

# DEALING WITH THE UNTHINKABLE

It is a hot humid summer morning. The press shop supervisor runs into your office horrified. A young operator's arm is trapped in a mechanical power press—on bottom! Fright and panic is natural for anyone faced with a situation so unthinkable—even the thought brings horror. What is done in the next few minutes can make the difference between a minor injury and loss of an arm. Let's look at how this accident might happen and ways to deal with it.

In this article, the reader is cautioned that, while the information is based on practical experience, the exact emergency plan and procedure to deal with human entrapment in a press will vary from machine to machine and plant to plant. Neither the writer nor anyone who has published this material is recommending a specific procedure. We do recommend that you develop a plan to suit your needs based on sound engineering advice applicable to your situation.

Pressroom amputations are becoming rare thanks to the industry using modern safeguards, reliable control equipment and ongoing employee training in safe procedures. Human entrapment in a die seldom occurs. Several ways in which human entrapment in a die can happen include:

1. The operator can reach into the diespace on the downstroke to reposition a part.
2. A press may fail to stop on top and cycle part way closed as the operator is loading a new part.
3. An upper die bolting failure on the upstroke can entrap an operator when hand loading a die.

Here, a failure to safeguard the point of operation, a press control maintenance problem and failure to properly secure the die in the press may be the cause of human entrapment. These accidents are violations of OSHA rules and avoidable. In a perfect shop no one makes a mistake. However, carelessness must be anticipated. The effect of plant power interruptions must also be considered in emergency planning.

## **Training and Preparedness**

Training and preparedness to react correctly to human entrapment in a power press is seldom included in safety programs. In the United States, following OSHA power press rules is both a legal requirement and common sense procedure based on good engineering practice. However, lapses in good judgment and unforeseen equipment failures can result in human entrapment in a die.

1. Never inch the press in an attempt to release a person having any part of their body trapped in a press. Push only the emergency stop and motor stop button. Everyone must be instructed in this procedure. Many needless amputations have occurred because the nearest operator inched the press through bottom dead center to free the subject.
2. Someone should stay with the victim while help is summoned. The victim should be physically supported and reassured. Until trained emergency personnel arrive, make sure that no one touches the controls other than the emergency stop and drive motor shut off switch.
3. Have steel blocks and wedges quickly available in an emergency response kit. The blocks are sized to withstand maximum press tonnage under power. This blocking is quickly put into place. The angle of the wedges is approximately eight to ten degrees. The wedges are hammered tightly into place within the die or press taking up any space in the stack of steel blocks to prevent further downward movement of the press ram.
4. Technical personnel including tool and die makers and diesetters familiar with die operation determine die pad, cam and nitrogen system operation. Die component movement must assist in releasing the subject, not further injury.
5. Medical personnel are promptly summoned. Quickly releasing the victim can lessen the extent of the injury, severity of pain and danger of going into shock. Emergency medical personnel can administer pain medication; lessen shock and control bleeding. Your local fire and rescue department should be called immediately.
6. The ranking officer on the scene is in charge of what happens next in most political jurisdictions and is very likely immune from liability. This person is going to work with your rescue people in ways that will benefit the victim. It is expected that your rescue personnel will work with the ranking officer and other rescue personnel to continue appropriate rescue steps. For example, the fire and rescue unit can summon a medical rescue helicopter, which will bring speedy transport to the appropriate hospital. The helicopter normally has a nurse and medical doctor. However, it takes skilled tradespersons and management to free the victim if possible. The Doctor can use medical judgement to further stabilize the entrapped person and perform medical procedures including amputation at the press if that is required.

### **Raising the Ram**

*Hydraulic presses* are handled on a case-by-case basis. If the ram is properly blocked to withstand full press capacity, there is little danger in raising the ram under power. Carefully raising a hydraulic press ram without blocking might be required quickly if the ram drifts down due to gravity.

***Mechanical power press*** entrapment nearly always occurs before bottom dead center. This is because the press has electrical take over cam switches that complete the stroke to the top of stroke once the operator's hands remain on the buttons until bottom dead center. In a typical entrapment example, the operator releases improperly positioned palm buttons to reposition a part on the downstroke and hand is caught in the die before bottom dead center.

1. Raising the air counterbalance pressure to the maximum may raise the ram in reverse. Of course the flywheel must be totally stopped. Hitting the emergency stop and motor stop normally does not shut off the control circuit. Pressing the inch button with the motor off can often release the brake—this will also engage the clutch and cause reverse flywheel movement.
2. To inch the press in reverse under power, the drive motor must be reversed. A reversing motor contactor with a control panel key switch is recommended for all three-phase drive motors. Otherwise, a maintenance technician may need to manually reconnect the motor to run in reverse.
3. If the press will not inch in reverse safety systems may have tripped. Trained technicians can reset or bypass hydraulic overload and clutch fault circuits. Care is required to insure that resetting a tripped safety system such as a hydraulic overload does not result in downward ram movement.
4. If entrapment has occurred because the upper die has become detached from the ram, the die may be opened in the press with steel blocks wedges and jacks. Once steel blocks and wedges within the die prevent further die closure, the ram may be reattached to the upper die and raised in reverse.
5. Powerful jacks may be required to assist in raising the ram. These may be they same type of jacks capable of raising the dead weight of the ram used for periodic press bearing clearance inspection.
6. If the ram is not to bottom dead center and cannot be raised by raising counterbalance pressure, jumpering tripped safety systems and reversing the press, then an oxygen fuel gas torch may be used to cut the die parallels. If necessary, cut the pitman connection adjusting screw(s). These are drastic measures, but necessary and to be carried out quickly with fire personal present to suppress fire. This method will work with large jacks to raise the ram even if there is no electrical power or compressed air at the press.

### **Regular Emergency Drills**

The emergency kit having steel blocks wedges jacks should be in a locked cart easily moved to any press. A key can be placed under a glass panel for quick emergency use. The cart and its contents are only used for entrapment emergency and training drills.

1. Conduct frequent emergency procedure training for all pressroom personnel. Explain the function of the take over cam contacts to complete the stroke and the fact that if the press stops near bottom dead center they have not engaged yet. Explain why the press motor is shut off and the slide blocked up.
2. Demonstrate proper palm button testing and make sure all operators test their palm buttons when starting or resuming operation of a press. Explain how the proper safety is determined and why it must be maintained.
3. Stop a press on the downstroke as the die just starts to close by releasing one palm button. Stop the press motor and practice the emergency blocking and wedging procedure. Explain each step and why it is done in that order.
4. Occasionally practice with your local emergency rescue personnel. They will need to stabilize and transport the subject should a need for an actual rescue occur.

### **Die Tryout Safety**

The writer notes a simple courtesy before cycling a press when die tryout personnel are working together has never been put into any formal procedure. When working on a consulting job in Mexico, my partner, a Chicago trained diemaker inched the press, he bumped the clutch and brake with the inch controls. This sound will alert anyone in the area that the press is about to be inched. Maintaining eyes contact and singling OK is important. The writer immediately walked over and shook the partner's hand thanking him for that simple courtesy that can save an arm or life on die tryout work.

### **Conclusion**

The focus of the rescue procedure is to release the person without further bodily damage. The ultimate goal is to instill press safety in the plant culture so that the need for an emergency rescue never occurs. Avoid shock value in training and emphasize the broader safety aspects of emergency response. If everyone understands the plan and contributes to maintaining a safe workplace the unthinkable accident will not occur.

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