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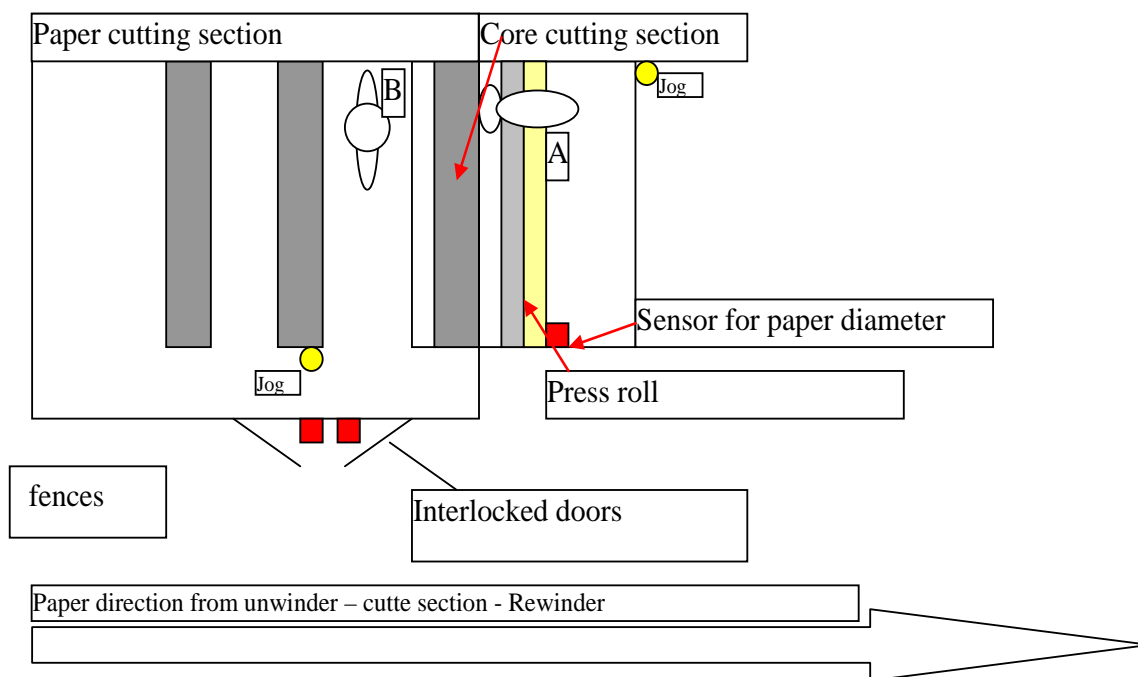
## Fatal Accident at SCA, Lilla Edet, Paper Mill Sweden

### Background

On 25 October 2009, an employee working in a Swedish paper mill suffered fatal injuries while working on a Perini Rodumat Model – Mo 5800. The machine was built in 1990 and the incident occurred while changing over from a small roll (19cm) – coreless product – 143cm width, to a large roll (38cm) – with core – 164cm width.

### Details of the incident

The figure below indicates the operator's respective position during the change over: Please note that the figures do not indicate Operator 'B's position during the accident. All photos below were taken in connection with the accident.



The operator's tasks during the change-over were to adjust the knives (both for paper and also for core) after manufacturing the first test roll. One operator was adjusting the paper knives.



Operator 'A' was adjusting the core material knives. Adjusting the core material knives normally takes about 10 minutes, whereas adjusting the paper knives normally takes about 15 minutes. As a general note, it should be stressed that the mill did not lag behind with its deliveries and there was ample time to meet forthcoming orders.



One of the procedures used to adjust the knives, which is used by several operators, is to start by building up paper on the reels. The machine is then set to automatic mode ("Auto"). This method was used during the accident. It is not necessary to produce a complete paper roll in order to adjust the core material knives. Some operators make the adjustment directly on the core material (*i.e.* without first building up paper on the cores).

In the case at hand, the machine was stopped just as the paper reel diameter sensor indicated that the reel had reached its specified diameter. This entailed that the paper reel was ready to be ejected and that the next step in the production cycle was that the press roll would move to its top position. Based on the information presently available, the system was then switched to "Hand" (*i.e.* manual mode) to prevent the press roll from moving up to its top position. The press roll was thus fixed by the system being switched to manual mode. As long as the system is in manual mode the press roll will not move.

**Operator B** (based in the paper cutting section)

Once the paper knives had been adjusted by Operator B, the side control panel was switched to "Auto" mode (in order to enable forthcoming production). Operator B then left the paper cutting section by closing the door which is connected to the interlock system.

**Operator A** (victim)

Operator 'A' went up on the platform at the front part of the reel machine and further into the machine, putting her knees on top of the water spray system on top of the press roll.

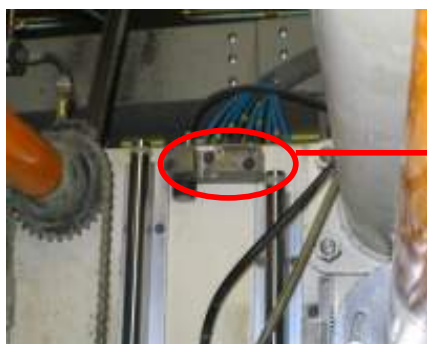


Position of operator 'A' knees

The tasks of Operator 'A' normally includes making adjustments to the core knives so that they are positioned at a correct distance from one and other depending on the product to be produced. Operator 'A' also opens or closes the compressed air to the core knives, depending on whether they shall be active or not during the forthcoming production. At the moment when Operator 'B' closed the door on the side of the machine, the press roll commenced moving upwards, whereby it caught Operator 'A' and squeezed her upwards against a fixed bar.

### Underlying facts

- Contacts after the accident with other SCA mills and some competitors show that similar incidents or accidents are neither known nor have been reported. Also the manufacturer of the machine, Perini, has during contacts stated that they are not aware of any similar incident.
- The Perini original programming in the PLC system shows that an interrupted cycle is always completed as soon as the system is switched into automatic mode without need for any active restoration by the operator via the control panel, provided that the diameter sensor is activated. There is a difference in relation to how modern systems are programmed.
- It is not possible to make the adjustments in question during a complete shutdown of the machine, since power supply is needed for jogging and pressurizing of the circular knives.
- The machine has been constructed by Perini in such way that if the pressure in the cones that hold the paper set in place is lost if the pressurized air is released. In such a case, the paper set is released and ejected from the machine. For this reason, the different power types are not interlinked with each other from a safety point of view and the pressurized air is completely independent. Even if the emergency button is pressed, the functions that are driven by pressurized air will continue to work. The movement of the press roll is driven by pressurized air.
- It has not been possible to find any indications of the pertinent upward movement of the press roll in the written material that has been provided by the manufacturer.
- There is an original mechanical safety device installed in order to prevent the hazard of the roll falling down in case of pressure release. According to the instructions that were given by Perini at start-up of the machine type, the roll should be down on the platform during change-over work. The very same procedure was taught when the machine was put into service in 1990. This has been confirmed by operators who participated in the start-up training and who are still working at the mill. The procedure has also been confirmed by at least other SCA units that have been consulted. In addition, it is very difficult to reach



Mechanical fixation

- The scenario where the press roll moves upwards has not been mentioned, neither in Perini's manual nor in the mill's internal documentation and therefore all parties concerned have focused on preventing the roll from moving downwards in case of pressure release/power failure.
- There has neither occurred (or been reported) any other incidents or accidents suggesting the risk for the course of event that has occurred.
- The visibility between the two operators is limited.



- Basic risk assessments are available
- As stated above, Perini's original instruction at start-up of the machine type Rodumat was that the press roll should be fixed on the platform and that the change-over work should be performed above the roll. There have been reports regarding incidents where the press roll has moved downwards after having been fixed in its upper position, as a result of the pressurized air slowly escaping the system and being unable to maintain the press roll in its position. Thus, the instructions given by Perini have created one of the pre-requisites for the current squeeze risk.
- The press roll reaches its upper position in 2.8 seconds on the pertinent machine, respectively in 5.6 seconds on the two other Rodumats.

#### **Preliminary conclusions regarding the root cause**

- Paper was built up on the core to such an extent that the diameter sensor, when the test roll was completed by the machine being switched over to manual mode, was activated and therefore ready for the next step in the production cycle, *i.e.* that the press reel should move up, thereby releasing the paper set so that a new set of paper reels could be produced.
- The programming of the machine completes the production cycle automatically without any preceding active resetting by the operators.
- On the day in question, Operator B's adjustment of the paper knives for some reason was performed more quickly than the less complicated adjustment of core knives performed by Operator A. This is very infrequent.
- During the change-over the front control panel of the machine was switched from manual mode to automatic mode to enable jogging.
- Once Operator B had completed adjusting the paper knives, she switched the side control panel position from "Hand" to "Auto" and closed the door that was connected to the interlock system. Thereby the machine was no longer in safe mode.

### CPI Comment and Action

The information within this safety alert has been taken entirely from the original source and we are grateful to SCA Lilla Edet Paper Mill for sharing this information with us.

With that in mind, we are currently unable to establish, a more in depth description of the machine, its mode of operation, layout of controls and the current methods for safeguarding dangerous parts are unclear. In particular, it is not clear how access was obtained to the dangerous parts associated with the core cutting section, including the movement of the rider reel.

However, it appears that one operator was inside a guard enclosure while adjustment was taking place by a second person. It also appears that the machine's control system was such that an interrupted cycle was always completed as soon as the machine was switched to automatic mode, without the need for the operator concerned to actively restore/reset from the control panel, provided the reel diameter sensor was activated.

All companies are strongly advised to review their current operating procedures against the above information, in particular to the fact that there may still be machines in operation in the UK, particularly machines that are several years old, on which **“the original programming of the PLC system is such that an interrupted cycle is always completed as soon as the system is switched into automatic mode, without the need for any active restoration by the operator via the control panel, provided the diameter sensor is activated”**.

The guidance in ‘*Rewinding Paper Safely*’, [www.paper.org.uk/services/health\\_safety/machinery/Rewinding%20paper%20safely.pdf](http://www.paper.org.uk/services/health_safety/machinery/Rewinding%20paper%20safely.pdf) which applies to all machines, new and old, is clear about retrofit measures. Sections 3 and 7 are particularly relevant. The second and third bullet points of section 7 refer to intervention at crawl speed and require users to carry out assessment to confirm if intervention is required whilst the machinery in motion, for setting purposes. In these circumstances the provision of interlocked gates should be provided, if access is needed. Interlocking using e.g. a trapped key/key exchange interlocking system should be designed to ensure the safety of an operator who enters the guard enclosure to undertake adjustments. Such a key exchange should be configured to ensure that crawl speed is selected prior to entry.

### Additional Advice

It is good industry practice for all companies to ensure that:

- A thorough ‘task related’ risk assessment is undertaken to identify **ALL** those tasks, including the infrequently performed ones, which could *potentially* involve working inside enclosures or removing/disturbing guards or safety devices. Include predictive human error types e.g. operator presses wrong button, and ask what the worst foreseeable outcome would be if things went wrong.
- All necessary isolations are in place for both standard and non routine operations. This should include ensuring that equipment is isolated from the power, that there is no residual pressure in the system likely to cause any part of the equipment to move in such a way as to cause harm, and that moving parts have been secured as appropriate in order to prevent them from moving.
- Training arrangements are reviewed to ensure that all operators are fully trained and competent to complete the tasks expected of them.
- Any manual intervention is strictly controlled by an agreed SSoW and that measures are in place to monitor compliance.