FINAL FACE REPORT

CALIFORNIA DEPT. OF HEALTH SERVICES
FACE REPORT: 97CA00201
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TO: Director, National Institute for Occupational Safety and Health

FROM: California Fatality Assessment and Control Evaluation (FACE) Program

SUBJECT: Supervisor dies when caught between an adjusting bar and the frame of a knitting machine in California

SUMMARY

A 51-year old supervisor/mechanic (decedent) died when he was caught and pinned at the neck between an adjusting rod (take-up) and the leg of the frame of a knitting machine. The decedent was attempting to correct a problem with the lines of thread feeding into the knitter. With the protective gate (machine guard) open due to a defeated interlock, he pushed the machine's stop button. He then apparently squatted down to look at the knitted cloth as the machine was coming to a stop. Before the machine stopped, the decedent's neck became pinned. The CA/FACE investigator concluded that, in order to prevent future occurrences, employers should:

- implement a formal, written program that provides requirements to perform maintenance on knitting machines including locking out and tagging.
- use knitting machines designed so controls can only be operated by an employee from a safe distance from moving parts and so interlocks cannot be easily defeated.

INTRODUCTION

On September 28, 1996, at 10:00 p.m., a 51-year old male supervisor/mechanic was fatally injured when his neck became pinned between an adjusting rod and the leg

of the frame of a knitting machine. The decedent was attempting to correct a problem with the lines of threads feeding the knitting machine. With the machine running and the protective gate (machine guard) open due to a defeated interlock, he pushed the machine's stop button. As the machine was turning to a stop, his neck was caught and pinned.

The CA/FACE investigator did not learn of the incident until February 3, 1997 from the county coroner's office. The CA/FACE investigator, AK/FACE investigator and the CA/FACE research scientist traveled to the site of the incident on February 4, 1997. They met with the general manager of the knitting mill, interviewed him, and photographed the machine.

The knitting mill had been in business for 25 years and had 130 employees with 50 working at the site at the time of the incident. The decedent had worked for the company for 20 years. The general manager was responsible for safety at the company and devoted an unknown amount of time to job safety. New hires are trained for three months before being allowed to work independently with a knitting machine. Additionally, employees are trained for three weeks on a new machine before being allowed to operate it. The decedent was trained on all knitting machines in the company. There were no written procedures for locking out the knitting machine or for maintenance.

INVESTIGATION

The scene of the incident is a company that produces different types of knitted cloth. The building houses many individual knitting machines. The machine involved in the incident was manufactured in 1986 and consisted of 84 individual lines of thread which feed into the knitter. The product, a two-ply cloth, was then pressed together with a rolls which resulted in a roll of fabric.

The decedent was the supervisor for the graveyard shift at the time of the incident. His job was to assure that all the knitting machines were kept operational. It is common for knitting machines to fail to operate when one of the many feeder lines

(threads) breaks. The decedent and other employees also were responsible for assuring that the cloth being knitted was not defective.

Prior to the incident, the decedent was informed by a machine operator that the cloth being produced had lines (defects) in it. The decedent checked the machine's operation for about 10 minutes when he was paged and asked to come to a different location. He advised the machine operator to leave the knitting machine stopped until his return. Upon his return, he worked on the machine for another 10 minutes when he was again paged. He went to answer the page and the machine operator left to move rolls of fabric. The machine operator noticed that another knitting machine he was operating had stopped. He spent about 5 minutes repairing it. He then returned to the machine involved in the incident.

Upon his return he noticed that the decedent was pinned between the take-up and the leg of the frame of the knitting machine. The take-up is an adjustment device which is shaped like a rod or pipe, about 1-inch in diameter and sticks out like an arm. In normal operation, a portion of the machine, including the take-up, rotates in a circle as the cloth is being knitted. This part of the machine is protected by a screen which has a gate for access. The gate is interlocked and will stop the machine when it is opened.

The knitting machine can operate at different speeds depending on the type of cloth being knitted. On the day of the investigation the machine was operating at approximately 30 to 40 revolutions per minute (rpm)**.** On the evening of the incident the machine was operating at a higher speed which, when de-energized, allowed a rotation of at least one-third of a turn of the portion of the machine to which the take-up arm was attached before ceasing movement. The knitting machine could be de-energized by pressing the stop button, which was just above the area where the gate closes, or by opening the gate, thereby activating the interlock.

When the lines were noted in the cloth being knitted, it indicated that one or more of the 84 lines of thread was defective. The procedure is to mark one of the suspected threads and watch where it comes out on the knitted cloth. By determining whether the defect is before or after the marked thread, the defective thread can be established and

replaced.

In order to closely view the cloth, an employee must open the interlocked gate and bend or squat to see it. A fluorescent lamp is located in the middle of the machine, between the two plies of cloth to facilitate viewing. It is sometimes necessary to physically reach in and pull on the cloth to be able to determine where the defect is originating.

On the evening of the incident, when the decedent was working on the machine he would reach up from a squatting position and operate the start and stop buttons. The gate interlock was easily defeated with a ball point pen which allowed movement of the machine with the gate open. The most likely scenario, although unwitnessed, is that the decedent lost his balance and fell forward as the machine was coming to a stop. It is unlikely that the knitting machine was running because it would not have been stopped by the decedent's body.

When he was found with his neck pinned between the take-up rod and the leg of the frame of the machine, the machine operator immediately called for help. One employee called 911 and other employees brought tools to extricate the decedent. Since the machine cannot be moved backwards, it had to be disassembled to remove the decedent. When he was freed, the employees laid him on the floor. He was unconscious at that time.

CAUSE OF DEATH

The coroner's report stated the cause of death to be **????**

RECOMMENDATIONS/DISCUSSION

Recommendation #1: Employers should implement a formal, written program that provides requirements to perform maintenance on knitting machines including locking out and tagging.

Discussion: The company did not have a written program that detailed the steps needed to maintain the various knitting machines and had no written plan for locking out

and tagging machines that were under repair. The knitting machine involved in this incident had been under repair for about one-half hour. The knitting machine was equipped with an interlocked guard (gate). Interlocks are used on machines to help prevent workers from being caught in moving parts. They work by shutting off the machine when a guard is opened while the machine is running. The interlock on the knitting machine involved in this incident, as demonstrated to the CA/FACE investigator, could easily be defeated with a ball point pen or similar object. While holding a pen against the interlock, it was possible to reach up and turn the machine on with the start button. According to the general manager, it seemed to be common knowledge that the interlocks could be defeated in this manner. With the interlock defeated it was capable of movement because its power source was not de-energized. This exposed employees to moving parts of the machine.

In order to prevent such exposure, a program that details the requirements for the safe maintenance of knitting machines should be developed and implemented. Employees should be trained to understand not only the methods of working safely, but the importance of following the rules and the consequences, including discipline, of not adhering to the rules.

If maintenance procedures which required locking out (disconnecting from all sources of power and preventing the power from being reconnected) and, if required tagging (placement of warning tags at the power source), knitting machines under repair were in place and followed by employees, this incident may not have happened.

Recommendation #2: Employers should use knitting machines designed so controls can only be operated by an employee from a safe distance from moving parts and so interlocks cannot be easily defeated.

Discussion: The knitting machine involved in this incident had its start/stop controls located just above the protective gate's interlock. The interlock could be easily defeated and since the controls could be reached while bending or squatting down, the machine could be started while the person operating it was exposed to moving parts.

The start and stop controls should be placed in a position so no employee body parts could be exposed to moving machinery parts. Additionally, a reset button should

be designed into the machine so that when an interlock is released workers must move away from any moving machine parts to reset it.

Interlocks should be designed so that they cannot be easily defeated with common objects. The company's newest knitting machines had interlocks which were activated by a rod with a detent. This type of interlock mechanism cannot be easily defeated.

Had the machine involved in this incident had an interlock which could not be defeated, and a reset button and start/stop controls placed away from the moving parts of the machine, this incident most likely would not have happened.

References:

Barclays Official Code of Regulations, Vol. 9, Title 8, Industrial Relations, South San Francisco, CA, 1990