine blade. The operator was performing his usual job duties at a plant that processed field baled hay into high-density bales for shipping. Near the end of his work shift, the plant supervisor asked the operator and two other employees to prepare the machine for scheduled maintenance. The shift supervisor was at the machine's control panel waiting for a signal from the operator to turn off the machine's power.

During normal operation, a conveyor moved hay into the main press where a scale and guillotine were located. When the hay reached the correct weight, the scale triggered the guillotine that sliced off a section of the hay to be compressed. The operator crawled into the hooded intake opening of the main press to push a bale through to clear the area of remaining hay. No one noticed him get into the energized machine. As he was lying on the scale, the guillotine activated and struck him, resulting in near decapitation. He was pronounced dead at the scene.

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CONTRIBUTING FACTORS

- Lockout/tagout (LOTO) procedures not followed.
- LOTO training not provided to all employees working on or near energized equipment.
- Recurring employee deviation from LOTO procedures not reported.
- Hazardous energy control program evaluations not conducted by management.

RECOMMENDATIONS

Washington State Fatality Assessment and Control Evaluation investigators concluded that to protect employees from similar hazards employers should:

- Enforce and evaluate employee compliance with machine manufacturer's LOTO requirements when servicing or maintaining machines and equipment.
- Provide and enforce LOTO training that emphasizes the severity of the hazard of entering energized machines that have LOTO requirements.
- Implement, enforce, and evaluate a hazard reporting and response system that can document employee deviations from LOTO requirements and initiate corrective actions when they reoccur.
- Perform risk assessments with the machine manufacturer to understand or customize safety control system features, such as emergency stop (E-Stop) locations and access doors.

DEFINITIONS

APP	Accident Prevention Program
COO	Chief Operations Officer
CSHO	Compliance Safety and Health Officer
DOSH	Division of Occupational Safety and Health
L&I	Washington State Department of Labor & Industries
LOTO	Lockout/Tagout
NIOSH	National Institute for Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
PPE	Personal Protective Equipment
SHARP	Safety & Health Assessment & Research for Prevention
WA FACE	Washington State Fatality Assessment and Control Evaluation Program

WASHINGTON STATE FACE PROGRAM INFORMATION

The Washington State Fatality Assessment and Control (WA FACE) program is one of many workplace health and safety programs administered by the Washington State Department of Labor & Industries' Safety & Health & Research for Prevention (SHARP) program. It is a research program designed to identify and study fatal occupational injuries. Under a cooperative agreement with the National Institute for Occupational Safety and Health (NIOSH grant# 5 U60OH008487), WA FACE collects information on occupational fatalities in WA State and targets specific types of fatalities for evaluation. WA FACE investigators evaluate information from multiple sources. Findings are summarized in narrative reports that include recommendations for preventing similar events in the future. These recommendations are distributed to employers, workers, and other organizations interested in promoting workplace safety. WA FACE does not determine fault or legal liability associated with a fatal incident. Names of employers, victims and/or witnesses are not included in written investigative reports or other databases to protect the confidentiality of those who voluntarily participate in the program.

Additional information regarding the WA FACE program can be obtained from:

www.lni.wa.gov/Safety/Research/FACE
PO Box 44330
Olympia, WA 98504-4330
1-888-667-4277

WASHINGTON State FACE Program
Fatality Assessment & Control Evaluation

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INTRODUCTION

In February of 2018, the Washington State Department of Labor & Industries' (L&I) Division of Occupational Health and Safety (DOSH) notified the Washington State Fatality Assessment and Control Evaluation (WA FACE) Program of the death of 39-year-old hay press operator at a hay processing plant who was struck by the hay press machine's guillotine blade.

Washington State FACE investigators interviewed the incident company's chief operations officer (COO). Documents reviewed during the course of this investigation included the DOSH inspection file, the operator's death certificate, police report, and the coroner's report.

EMPLOYER

The employer was a grower, processor, and wholesaler of hay forage and other agricultural animal feed commodity products for export. It was one of the largest exporters of hay forage in the western U.S.

Established in 1987, the employer was an owner-operated company. At the time of the incident, the employer had approximately 12 full-time employees working in the processing plant. The employees in the hay processing plant worked five days per week, Monday through Friday. The facility operated year-round with two ten-hour shifts per day. The first shift (day shift) was 2 a.m. to noon and the second shift (night shift) was 2 p.m. to midnight. Saturday was a designated machine maintenance day. The incident occurred on Friday as employees were preparing the machine for maintenance on the next day.

WRITTEN SAFETY PROGRAMS and TRAINING

The employer had a formal, written accident prevention program (APP) in English. A few of their employees were native Spanish speakers. For those employees who were not fluent in English, there was a Spanish speaking manager who communicated with them to ensure they understood instructions clearly. The COO as part of his duties was responsible for overseeing employee safety. Approximately five percent of his time was devoted to safety management. Weekly operations meetings were held with supervisors and lead mechanics; safety issues were brought up in discussions at these meetings. The COO held monthly meetings for each crew where all issues affecting the crew, including safety, were addressed. Safety responsibilities were mostly delegated to supervisors. Each shift supervisor held a weekly meeting with his crew. The COO reported directly to the company owner, who he met with once a month. The operations crew for the plant or "barn" was the safety committee. They along with the COO compiled lists of things that needed to be addressed at the plant, assigned individuals to address the issues, and periodically reviewed progress. The operator regularly attended these meetings.

New employees went through orientation training where they received instruction about the company's safety policies. They were then trained by their shift supervisor who ensured that they received on-the-job instruction on their work assignments and the equipment they were required to operate. New employees were monitored by their supervisors. After 90 days, they were evaluated to ensure that they understood how to do their jobs and to assess whether they needed additional training or other help of any kind.

WORKER INFORMATION

The worker was a 39-year-old hay press operator. His work shift (night shift) was from 2 p.m. to midnight. He was a Hispanic foreign born worker. According to the company's COO, he spoke fluent English and appeared to have no trouble understanding or reading it. He had been employed by the company for one and a half years and worked as a

press operator since August 2016. The COO considered him to be self-directed and very competent at his job. Two weeks before the incident, he had participated in an employer provided LOTO refresher training.

EQUIPMENT

The machine involved in the incident was a FC10000 series export forage compactor manufactured by Hunterwood Technologies. This machine is commonly referred to as a "hay press" (photo 1). Hunterwood Technologies represents 70% to 80% of the North American sales market. The hay press processes field baled hay into high-density bales for shipping. The employer purchased the machine new in 2012 and had used it continuously since the time of purchase. The hay press is fully automated and controlled from a touchscreen interface panel located at the operator's station near the press. After field baled hay is loaded with forklifts into an input system, the machine uses an elevator, kickers, paddles, hydraulic plungers, and a chain-driven conveyor to feed the hay into a main press (photo 2). The hay is weighed, sliced, compressed, strapped and ejected as a large compressed bale weighing 240 pounds. The kicker then moves the ejected bale into a cutter box that slices it into four small 60-pound compressed bale cubes. The smaller bale cubes are wrapped and shipped to venders. The press is equipped with a hazard control system that includes a start key control, emergency stops (E-Stops), fenced zones, gates, interlocks, fixed guards, photoelectric sensors, light curtains and warning signs (photo 3). All moving devices are painted in yellow. The employer's equipment mechanics maintained the press and checked it at least once per day.

Photo 1: Incident hay press

Photo 2: Chain-driven conveyor moving field baled hay into the machine's main press that processed them into smaller compressed cubes for shipping to customers.

Photo 3: Warning signs in English and Spanish on incident hay press.

INCIDENT SCENE

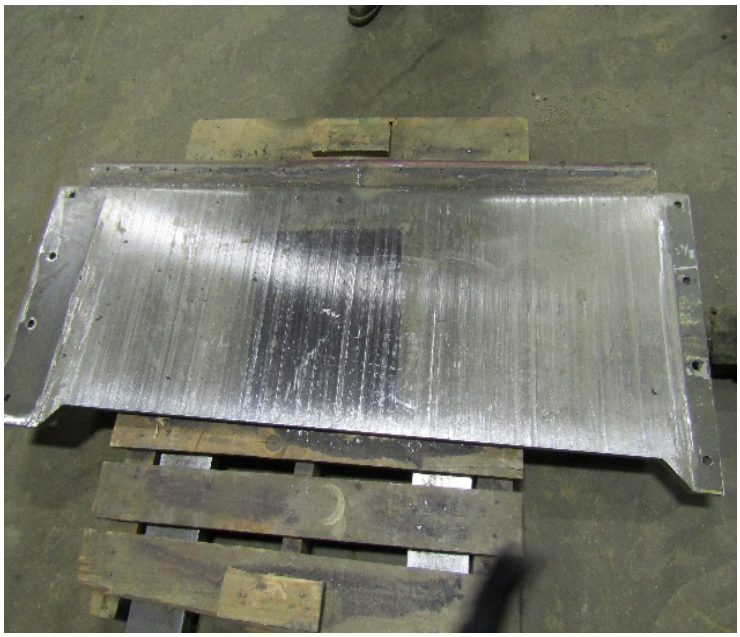
The worksite was a hay processing plant that consisted of a large metal and concrete agricultural building that housed two hay presses used for producing high-density hay bales sold as livestock forage. The night shift's work crew consisted of a supervisor and twelve plant employees that included the hay press operator, forklift operators, floor techs, and truck drivers.

INVESTIGATION

On February 9, 2018, the operator started his usual ten-hour work shift in the hay processing plant at 2 p.m. He was performing his regular job of operating the hay press. At approximately 10:50 p.m., the night shift supervisor instructed the operator and two floor techs to prepare the machine for scheduled maintenance of the bale ejection device that is part of the main press. Maintenance on the device was scheduled about once every three months. The employees were told about the maintenance a week in advance.

During normal hay press operation, the machine's conveyor moved field baled hay into the hooded intake opening of the main press where a scale pan, steel guillotine, compress chamber, and ejection device were located (photos 4 and 5). When the hay reached a programmed weight, the scale activated the hydraulic guillotine to raise up and slice off a section of the hay that was then pushed into the compress chamber by a loading plunger. High pressure cylinders in the compress chamber squeezed the sliced hay into a single bale and ejected it through a gate into a set of strap paddles. The paddles held the bale while the machine applied straps before finally cutting the hay into smaller cubes. The last bale remained in the strap paddles because no other hay followed it from the conveyor into the compress chamber to push it out.

The pre-maintenance preparation required the operator and floor techs to clear out the last remaining bale from the paddles as all hay had to be removed from the press. The task involved manually sliding two smaller cut bales or a metal box through the main press to push out the last bale held by the strap paddles. Having the employer's permission, operators usually chose to use the lighter bales rather than the heavier, bulkier metal box, which the employer created for the purpose. Before the task could be performed, the hay press had to be de-energized using a full LOTO procedure to prevent device activation while an employee was inside the machine.[2] The procedure required the operator to switch off and remove the start key from the control panel at the operator's station (photo 6) and place it in his pocket until it was safe to restart the machine.



Photos 4 and 5: The left photo shows the hooded intake opening of the main press where the machine's scale pan, steel guillotine, compress chamber, and ejection device are located. The right photo shows a steel guillotine blade of the same type that struck the operator inside the main press.

Training and job performance evaluation records showed that the operator had been trained and experienced in the LOTO procedure. His most recent LOTO training was during a safety meeting two weeks before the incident. He received the training in English as he demonstrated proficiency in speaking and reading instructions in the language. In interviews with the DOSH compliance safety and health officer (CSHO), the operator's shift supervisors and a maintenance mechanic indicated that they had reprimanded him several times for not following hay press LOTO requirements. The night shift supervisor who was on duty when the incident occurred had once temporarily dismissed the operator from the machine after he ignored two verbal reprimands. The operator's previous deviations from LOTO requirements were never documented or reported to management despite the employer's policy to issue written reprimands when employees ignored verbal ones.

Photo 6: Operator's station with touchscreen interface panel.

The pre-maintenance preparation that ended in the incident began when one of the floor techs manually lifted two 60-pound hay bales from the plant floor and handed them to a second tech who was standing on the conveyor, which was energized but not moving. The second floor tech pushed the bales toward the operator who was also standing on the conveyor but closer to the covered intake opening of the main press. The floor techs then turned their attention away from the operator to sweep chaff from the floor and conveyor. One of the floor techs had no knowledge or experience with the LOTO procedure and the other had only basic knowledge of it. The shift supervisor was approximately 40 feet away at the operator's station observing other employees but expecting a signal from the operator to shut off the machine's power from the control panel.

Without performing the required LOTO procedure, the operator crawled into the main press' 54-inch-wide by 24-inch-high hooded intake opening to push the bales through to clear the compress chamber (photos 7 and 8). Warning signs written in English and Spanish were located directly above the opening. No one noticed him enter the opening. As the operator crawled headlong across the scale pan (photo 8), the combined weight of his body and the bales reached the scale's 218-pound programmed trigger weight that activated the guillotine that struck and nearly decapitated him (photo 9). When the supervisor heard a floor tech scream and yell to the operator after the guillotine engaged, he pressed one of the machine's E-Stop buttons, shut off the power at the operator's station and removed the key from the control panel (photos 10 and 11). The operator was pronounced dead at the scene.

Photos 7 and 8: The left photo shows hay press after the incident showing hay bales on the machine's conveyor. The left photo shows where the operator crawled into the hooded intake opening of the main press to push hay bales through in order to prepare the machine for scheduled maintenance.

Photo 9: The red arrow shows where the operator crawled onto the scale pan that triggered the guillotine to raise up and nearly decapitate him.

Photo 10: Red arrow shows the location of the guillotine where the operator was found. The yellow arrows show the locations of red emergency stop (E-Stop) buttons at the main press and operator's station.

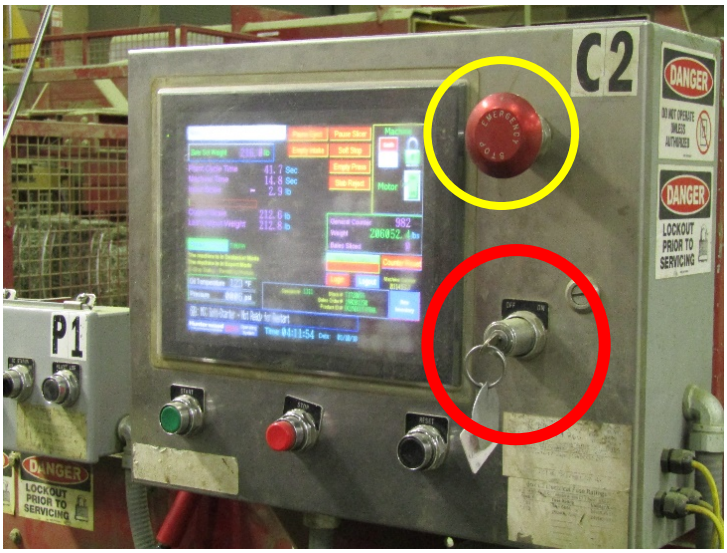


Photo 11: Operator's station control panel. The red circle shows the key that controls the power to the hay press. The yellow circle shows the emergency stop (E-Stop) button.

CAUSE OF DEATH

According to the death certificate, the coroner reported the cause of death as "near complete decapitation."

CONTRIBUTING FACTORS

Occupational injuries and fatalities are often the result of one or more contributing factors or key events in a larger sequence of events that ultimately result in the injury or fatality. Washington FACE investigators identified the following as key contributing factors in this incident:

- Lockout/tagout (LOTO) procedures not followed.
- LOTO training not provided to all employees working on or near energized equipment.
- Recurring employee deviation from LOTO procedures not reported.
- Hazardous energy control program evaluations not conducted by management.

RECOMMENDATIONS/DISCUSSION

Recommendation: **Enforce and evaluate employee compliance with machine manufacturer's LOTO requirements when servicing or maintaining machines and equipment.**

Discussion: The employer had a hazardous energy control program in place that adopted the LOTO procedure requirements from the hay press manufacturer's safety manual. The operator was trained in the procedure by the employer and had one and a half years of hands-on experience applying it. In the incident, the operator could have avoided fatal injury had he followed his LOTO training to de-energize the hay press before he crawled into the machine. The post-incident inspection discovered that the employer had not conducted periodic evaluations of its hazardous energy control program. Such evaluations could help identify problems with employee performance of the LOTO procedure. Without periodic evaluations to act as a built-in performance safeguard for their hazardous energy control program, an employer cannot be sure that employees are properly applying their LOTO training, nor can they identify and correct deficiencies in how supervisors are documenting and reporting employee deviations from LOTO requirements. [3, 4, 5, 6]

Recommendation: **Provide and enforce LOTO training that emphasizes the severity of the hazard of entering energized machines that have LOTO requirements.**

Discussion: In the incident, the two floor techs who were instructed to assist the operator in preparing the hay press for maintenance were not trained by the employer in the machine's LOTO requirements. Consistently providing LOTO training to all employees assigned to operate or work on or near a machine that has LOTO requirements can prevent a serious incident by showing the employees how to recognize and react to hazardous situations. This includes how to recognize when a co-worker has deviated from LOTO requirements and how to respond by locating and pressing an E-Stop. The training should strictly adhere to the machine manufacturer's LOTO and E-Stop procedure requirements. Refresher training should be given to employees prior to each time they perform scheduled machine maintenance. Training should be provided in the language that employees have demonstrated proficiency in understanding. Disciplinary action should be considered for employees who intentionally deviate from LOTO requirements that they were trained or retrained to follow. [7, 8, 9]

***Recommendation*: Implement, enforce, and evaluate a hazard reporting and response system that can document employee deviations from LOTO requirements and initiate corrective actions when they reoccur.**

Discussion: Post-incident interviews with the hay press operator's co-workers and supervisors done by the CSHO revealed that they had previously observed him deviate from the LOTO procedure multiple times. Although the supervisors verbally reprimanded the operator, they never documented or reported to management when he failed to change his behavior. Having a hazard reporting and response system in place that is enforced and periodically evaluated can help management track the performance of their hazardous energy control program, identify areas for improvement and implement corrective action plans.

Properly trained employees and supervisors can attempt to resolve low level hazards verbally if doing so does not present risk of injury. However, employees and supervisors who identify a more complex hazard, such as observing a co-worker repeatedly and intentionally deviate from safety requirements, should document it in a hazard identification report form and submit the form to their supervisor, safety director, or management to initiate corrective action.

Supervisors and managers should always have hazard identification report forms available for employees. The form should ask for specific information about the hazard location, description, and suggested controls. The supervisor or manager should respond by discussing the hazard with the employee(s) who reported it. Supervisors should then consult with management or the company safety director to assess the hazard. After assessing the hazard, the supervisor or management should implement a corrective action plan to eliminate or control the hazard or issue personal protective equipment (PPE). Corrective actions that management should consider include disciplining employees who repeatedly and intentionally deviate from LOTO requirements. Supervisors should give copies of completed hazard identification report forms to management or the safety director for follow-up, recordkeeping, and safety program enforcement and evaluation.

***Recommendation*: Perform risk assessments with the machine manufacturer to understand or customize machine safety control system features, such as emergency stop (E-Stop) locations and access doors.**

Discussion: The incident hay press had red E-Stop buttons mounted in several areas. The E-Stops nearest to the hooded intake area of the main press where the fatality occurred were located on the left panel of the conveyor loading area, on the right wall of the main compress chamber and at the operator's station approximately 40 feet away (photos 10 and 11). Employers can request the machine manufacturer to send a technician for consultation in performing a risk assessment to understand and possibly customize the machine's safety control system. Such an assessment can identify better locations to install an E-Stop, such as mounting one closer to the hooded intake opening of the main press. It can also consider the use of wireless remote control E-Stops so workers won't have to run to a wired E-Stop that may be located at a large distance from the hazard. A consultation could also identify a safer way to remove the last bale from the compress chamber, such as installing an access door on the right wall of the main compress chamber that would eliminate the need for an employee to enter the hooded intake opening. Installing an additional E-Stop and an access door would not eliminate the requirement to de-energize the hay press through a full LOTO procedure.

ADDITIONAL RESOURCES

Hay Processing Foreman Killed in Fall
https://lni.wa.gov/safety-health/safety-research/files/1999/hayd.pdf

A Foreman Dies When He is Crushed in a Hay Baling Machine
https://www.cdc.gov/niosh/face/pdfs/16CA002.pdf

Hazard Reporting and Response System
http://keeptruckingsafe.org/assets/WorkplaceHazardReportingandResponseSystem/story_html5.html

Wireless Emergency Stop (E-Stop)
http://www.absatraining.com/newsletter/feb/rockwellautomation_feb.pdf

ANSI/ASSE Z244.1-2016, The Control of Hazardous Energy, Lockout, Tagout and Alternative Methods
https://store.assp.org/PersonifyEbusiness/Store/Product-Details/productId/213108824

ANSI B11.19-2019, Machine Guarding, Performance Requirements for Risk Reduction Measures: Safe Guarding and other Means of Reducing Risk
https://store.assp.org/PersonifyEbusiness/Store/Product-Details/productId/205076242?_ga=2.114547271.1551780077.1627501139-2024922931.1597191152

REFERENCES

1. Accident Prevention Program, WAC 296-800-140
www.app.leg.wa.gov/wac/default.aspx?cite=296-800-140
2. Forage Compactor FC10000 Series, Safety Manual, Hunterwood Technologies
3. WAC 296-803-50005, Lockout/Tagout, Use energy control procedures
https://app.leg.wa.gov/wac/default.aspx?cite=296-803-50005
4. WAC 296-803-70005, Lockout/Tagout, Perform and document periodic reviews to verify employees know and follow the energy control procedures
https://app.leg.wa.gov/wac/default.aspx?cite=296-803-70005
5. WAC 296-803-70010, Do periodic reviews of procedures using lockout devices
https://apps.leg.wa.gov/wac/default.aspx?cite=296-803-70010
6. WAC 296-803-70015, Do periodic reviews of procedures using tagout devices
https://apps.leg.wa.gov/wac/default.aspx?cite=296-803-70015
7. WAC 296-803-60005, Provide and document employee training on the energy control program
https://apps.leg.wa.gov/wac/default.aspx?cite=296-803-60005
8. WAC 296-803-60010, Provide additional training if you use tagout devices
https://apps.leg.wa.gov/wac/default.aspx?cite=296-803-60010
9. WAC 296-803-60015, Retrain employees when necessary
https://apps.leg.wa.gov/wac/default.aspx?cite=296-803-60015

INVESTIGATOR INFORMATION

Todd Schoonover has a PhD in Industrial Hygiene from the University of Illinois at Chicago. He is a Certified Industrial Hygienist (CIH) and Certified Safety Professional (CSP). Todd is currently the Principle Investigator for the WA FACE Program.

Paul Karolczyk has a PhD from Louisiana State University. He is a Safety and Health Specialist with the WA FACE Program.

Randy Clark has a BA from the Evergreen State College. He is a Safety and Health Specialist with the WA FACE Program.

ACKNOWLEDGEMEMENTS

This report was reviewed by stakeholders from labor and business communities and various Washington State and Federal worker safety agencies. Though we are unable to acknowledge specific individuals for their contributions to this report, we would like to recognize the following for their help and support of the FACE mission and objectives:

- The employer involved in the incident
- Hunterwood Technologies
- Division of Occupational Safety and Health (DOSH)
- Federal FACE Program management (NIOSH)
- Safety & Health Assessment & Research for Prevention (SHARP)

DISCLAIMER