

Foot Amputated by Auger¹

California NURSE Program²

SUMMARY : CASE 292-009-01

At a vegetable processing plant, a machine operator's foot was amputated while walking down a trimming line. On the trimming line the vegetables are cut to size, and the trimmings are dumped into a trough that runs along the floor. Inside the trough a metal auger turns like a screw, pushing the vegetable matter out of the trimming area. The trough is covered with heavy grates. Somehow, one of the grates covering the trough was not in place and the machine operator stepped or slipped into the turning auger, tearing off the left foot and ankle. The machine operator is not certain how the injury happened, and nobody was watching. Co-workers, and then the fire department, arrived quickly, stopping the machine and applying a tourniquet. The injured machine operator's foot was too badly mangled for the hospital to surgically reattach it.

How could this injury have been prevented?

- The guard over the moving auger should not be easy to remove.
- The auger can be made of a lighter, more flexible material than metal, such as rubber or plastic, which will give way when a person's hand or foot becomes trapped.
- Contact switches can be connected to the grate so that if the grate is raised the power to the auger will switch off.
- Running water, rather than an auger, can be used to carry vegetable matter down the trough.

BACKGROUND

On March 22, 1992, a local newspaper reported that a machine operator had been injured the previous day in a vegetable processing plant. She suffered a traumatic amputation of the left foot above the ankle when her foot was caught in a turning auger.

A Nurse from the NURSE project identified the case when reviewing the newspaper and discussed the incident with the injured worker on April 15, 1992. On May 29, 1992, a NURSE team consisting of the Senior Safety Engineer, the Epidemiologist, and a Nurse visited the site and investigated the incident. The team also discussed the incident with the plant manager, who was the safety director at the time of the incident, and a representative of the employer's workers' compensation insurer. NURSE staff also reviewed the emergency medical service records and the Cal/OSHA report on the incident.

Cal/OSHA was notified the day of the injury by the local fire department who responded to a 911 call made by a co-worker. Cal/OSHA contacted the employer that day and investigated the incident, which included reviewing the employer's injury and illness prevention program. The safety program was found to be in compliance with Title 8 California Code of Regulations 3203 -- Injury and Illness Prevention Program. (As of July 1, 1991 the State of California requires all employers to have a written seven point injury prevention program: designated safety person responsible for implementing the program; mode for ensuring employee compliance; hazard communication; hazard evaluation through periodic inspections; injury investigation procedures; intervention process for correcting hazards; and a health and safety program.)

1. This document, CDHS(COHP)-FI-92-005-11, was extracted from a series of the Nurses Using Rural Sentinel Events (NURSE) project, conducted by the California Occupational Health Program of the California Department of Health Services, in conjunction with the National Institute for Occupational Safety and Health. Publication date: May 1992.

2. NURSE Project, California Occupational Health Program, 2151 Berkeley Way, Annex 11, Berkeley, CA 94704.

Also, six months prior to this incident, the plant manager had begun an updated safety program with videotaped instruction for employees. The injured worker said she had participated in this program and had received safety training related to operating a trim machine.

INCIDENT

On March 21, 1992, at approximately 7:50 a.m., a machine operator in a vegetable processing plant had her left foot and ankle caught and torn off by a turning auger. The worker was a 49 year old Hispanic female, a seasonal employee of the company for five years. She was employed as a trim machine operator, trimming vegetables to a uniform size before processing and shipment. She was on her second day of work in the current season.

The incident occurred next to one of the trim lines in the plant. The vegetables are trimmed to the proper size at the lines. The excess vegetable matter from the trimming is washed down into a U-shaped trough set in the plant floor. The trough is 10 inches wide, 12 inches deep, and runs 75 feet across the plant. Inside the trough a metal auger continuously turns and pushes the vegetable matter to a section of the plant where it is processed into cattle feed. Protective grates are recessed in the floor and cover the trough and auger. The grates are made of flat metal strips which rest on 4 inch-wide lips on either side of the trough.

The incident was unwitnessed. The processing plant was about to begin its day shift when the employee went walking down an unoperating aisle of a trimming line. She had worked on this line the previous day, but had been reassigned to a different line the day of the incident. The injured machine operator did not remember the incident clearly. Apparently, the protective grating over the trough had been dislodged or became dislodged, and her foot went into the trough and was caught in the rotating auger. The section of grating that was not in place at the time of the injury was one of the smaller sections, approximately 18 inches long and weighing about 34 pounds.

According to the plant manager, a maintenance man was nearby when the incident occurred. The maintenance man immediately called for help. Two co-workers arrived and helped the victim while the first worker ran to shut off the power to the screw conveyor system. The cut off switch was approximately 200 feet away. Co-workers trained in first aid applied a

tourniquet to the left leg to control bleeding and called 911.

The local fire department responded to the 911 call and arrived on the scene four minutes after being called. An ambulance Emergency Medical Services (EMS) crew also responded, arriving at the scene nine minutes after 911 was called.

The EMS crew gave the injured worker oxygen, applied MAST pants (Military Anti-Shock Trousers to restrict blood-flow to and from the lower extremities), set up a cardiac monitor and attempted to establish an I.V. After ten minutes of EMS treatment at the scene of the injury, the injured worker was transported to an acute care general hospital within twelve minutes (at approximately 8:22 a.m.). The amputated foot was placed in a plastic bag, put on ice and transported to the hospital with the patient. Because of extensive tissue damage, the hospital did not attempt to surgically reattach the foot. The injured worker was admitted to the hospital for one week. At the time of the NURSE interview she was still at home, and unsure of whether she would be able to return to work.

PREVENTION STRATEGIES

1. Employers should insure that guards on moving machinery are not easily removed. Immediately after the incident, the company welded the smaller portion of the protective grate to the adjacent grate so that two people are needed to lift the grate free of the trough lips. In this incident, if heavy equipment had been required to move the grate it might not have become dislodged.
2. Employers should consider using safer materials when designing, installing and upgrading equipment. The auger could be made from lighter and more flexible materials such as hard rubber, high technical grade plastic, or flexible wire which would give way (e.g.: bend, stop) upon contact with a person's hand or foot. Some or all of these materials are feasible in vegetable processing plants since the material being moved is vegetable matter, and does not need a heavy metal screw to push it down the trough. In this incident, if the auger had been made of a more flexible material it might have given way when the worker's foot contacted it, resulting in a less severe injury.
3. Employers should consider safety engineering when designing, installing and upgrading equipment in a processing plant. The auger should have a shut-off

switch within immediate reach of employees in the work area. Cord-type or other emergency off switches can be easily installed at intervals adjacent to the conveyor system. (The company is currently researching the feasibility of installing more accessible shut-off switches in a new plant.) Although stopping the equipment earlier may not have prevented the loss of the worker's foot, it would have prevented co-workers coming to her aid from being exposed to the same hazard.

4. Employers should consider using automatic power shut-off switches when designing, installing and upgrading equipment in a processing plant. An electrical interlock system could be installed with micro-switches at the contact points of the grate so that the removal of the protective grate would turn the rotating auger off. In this incident, if an interlock system had been installed the auger would have stopped turning when the grate was removed or dislodged, resulting in a less severe injury.
5. Employers should consider using safer, innovative methods when designing, installing and upgrading equipment in a processing plant. A multi-jet recirculating water wash system can be installed in the waste troughs in place of the auger. In this incident, re-design using water would have removed entirely the hazard of the moving auger.

FURTHER INFORMATION

For further information concerning this incident or other agriculture-related injuries, please contact:

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The NURSE (Nurses Using Rural Sentinel Events) project is conducted by the California Occupational Health Program of the California Department of Health Services, in conjunction with the National Institute for Occupational Safety and Health. The program's goal is to prevent occupational injuries associated with agriculture. Injuries are reported by hospitals, emergency medical services, clinics, medical examiners, and coroners. Selected cases are followed up by conducting interviews of injured workers, co-workers, employers, and others involved in the incident. An on-site safety investigation is also conducted. These investigations provide detailed information on the worker, the work environment, and the potential risk factors resulting in the injury. Each investigation concludes with specific recommendations designed to prevent injuries, for the use of employers, workers, and others concerned about health and safety in agriculture.