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58th NATIONAL SAFETY CONGRESS
Papers Delivered in the
AUTOMOTIVE and MACHINE SHOP SESSION

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AUTOMOTIVE & MACHINE SHOP SESSION

WHAT IS COMMUNICATION?

By **RICHARD A. HAHN**
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In a broad sense, communication is any act by virtue of which one organism evokes behavior from another. This behavior is evoked, of course, because of a transfer of an idea or concept from one to another. This does not imply that the evoked reaction will be consistently what the initiator anticipates. Usually, however, the reaction is somehow related to the intention and anticipation of the initiator's symbol efforts, even if the relationship is a negative one.

The receiver's reaction merits discussion because it is vital to the completion of the communication cycle. Any valid communication system must make provision for some type of reaction (feedback) and must seek to activate that feedback. Unfortunately, most people who seek a facile communication system pay lip service to feedback but do very little to promote it. Many communication systems find their weakest link here.

A fundamental communication system includes message creation, encoding, transmission, reception, decoding, message recreation, and feedback. To further explain the broad connotations of communication, the transmission can assume any of three forms:

1. Oral (face to face)
2. Written
3. Non-Verbal

The above forms need to be understood because every employee makes use of each form, whether he realizes it or not.

1. Oral Communication

Recent studies at the University of Michigan indicate that 85 per cent of one's communicative time is spent speaking and listening. Oral communication has the advantage of being the most creditable to the listener because

he can question immediately. It also offers the communicator a better opportunity to create the desired response from the receiver because of the opportunity to make use of immediate feedback . . . and the voice is more expressive than a piece of paper. It is disadvantageous in that it is distorted each time it is passed on. Furthermore, the message, if not recorded, is ephemeral and lost for future reference.

2. Written Communication

Written communications transcends all boundaries of time. They are ideal for future reference and for material that has to be circulated. The written form is impersonal and gives rise to greater suspicion than oral communication. It is also limited in ability to adapt to feedback.

3. Non-Verbal Communication

Non-verbal communication is important here because it is often overlooked. Many people fail to realize that it exists. Between people everywhere the most direct communication is by action. A decision to not send communication about a given management action does not prevent communication concerning that action. It merely allows greater latitude in the interpretation of that action. Likewise the lack of action can be a communication, too. Therefore, communication is moving down the line *all the time*.

The goals of a sound communication system for a growing industrial concern are:

1. Make all management aware of the constant non-verbal communication so that possible errors by accident may be avoided.

2. Make the employees informed.
3. Make the employees feel informed.
4. Keep management informed about employee feelings and reactions.
5. Assist in creating high morale and a feeling of unity throughout the corporation.
6. Maintain a smooth running, coordinated organization.

How Is Meaning Conveyed?

The cost of effective communication between people is much higher than is commonly supposed. It is expensive in time, in understanding, and in emotional control. The reasons for this are that the process of communication is much less simple than we ordinarily realize, and meaning (or that which gets across in communication) is more than a matter of logical facts. Therefore, words can do only a small part of the job of building understanding.

Meaning is conveyed by:

1. WORDS, spoken or written to a given audience, and consciously intended to transmit meaning. This is all that most people think of when they use the word, "communication."
2. INTERPRETATIONS made by other people of words or silence, of expressive behavior, or even of inaction. This way of picking up meaning is being used all the time; especially by people in subordinate positions, and by those who have any reason for feeling suspicious or insecure. But important people often remain unaware of such interpretive activity. They seem to have forgotten that they themselves once found it an absorbing preoccupation.
3. INSIGHT INTO SITUATIONAL MEANING, as when we say: "The facts speak for themselves." When a leader gives an order, he is presumably translating into an explicit statement his insight into the implied, or tacit demand of the situation.

If we are to understand all that communication can do, we need to think about all these ways in which meaning gets back and forth.

Non-Verbal Communication

Of the three elementary forms which communication may assume, oral, written, and non-verbal, the first two are always considered by would-be communicators, but the latter is generally overlooked. This demands an examination of non-verbal communication because it probably occupies more of our communicative time than either oral or written.

In the case of art, or a gesture, or a physical demonstration, non-verbal communication can be planned and well controlled. There are other times, however, when man unknowingly communicates with his fellow man either by some action or by the lack of some action. In either case, if the resulting communication is unplanned it is therefore also uncontrolled. Such lack of control over one's communication places him in a tenuous position.

One obviously doesn't have to use words (written or spoken) to communicate. That fact is often dangerously overlooked. The total concept of non-verbal communication assumes many forms, the most common of which are:

- a. Specific action taken,
- b. Non-communication (lack of explanation when one is needed),
- c. Manner in which message is communicated, and
- d. Workers' environment.

One must be aware of this type of communication, because he uses it every day.

Perhaps specific examples will put non-verbal communication in better context. In its simplest form, non-verbal communication would assume the form of a child sticking out his tongue or an irate man making an appropriate gesture. Surely neither of these examples are verbal, but both do a great deal of communicating.

In its more complex form and in relation to the business world, non-verbal communication might assume the form of neglect to paint an office or area which is in need, or of any unexplained action which might be misinterpreted.

Any manager must remember that he is communicating all the time whether he realizes it or not.

POWER PRESS and FORGING SESSIONS SAFETY MOTIVATION IN THE FORGE SHOP

By DALE R. BOS

Supervisor of Safety, Chevrolet-Detroit Forge, Detroit, Mich.

The problems encountered in the forging industry are very much like those in other manufacturing industries where material must be moved in and out of the plants expeditiously. Along with material handling devices, systems, and storage, adequate guarding good housekeeping, and maintenance of the equipment are important for the safety and welfare of employees.

Management at Chevrolet-Detroit Forge has for a long time conscientiously accepted its responsibility for the prevention of accidents. Over the years, many safety engineering advancements have been installed into our manufacturing processes. As a result, few injuries are due anymore to insufficient guarding, defective platforms, or lack of protective devices.

The accidents with which we are confronted today are mainly due to acts of carelessness, such as one fleeting second of inattention by an employee. Failure to inspect and correct faulty tools and equipment, placing hands and fingers in pinch point areas, and failure to use the protective equipment available. Obviously, employees must be especially alert at all times in a forging plant to anticipate what can happen, so preventive measures can be taken. They should be well acquainted with the potential hazards of operating the machinery and handling the equipment with which they work. To accomplish this, numerous safety programs have been incorporated to motivate employee awareness and enthusiasm. For example, in March 1966 we initiated a program wherein each foreman was assigned to the safety department for a two-week period. They were instructed to talk to employees individually throughout the plant and obtain their personal reactions to our safety program. The foremen then submitted written reports of their findings on forms which were reviewed by the plant manager, personnel director, and safety supervisor. The assigned foremen discussed with employees such things as production and safety, proper

job instructions and training enforcement, and the employee's supervisor's safety attitude. The written reports included a survey of the physical conditions of the plant, the employees' safety attitude, and the foremen's personal comments.

We continued this program for approximately two years, until every foreman had spent two weeks strictly talking and selling safety on a man-to-man basis. In addition, we continued to conduct many other safety educational programs for employees and supervisors to create increased safety consciousness. One, of particular benefit, was a nine week "Training for Safety" program for supervisors. This program reminded supervisors of the three E's—engineering, education, and enforcement—that are essential components of safe operating procedures. We were able to devote a session to each important safety phase, such as housekeeping, education and training, protective clothing and equipment, material handling, our plant guarding program, and accident reporting. We felt that in these meetings we were able to further impress each supervisor with the importance of communicating, motivating, and then selling safety to his employees. As stated by our plant manager during the concluding session, this was essentially a "people program." He pointed out that safety is our first responsibility and that we must have the cooperative support of all employees.

We then initiated a program titled "The No. 1 Safety Team Program," which has helped us establish and maintain our leadership in safety. This program was designed to cover all the basic principles of safety. In addition, we added a fourth E, enthusiasm, by providing employees with a competitive challenge as well as a monthly incentive reward. To draw attention to the new program and to arouse the employees' curiosity and interest, a different poster was displayed throughout the plants each week for four weeks. The fourth poster was dis-

played the same week that meetings were held with all employees to introduce the program.

We divided the plant into 72 teams. Each team comprises all employees assigned to one foreman, who is a team leader. Once a month, the members of the safety department rate each team in five different categories: housekeeping, physical hazards, unsafe work practices, accident experience, and the employees' safety attitude and interest.

To be fair in our rating in the housekeeping and physical hazard categories, all inspections are unannounced as to the time or date they are to be made. Items needing correction are listed on standard forms. The inspectors record each item in the space provided, indicating what was observed and the location. A specific number of points is charged for each poor condition observed, regardless of who caused the condition. For instance, each time excessive oil or grease is found on the floor in a team's work area, that team is charged four points. This is because we feel that as long as the hazard is in the team's work area, someone in their group could be injured, and unless they have reported the condition in writing to a service department for correction, they are to receive the point charge.

This brings us to the safety request forms. These forms are provided for all supervisors and have proved to be a vital link in strengthening communications between the area foremen and the service departments. Space is provided for listing any routine safety items which need to be corrected. They are in triplicate on NCR paper, which eliminates the use of carbon paper. When the area foreman fills out a safety request form, the service department foreman signs it and retains the original. The second copy is sent to the safety department, and the third copy is retained by the requesting foreman. This procedure expedites the completion of safety items needing correction, since any request not corrected within five days from the time it is given to the service department is charged to that service department's team score. If an item is not completed before 30 days, a written follow-up is again required by the area foreman to avoid the point charge against his team score in the following month. This provision is to motivate the requesting foreman to

follow up until completion, although it is seldom that a written request is not corrected by the service department within five days of its origin.

Employee violation is the third category in which we rate each team monthly. It is based on the detection of unsafe work practices that the inspectors may observe. Employee safety violations are charged to a team's score anytime they are noted during the month, rather than just during the inspection period. Our procedure is to also record an unsafe practice on the Employee Violation Card and to discuss the unsafe act with the employee's foreman. He in turn, takes whatever action he deems necessary and returns the card to us with his written disposition. The card is then maintained in our file for future reference.

The fourth category is "accident experience." Points are charged to a team score if a serious accident occurs to an individual. If it is a reportable accident, 20 points are added to the team score. If an accident results in lost time, 30 points are charged.

The last category in which each team is rated monthly is "safety attitude and interest." To assist us in evaluating this phase of the program, we ask one employee, selected at random from each team, three questions.

The first question is derived from the *Monthly Safety Reminder*, which is published by the safety department on a personalized pocket folder furnished to each foreman. The folder is designed to fit in the shirt pocket, with the heading visible at all times. This has motivated employees to approach their foremen and ask what the heading means. The foremen then have an opportunity to emphasize safety to their employees and also make for a more interesting discussion. We ask that foremen apply the text of the material in the manner pertaining to the team's operations, so it will have more meaning to their employees. Other pertinent material, such as information related to hand safety and articles which will assist in their safety endeavors, is included in the pocket folder.

The second question asked of an employee on each team is "What is the color of the traffic safety light?" These are located in seven strategic areas in the plants so that every employee passes one of them on his

way to his work station. The light is "red" if a lost time accident occurs, "yellow" when a reportable accident is experienced, and "green" when there have been no injuries. The yellow or red light is displayed for 24 hours after an accident so that every employee has an opportunity to observe it. A description of the most recent accident is displayed near each light so all employees are cognizant of how the accident occurred and can take steps toward preventing any re-occurrence of similar injuries.

Also displayed on the sign at each light is the number of lost time accident-free days our plant has worked. This constitutes the third question that is asked of an employee selected at random on each safety team. For each incorrect answer, there is a 15 point charge against his team score. If he is able to provide the right answers for all of the questions, his picture is taken at his work area and mounted in a picture folder. For additional recognition, the pictures are displayed in the cafeteria for 15 days before being presented to each individual. The name and badge number of each employee questioned is recorded on the team's score sheet. This serves as a feedback for the foreman. If, for instance, an employee does not know the monthly safety subject when asked, his foreman apparently failed to communicate effectively with the individual and should vary his approach for future safety talks.

In many areas of the plant, the employees have posted the answers to the three questions in their work areas to assure that their team members respond correctly if asked. Others will carry the current answers in their pockets so as not to hinder their team score. We are favorably impressed with the results obtained from this portion of the program, because approximately 50 per cent of the employees contacted know the correct replies to all three questions.

Following the monthly inspection, the scores are totaled and every foreman receives a copy of his team's entire results. Each team is then placed in standings order, and this report is posted on all safety bulletin boards so every employee can see how his team stands in comparison to the rest of the plant. In addition, all general foremen and higher supervision receive this report for their particular department following each month's inspection. Listed in standings

order by shift are the names of the group leaders, their sections, and scores in each of the five categories rated. By keeping everyone fully informed throughout the program, we have made each employee feel that he is a critical part of the entire operation.

Recognition is awarded to the top ten teams through this display board placed in the cafeteria for viewing by all plant employees. The listing is exhibited for an entire month and identifies the supervisor or team leader and his section as they appear in order of standings for the month.

In addition, special recognition is awarded monthly to the top team in a number of different ways. The winners are presented with a meal ticket from their foreman which entitles them to a free lunch in a reserved section of the cafeteria. The meal symbolizes the personal congratulations of the Plant Manager for the individual and team effort which was put forth in winning the contest.

Following the meal, recognition buttons are given to each team member to wear. In this manner, other employees noticing the buttons, have developed more interest and incentive in our safety program. The color of the buttons is changed each month to correspond with the color of the recognition sign placed in the first place team's work area. A new sign is added to the pole which shows the month, section and team leader's name. As an added bonus, the first place team leader is given an opportunity to drive a new Camaro for a period of time.

Unfortunately, as in every competitive event, some teams have to be in the last positions. In an effort to motivate the leaders of these teams to improve their group scores in subsequent months, separate meetings are held with the foremen of each of the bottom ten teams and their general foremen. The meetings are scheduled to review the inspection results, accident experience, safety talks, and items on which special effort must be placed. To further assist them, a complete survey is made in each of the team's areas in advance of the meetings. In these surveys, the safety representative records all housekeeping and physical hazard conditions for review in the meeting. A copy is given to the foreman and his general foreman. Their full effort must be made to have all items corrected immediately. The safety depart-

ment will assist on any items needing special attention. Routine items involving equipment or machinery, not corrected within two weeks from the time they are reported, will be tagged out of service.

The results of this effort are extremely favorable. In nearly every instance, a follow-up inspection one week later shows 80 per cent of the items to be completed. During a three-year period, there have been very few instances when a piece of equipment had to be shut down because a routine safety condition was not corrected within the two weeks. I can assure you that this measure brought results.

It was interesting to note, when we made our first inspection, a few employees were attempting to clean up ahead of us, in hopes that their team would be awarded a free meal. They soon realized that to be on a winning team requires the constant effort of all the members, as the award is measured on the basis of each team's total safety performance.

The first place teams take considerable pride in their achievement, while others strive to improve their position. The program motivates employees to check their equipment constantly and to immediately report items needing correction. It also encourages the area foremen to put the request in writing, to avoid a team charge and being blamed for a poor team score. Furthermore, it has encouraged the service department to make the corrections within five days from the time they are received. Employee interest has been reflected throughout the program and has continued to generate with the supervisors' full support.

In conjunction with this program, monthly events are scheduled to help stimulate and renew employee interest. In January, meetings are held with all employees to introduce the program for the current year and to obtain their full support toward achieving our plant goals. A pictorial display of the basic causes for accidents was posted in the cafeteria in January and attracted a great deal of attention.

During February, we stress hand safety by posting daily the accumulating number of hand and finger treatment cases reporting to our medical department compared to those received in the same period in the previous year.

March is electrical safety month. Meetings are conducted for all electricians, fire brigade members, and certain other employees for the purpose of reviewing the techniques to be used in applying artificial respiration.

In April, we conduct a well publicized safety suggestion drive with prize drawings to encourage employee participation. Letters are sent to the homes from our plant manager introducing the program, and again to thank each employee who submitted a safety suggestion during this period.

Special effort is placed on good housekeeping in the month of May. This is done through a slogan contest, pictorial displays of "before" and "after" housekeeping conditions, and other activities.

Vacation safety is emphasized in June. Just prior to Memorial Day last year, letters from the plant manager were mailed to the homes of all employees with a list of vacation safety tips. In addition, an emergency first aid kit was presented to each employee by his foreman, with the thought that he will have it available should the need arise.

As employees return to work following the plant inventory and rearrangement period in late July, we distribute safety questionnaires which request that employees take stock of their safety attitude and their safety program. The questionnaires are designed to further aid us in knowing where we can improve our safety effort and, at the same time, cause employees to "think safety." After they are returned, each department head is given a compiled report illustrating how his employees reacted to 31 questions asked of them. The report also lists the employees' comments and ideas toward improving our safety program. In this manner, we have been able to obtain our employees' reactions to the various phases of our plant safety effort.

August was selected for material handling safety. A truck drivers' testing program was conducted for licensed operators. The program consisted of three parts designed to test and rate an operator on his knowledge and ability in fundamental safe driving principles. First, he was tested by multiple choice questions developed from the Forge Plant Truck Operators Safety Rules; second, he was scored on his inspection of a truck before operating; third, he was given a

performance test. Engraved trophies were presented to the individuals who ranked in the top three positions. Upon completion of the entire program, the foremen reviewed the scores with the participating employees.

Our program for the remaining months of the year normally concerns topics such as "Planning for Safety," "Fire Safety," "Applying Safety," and "Home Safety." Various media are correlated to promote the monthly topic. These include pocket folders used by the foremen in presenting their safety talks, table teasers placed on cafeteria tables and foremen's desks, bulletins posted on safety boards located throughout the plants, hand-out material such as booklets and home check lists, numerous displays, and safety films that are shown monthly in the cafeteria during lunch periods.

The monthly program topics do not necessarily fall in the same month each year, as we attempt to time each program to the month best suited to current conditions.

In addition, each year we tie our program into a year-round theme by incorporating the ideas and promotional material that are available from safety programs conducted in other plants. These have included Chevrolet Spring & Bumper "Chevy Safe Program," United States Steel "Hand Trap Test Program," and "Knowing's Not Enough." This year, we stimulated additional employee interest and enthusiasm through the use of a program which was patterned after that presented by A. Cavanagh at the National Safety Congress in 1961 entitled, "I'm a Safety Bug," and was introduced in our plant through a display of posters and followed by meetings held with all employees. They were asked to be constantly alert for accident causes, to observe the work habits of fellow employees and call it to their attention when they see them perform an unsafe act. Following the meetings, each employee received, from his supervisor, three reminder cards and a reference card which listed 19 unsafe acts that are the most frequent causes for accidents. When an employee detected an unsafe act on the part of another employee, he would

point it out and hand him this reminder card. He would then check one of the 19 unsafe acts listed on the reference card that applied. If none of those listed were applicable, he placed a check mark at the bottom of the list where it says "Others." After three unsafe acts were observed by an employee, he turned his reference card back in to his foreman, who gave him an "I'm a Safety Bug" pin to wear. The number of unsafe acts were then accumulated from the reference cards returned and posted on large charts throughout the plants. In this manner, everyone was able to see at a glance which unsafe acts were most frequently violated, so that special effort could be placed toward their elimination.

On the back side of the reference card, employees were encouraged to submit a brief description of one of the three specific instances in which they felt their alertness contributed the most in our accident prevention program.

We did not ask for the name of the individual who committed the unsafe act; but we did ask for the observer's name, as prizes were awarded to the three best observations that were selected by a safety committee. Employees were told that they could enter the contest any number of times, and many of our employees were wearing more than one "I'm a Safety Bug" pin by the end of the period.

This program created a great deal of safety involvement and interest on the part of all employees. We are continuing the theme throughout this year by changing the message on the "I'm a Safety Bug" posters to correspond with the monthly safety reminder that supervisors use in their safety talks with employees.

In conclusion, I can say that we have found our safety program of engineering, education, enforcement, and enthusiasm to be very beneficial at Chevrolet-Detroit Forge. It is continuously more evident that supervision and hourly rated employees have accepted safety as a vital segment of their daily responsibility.

SAFETY CONSIDERATIONS IN PRODUCTION ENGINEERING

By CARL D. FIFIELD

Supt., Pressed Metal Plants, Pontiac Motor Div., General Motors Corp., Pontiac, Mich.

Five years ago, the safety record of Pontiac Motor Division's pressed metal plants was not as progressive or effective as management felt it should be. In order to enhance our safety record and better protect our personnel from industrial accidents, we critically scrutinized alternatives to the operational safety program and formulated our contemporary approach to safety.

Our program is now constructed on three foundations: Education, Engineering, and Enforcement.

Pontiac Motor Division's pressed metal plants' master mechanic, as administrator of the pressed metal plants' engineering staff and tooling construction groups, is charged with the responsibility of promoting the engineering phase of our safety program.

At the time we initiated the implementation of our current approach to safety, Pontiac's pressed metal die engineering group was actively involved in a newly instituted, inclusive, tool cost reduction program; participating in a multi-phasic developmental project designed to reduce tooling lead time; while concurrently pursuing an extensive technological improvement program involving the die room with the die engineering activities, structured to advance overall operational efficiency. The consensus of the die engineering administrative staff was that the addition of a new comprehensive safety engineering program would seriously undermine these crucial programs. In reality, the safety engineering program reinforced, improved, and contributed to their successful, cumulative implementation.

Before the inauguration of our three phase approach to safety, we had an operational safety engineering program that had, as its pivotal basis, a die engineering standards publication that directed die engineering personnel to: locate guide pins out of the way of production operators; place stop blocks to the back of dies; install safety block pad areas so that production and service personnel could not be injured; and design the

die tooling in a manner so as to facilitate the loading and unloading of production parts. Our die engineering staff assumed that they were exercising a maximum safety effort and injurious industrial accidents were the responsibility of people who were improperly utilizing the equipment. However, an insolently undisguised mandatory prescription for a modified approach to industrial safety was apparent from the difficulties we were encountering with certain die tooling we were preparing for the production of the 1967 model Pontiac. This tooling violated or emasculated every safety principle that management was promulgating in its own die safety standards publication.

Investigation, by the die engineering administrative staff, of the circumstances that contributed to the production of this unsafe tooling revealed that the engineering staff was aware of a significant percentage of these production difficulties but regarded them as inconvenient rather than crucial. To compensate for a late release date of approved parts and the incessant coercive influence of an early production start-up date for the 1967 model, this tooling was not redesigned to abrogate the unsafe conditions.

The paramount consequence of this tribulation was that pressed metal management began to improve its basic attitude about safety. As master mechanic, I began to rigorously promote improved safety engineering performance. Our first undertaking was to modify the 1967 model tooling that was in tryout, to eliminate safety hazards. Our next consideration was a critical engineering analysis of current production tooling in the plant, which revealed additional safety engineering errors. We discovered: unrealistic, unenforceable, and, therefore unobserved safety regulations; amply provided die safety blocks that were difficult, if not impossible, to place into the dies correctly, and consequently not properly, if at all, employed; safety guard shields of custom

construction that were unusable; safety tongs being utilized to load tooling on parts that were cumbersome or heavy, with the result that operators would discard them and resort to hands, thus placing them in dire jeopardy; in other instances, operators were observed placing their hands between the dies in order to run production, while mislocated parts were constantly destroying our tooling. Safety had been supplanted by the pressure of the moment. The cliché, "Haste makes waste," was amply illustrated within our plants. Costly waste was in the form of excess labor, industrial accidents, and destroyed tooling.

We implemented selective improvements on our tooling while observing their outcome. We altered the process engineering and revised the die tooling, employing mechanical loading devices. Operators were no longer required to use tongs or place their hands inside the dies. Production noticeably increased, while die breakage and tool destruction and their concomitant problems were drastically reduced, with the result that these revised production processes were enthusiastically received by our production departments.

Pursuing our new approach further, we experimented with part loading chutes in our small parts plant, with equivalent encouraging results. Production increased, while die breakage decreased. The problems of not enough effort being expended to produce the best engineering process and not enough ingenuity and engendered enthusiasm being addressed toward developing safe systems were now accurately identified. Management was cognizant that we were going to have to vituperously employ enforcement and education within the die engineering department to restructure, radically improve, and reinforce our safety engineering approach.

The consensus of the die engineering administrative staff was that a better job of safety engineering could and should be done; however, there was a divergence in the opinions on how this could be effectively accomplished. One proposal was the employment of a safety engineer within the die design department to act as a policeman. The master mechanic's administrative staff vetoed this approach. Pressed metal's management had confidence that safety is pri-

marily a matter of attitude and must involve everyone if it is to be successful, and that the tools to work with were available but were not effectively utilized.

The aforementioned engineering analysis of production tooling in current operation that resulted in the advantageous application of automatic part feeding and mechanical part loading mechanisms to current production tooling promoted the redesign of tooling in process for future model runs. Tooling where the employment of mechanical part loading devices was inexpedient underwent revision, enabling parts to be loaded and unloaded with minimum operator discomfort and eliminating the necessity or temptation for production operators to place their hands into the dies. Information from this analysis also enabled die engineering to establish new design standards for part loading chutes and devices, with built-in adjustments, so they could be employed on parts of varying thickness, overall size, and configuration, with the result that new applications for these devices are continually evolving.

The engineering staff then aggressively invaded the area of inadequate and unused safety guards, devising a standardized guarding system enabling one guard to be used on the same press regardless of the job being run, year after year.

Next, we applied our safety engineering efforts to press actuation methods. The application of automatic and mechanical press loading systems has enabled the extensive employment of dual palm buttons and guarded floor pedal press controls, eliminating the use of human hands.

Scrap shedding systems have also been revised in order to promote safety, good housekeeping, and increased production.

Another major consideration brought into focus by our analysis was our equipment lock-out system. It was discovered that some manufacturing equipment lacked this provision. All equipment now has this important provision, and its use by service personnel has been, and is, rigidly enforced.

Pontiac's pressed metal management believes that safety enforcement is ineffective unless it engenders a genuine desire to act and work safely. This approach takes the operational form of active participation and involvement of all personnel. We discovered

that through enthusiastic inclusive personal involvement and constructive guidance, the engendered cooperation provides the optimum motivation.

Dynamic methods employed to accomplish participation, involvement, and guidance include: the investiture of our safety engineer with unlimited authority to shut down a production operation if its continuance constitutes a safety hazard; revised engineering standards eliminating ambiguous language and employing pictorial representation; the distribution and religious application by design checkers of new safety engineering check sheets that accurately describe safe design requirements; the distribution of standardized pictorial flow charts by engineering to production and maintenance service personnel that has amortized the problem of communications and expedited safe tooling installation; and the inauguration of a computerized monitor system that serves as an effective management tool by maintaining a historical and current record on the safety

engineering status of all tooling, accurately pin-pointing and assigning individual responsibility for non-compliance to engineering safety standards which facilitates enforcement through the personnel development review.

Other methods employed by management include: the monthly safety meeting of all supervisory personnel where the responsibility for conducting the meeting is rotated among the staff to insure everyone's inclusion and participation; mass meetings of all personnel where films are shown and talks are given; and the distribution of small awards to personnel for improved safety performance.

The paramount characteristics of our highly successful safety program are identical to other personnel programs that are effectively operational within an extensive complex manufacturing facility. These operational factors are: cohesive interrelation, cooperation with personal involvement, and cyclical self-reinforcement.

ENFORCEMENT

By GARY L. ROBINSON

Safety Dir., Pontiac Motor Div., General Motors Corp., Pontiac, Mich.

We have considered two elements of the safety formula: engineering and enforcement. But engineers cannot be expected to properly engineer dies if they have never been exposed to the inherent problems of their task. The people in the plant cannot abide by safety rules when they are not brought to their attention.

Obviously, this requires that a new element must be introduced into our formula, a catalytic agent that will cause the desired reaction. We speak, of course, of education!

There is a growing conviction in the field of safety that in spite of all the time and effort devoted to the mechanical aspects of the safety program we are almost entirely dependent upon our ability to develop a high degree of safety awareness among all our people. Even if the plant could be made absolutely safe from a mechanical stand-

point, we would continue to have accidents unless the employee was trained to perform his job in a safe manner. With this objective in mind the management of pressed metal and the safety department began to put together what we believe to be a comprehensive education program.

Since we are hopefully building for the future, the newly hired employee is given high priority. Often the new-hire is faced with a perplexing situation inasmuch as this may be his first experience in the industrial environment. To introduce him to pressed metal operations, a safety orientation session was formulated.

A great deal of emphasis has been placed on the visual aspects of the presentation. A model press was built by the pattern shop and is complete in every detail—from the guarding of the crown of the press to the

blue air cylinders on the sides. To be a really effective visual aid, we felt that the press should be more than just a replica, it had to be operational. This enabled us to demonstrate the movement of the ram with a standard set of dual controls. When the control buttons are depressed the slide starts in motion; when released, all movement comes to a halt. Of course, the stop button will stop the press in any portion of its cycle. We point out a few press components such as the gibs, ram, and the upper and lower die so that the new hire will become familiar with some of the press room jargon. Also, the employee is given an opportunity to operate the model press as well as ask any questions at the conclusion of the session.

Safety tools and apparatus are mounted on a display board to enable the new hire to view some of the equipment made available for their protection. Two card cases contain the twenty pressed metal safety rules with accompanying photographs. Each rule is completely explained, utilizing the cards as well as the model press.

Let us examine briefly just a few of the pressed metal rules and illustrations. Most presses in the pressed metal plants are equipped with dual control actuating devices. The purpose of these devices is to insure that the operator's hands are out of the danger area. Any attempt to bypass the dual control device will result in disciplinary action. This method of operation is the most prevalent. However, when dies are completely enclosed, a second alternative is used.

Many presses may be operated with a foot pedal tripping device if the dies are completely guarded. The guards completely enclose the die and prevent the operator from entering the danger area. All other operations not completely guarded must operate with dual controls. If foot pedal presses are found to be malfunctioning, the foreman must be contacted immediately.

In blanking operations using strip stock two guards are utilized—the master guard attached to the press and the secondary guard attached to the bottom shoe of the die, preventing the operator from entering the danger area.

Slide and progressive feeding devices are often utilized. Total guarding must be maintained. This guarding will prevent the operator from entering the pinch point of the die.

A new guarding technique was developed for the pipe area which allows maximum safety and productivity. The funnels allow the pipe to be inserted into the die, yet will prevent an operator from reaching into the hazard area.

The third visual aid, the display board, is utilized when discussing protective clothing. Protective clothing such as sleeves, gloves, and hand pads are provided for the employee's protection and must be used. The foreman specifies the type of safety clothing to be used.

After the initial portion of the orientation has been completed, the new hire is given an opportunity to test his knowledge of pinch points by viewing the hand trap test film and participating in the test accompanying the film. The entire session lasts 55 minutes.

Our educational program does not encompass only the new hire. All pressed metal employees have attended this session, as well as all new hires. A film, "Design for Safety," serves as an instructional device for our engineers. The model press will be utilized in the training of die setters as to their role in our safety program. We are currently in the process of formulating similar training programs for our die workers and other service groups in the plant.

How effective has this fundamental approach to safety been? In the final analysis, the record speaks for itself.

In 1966, the year prior to the start of this new program, we had 15 lost time injuries, including 11 partial finger amputations and one hand amputation. In 1967 there were five lost time injuries, a reduction of 66 per cent. Since that time we have not had one hand or finger amputation from power presses.

In summary, we have begun to reap production benefits from our concentration on safety. The results to date are good, and we look for even greater progress in both production efficiency and safety.

SAFETY CONSIDERATIONS IN DIE DESIGN

By JOSEPH W. HART

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The starting point in a power press safety program is in the planning stages when the die or tooling is being designed. Management must be aware of the advantages and the necessity of planning well in advance how the power press operator will be protected from the inherent hazards of press operations, rather than relying solely on the foreman and diesetter to provide some operator protection or otherwise keep the operator from injury, yet still run the operation efficiently.

A major cause of failure of accident control programs in power press operations is poor planning and the resultant unsafe die design. This is a product of failure on the part of management to plan in advance for the safety of the operator and a desire to reduce the initial costs of tooling to a minimum. A frequent result of this short sightedness is that it is difficult and expensive to adequately protect the operator from injury with a guard or safety device that is often an afterthought and thereby ineffective or inefficient.

To illustrate the magnitude of the problem, an analysis of 300 serious power press accidents indicated that about 80 per cent of the accidents occurred on secondary operations and about 20 per cent on primary type operations. Approximately 95 per cent of the serious secondary operation power press accidents occurred when the operator was loading or unloading the die or readjusting the part in the die. Nearly all of these accidents occurred during manual positioning or removal of the part or material at the point of operation. It is on the secondary power press operations where the greatest problem exists, and this is where most of the die design faults occur which allow serious exposures and the resultant high percentage of accidents which are frequently extremely serious. It is not difficult to recognize, then, that the attention given to the feeding and ejecting or the loading and unloading of dies is of major importance to the planning of safe power press operations.

The first objective in safe power press operation is to design the operation so as to

make it unnecessary for the operator to place his hands in the point of operation when the machine is running. This means that the operator will be able to operate the machine without having to place his hand in the point of operation or danger zone. Obviously, if he is not required to have his hands in the danger area his exposure to possible injury will be greatly decreased. The second objective is to design the operation so as to make it impossible or extremely difficult for the operator to place his hands in the point of operation when the slide is descending. To achieve the first objective, the die designer must consider several important aspects of the operation if optimum operator safety is to be achieved. He should be able to answer these questions:

1. How should the material be fed into the die without exposing the operator's hands in the danger area?
2. How will the completed part be removed from the die without requiring the operator to reach into the danger area?
3. How can scrap be removed from the die area without expecting the operator to reach in after it?
4. What means will be provided for die lubrication other than having the operator reach in to do it manually?
5. What features should be built in the dies to allow for safe handling of the dies during setting, transportation and storage?

The principle reason for placing the hand in the point of operation is to feed and eject stock. Fortunately, there are ways in which a large percentage of press operations can be performed without placing a hand in the point of operation. These are:

1. Automatic feeding, requiring no manual operations other than replacing of stock, etc.
2. Semi-automatic feeding by means of manually operated feeding devices, including sliding dies, dial feeds, etc.
3. Hand tool feeding by means of tongs, suction cups, sticks, etc., permitting hands to be kept away from the point of operation.

4. Manual feeding of large pieces of such size or shape that when holding them the hands are positioned well away from the point of operation.

Feeding and Nesting

There are available commercially several types of feed mechanisms designed to accommodate coiled stock or strip stock. These include roll feeds, hitch feeds, and air operated feeds. The stock is fed into the mechanism immediately adjacent to the die or as a part of the die. The stock is indexed forward into the point of operation of the die on each stroke of the press a pre-determined and adjusted distance. The feeds are actuated by the ram or by action of a cam on the crankshaft. These feeds are usually so designed as to allow the press to operate on automatic or continuous stroke and thereby reach a high rate of production. A barrier guard or safety device should then be installed to prevent the operator from reaching into the danger area while the press is in operation.

Other automatic loading and unloading methods such as transfer units and mechanical hands are also manufactured on a custom made basis for long run press operations. In the field of semi-automatic feeding, there is a wide variety of units which can be designed to facilitate die loading without exposure of the operator's hands. Dial feeds consist of a turntable mounted on a power press which allow the operator to load the part at one station or stations before the table indexes, bringing the part under the ram where the work is performed. The completed part is usually ejected by air, mechanically, or it is removed manually from the lower die as the table indexes again to the operator's position. Dial feeds are adaptable to many different secondary press operations using the same basic turntable. The turntable is indexed by action of the press ram or crankshaft.

Many secondary power press operations are adaptable to feeding methods which require manual handling but do not require the operator to reach into the danger area. One such method is through the use of gravity feed in which the part is placed on a chute and allowed to slide down into the lower die. Pins, gages, and stock guides should be provided to assure easy part nesting in the proper position. Open back in-

clinable presses, because of their ability to be inclined, allow good application of this type of feed because the part can be placed into the die by gravity and ejected out the back of the press by gravity or air blowoff.

There are various adaptations of gravity chute feeds which can be used to assure only one part being placed in the die at a time, such as through the use of a single piece feeder. When oil or other lubricant on the parts causes the parts to stick in the chute or slide, wire or metal rods can be installed in the chute to allow the parts to slide into the die without sticking.

Probably the most common type of semi-automatic feeding is the follow or push feed which allows the operator to push the parts on a tray into the die by pushing one part behind the other or using a pusher to place the part into the die, thereby keeping the hands well out of the danger area. This die is easily guarded with an enclosure guard. Even irregularly shaped parts can frequently be fed with a push feed to keep the hands out of the danger area.

The addition of a magazine on the push feed can considerably increase the production rate as well as minimize the manual handling of the blanks at the press operation. Blanks with various configurations are adaptable to magazine feeds. Magazine slide feeds can be adapted to a nearly automatic operation by actuating the slide through mechanical attachment to the press slide or crankshaft. The operator then needs only to keep the magazine filled with blanks to feed the press. Other methods of providing mechanical actuation of the slide feed include air and hydraulic cylinder control timed with slide movement.

Finally, where parts must be placed or removed from the die manually, hand tools such as soft metal pliers, tongs, tweezers, and suction cups provide effective aids for keeping the hands out of the danger area. If the part is flat it is sometimes very desirable to provide clearance holes or slots to assist the operator when inserting or removing the work pieces with hand tools. Relieving of the dies to provide clearance will make the job of grasping the parts much safer and more efficient. The lower die can be automatically or manually moved from under the upper die through the use of a sliding

bolster so that difficult to nest parts can be manually loaded outside the danger area.

Part Ejector

Dies should also be designed so that the part can be ejected without the operator reaching into the danger area. This is equally important as providing safe means of loading the die. Some means is frequently necessary to first strip the part from the upper die or punch or to lift the part from the lower die before actually removing the part. The part can then be ejected by gravity with an inclined press, or by other means such as air blow-off to force the part from the die. Lift out fingers in the upper die can remove cup shaped parts from the lower die that tend to adhere or stick in the cavity. Spring strippers in the upper die or lower die also will loosen the part from the die. Knockouts in the upper die are frequently used as a mechanical means of freeing the part to eliminate reaching in to pull the part from the upper die. On larger parts, air cylinder ejectors or lifters, as well as mechanical knockouts, are used to lift or eject the part from the die.

On some straight punching operations where the part tends to stick to the punch because of oil on the part, spring loaded stripper pins in the punch are helpful in breaking loose the part from the punch.

Shuttle type extractors can be used to reach between the dies to catch the part as it is stripped or knocked from the upper die and then transfer it from the die area into a stock container. These types of unloaders must be timed with slide travel and can be used on automatic or semi-automatic operations.

Scrap Removal

Designing an efficient and safe method of disposing of scrap is as important to the accident prevention aspect of an operation as loading and unloading of the part. Dies should be designed to shed all scrap with no handling required within the danger area. When scrap is produced in the die, the operator should not be required to reach through metal trimmings or into the danger area to remove the scrap. Adequate clearance must be provided for slug removal. If slugs cannot be shed from any side of the die or through the bolster, the die must be designed for risers under the lower shoe. Dies must

be designed to permit visual inspection by the operator for proper scrap and slug shedding. Chutes can be added to direct the scrap outside the die area and beyond the bolster into a scrap container. The die can be relieved or sloped outwardly to prevent build-up of scrap which may tend to encourage the operator to reach in to remove the scrap manually.

A scrap cutter can be an integral part of the die or can be an attachment to the press. When cutting scrap, the scrap cutter should be designed to eliminate the pointed or needle type scrap which can result in very serious lacerations and puncture wounds to employees handling the scrap. When rings of scrap are a result of trim operations, the rings should be cut in several segments or in sizes small enough to be efficiently and safely disposed of without requiring the operator to reach into or unnecessarily close to the danger area.

Other Die Design Features

Guide pins or leader pins should be kept to the back of the die away from the operator. Pinch points can be created by the guide pins separating from the upper die shoe. Guide pin covers should be used to enclose the opening between the top of guide pins and the bushings in the upper die set. Helically wound flat steel springs or telescoping guards or covers are available commercially for enclosing this pinch point.

Stop blocks which limit the closing of certain dies to prevent die damage should be placed on the inside of the dies, facing each other, or to the rear of guide pins and away from the operator to minimize the potential pinch point between the blocks and the upper die.

Sufficient surface should be provided on the die sets for adequate bolting or clamping of the dies to the bolster or to the slides. Bolting is preferable to clamping. The die designer should know the layout of the threaded holes in the bolster and in the slide in advance of designing the die so that bolting provisions may be made wherever possible.

Air, hydraulic, electric, and lubrication lines should be located so they will not be cut by sharp edged panels of stock or parts being processed. Hand clearances must be provided between air cylinders and other

accessory equipment on the presses to avoid pinch points between the die and the slide and other equipment. Pinch points under stripper plates or pressure pads, in the upper and lower dies, should be provided with steel angle type guards unless other adequate die or press enclosure guards are provided. Cam springs should be guarded to enclose the pinch points and to contain flying rods that may break in tension. Pins used in dies for locating or nesting purposes should be as low as possible to facilitate easy part removal.

When safety blocks are used, especially on large dies, pads should be provided or areas in the dies should be provided for placement of the safety blocks. Safety blocks should be used when work is being done on the dies while in the press. Spring clips, clamps, and die extensions to eliminate the need of the operator holding the part in the die should be provided where possible. Safety devices, two hand controls, or guards should then be employed to keep the hands out of danger areas during the down stroke of the slide.

There are several aspects of large die press operations that warrant special consideration. In many instances when mechanical functions of feeding or extracting the part from the die break down or malfunction, the mechanism is removed for repairs and production on the press continues by hand feed and extraction. Therefore, the designer should engineer into the die alternate means of safely loading and unloading the part by hand. This can be done by providing indentations or die cavities where the part may be handled safely.

Tabs which project beyond the die closure line should remain as part of the parent panel for ease in manual handling. Where tabs cannot be engineered as part of the panel, handling holes should be punched into the panel in the blanking stage for later feeding and extraction by metal hook held

in the operator's hand. Dies should be designed with the operator in mind. Excessive bending or reaching may create operator irritation, discomfort, and fatigue leading to a greater number of accidents. Any unusual or special die setting instructions should be stamped or otherwise indicated on the die for the information of the die setter and supervisor.

Die Handling

Several features can be provided in the dies to facilitate safe die handling. Chain slots and flanges should be provided with $1\frac{1}{4}$ inch radius around the slots. Cast or inserted pin die hooks can be used on dies, especially on dies weighing more than 15 tons. Die hook holes can be provided in die shoes. Sharp edges in die sections should be beveled or chamfered. Eye bolt holes in dies and in all heavy individual die parts can be provided where eye bolt lifting is used. It is advisable to mark the center of gravity of some dies on top of the upper die to facilitate safe die lifting.

Summary

Since real press room safety begins on the die designer's drawing board, the die designer must be constantly cognizant of the operator's safety. To effectively design safety into dies requires frequent communication between the operator, supervisor, safety function, die engineer, and die designer. The philosophy of everyone concerned with operation of power presses should be that every cycle is a potential hazard. In view of this, the policy of "No hands in the dies" should be followed. Every reasonable effort should be expended, therefore, to make it unnecessary for the operator to reach into the danger area and also to prevent any part of the operator's body from entering the danger area by using guards, controls, and safety devices.

SAFETY CONSIDERATIONS IN THE USE OF PRESS BRAKES

By C. A. CARLSSON

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Some of the greatest things that have happened to industry in the past decade are: the emerging management techniques, the present safety movement, and the mini skirt. I am going to zero in on safety considerations on the use of press brakes and suggest some things that, hopefully, you will use to produce results in your accident prevention activities. The mini skirt approach signifies that we must take advantage of not only the appealing but also the well founded "short cuts"!

Today we are in the supersonic jet age of safety. The state of the art regarding safety is moving at a very fast pace. So fast in fact, that it is difficult to keep up let alone get ahead. Old methods and old cliches are no longer valid. We used to hold meetings on what posters we should make to state "Be Careful." We told operators, "Don't Get Hurt."

A few far-sighted individuals on our Executive Committee of the Power Press and Forging Section recognized, that as far as press brakes are concerned, the past safety approach was inadequate and ineffective. To overcome this serious deficiency, they recommended that a separate safety standard be written for press brakes. This was approved by National Safety Council and American National Safety Institute and the standard was subsequently drafted. It is called B11.3 Safety Standard for Mechanical Press Brakes. If you are a manager that likes to get results fast, take advantage of the work done on this safety standard. Order a copy and follow it. You will find that its objective is to prevent accidents.

You must realize you are up against a people problem! Part of your people problem is to produce a profit thru efficient production. Let's compare efficient production to the good old three-legged milking stool. The stool has three legs. Using one of these on the farm, you know the three legs must be equal or you will have trouble keeping your balance. The base, or seat, is called

"efficient production." Each leg has a name: "quantity," "quality," and "safety." You must maintain equal portions of each if you want to assure yourself of efficient production.

For example, quantity you must have if you want to meet your production schedules and get the price of your product at a competitive rate. Quality you must have or your customers will buy from your competitor. Safety is vital because if you have accidents your people will be hurt. They will be unable to perform the job, as they will be recuperating in the hospital or at home. Then it is necessary for you to hire a new employee to fill in for the injured person. The new employee is new on the job; his quality will not be as good as the experienced employee's; his quantity will be down, as he is unable to produce as an experienced trained operator. So let's play a game. Let's take a chance with safety to get more quantity. The safety leg is getting shorter and shorter; the leg of quantity is getting longer and longer. This works until . . . all hell breaks loose.

Gone is the thing we are trying to maintain: efficient production. Your experienced people are on the injured list and are unable to perform the job. Those things that you are trying to show, namely, profit and growth, go down the drain.

If you want to maintain efficient production, you must maintain three equal portions of quality, quantity, and safety. When you do, you will get, from your efforts, no accidents, increased production, high morale and, last but not least, profit and growth.

Keeping quality, quantity, and safety in mind let's go to press brake safety considerations. The B11.3 Press Brake Safety Standard has been drafted and is out for comments and should be published this year or early 1971. It has three major sections: construction, use, and care. Its purpose is to prevent accidents and eliminate injuries.

A press brake is a unique piece of machinery. Unique because of its universal

nature. It can be used to bend, form, shear, pierce, notch, and blank. Often, press brakes are found performing work that could and should be done on other machinery. Many times jobs are found running in press brakes where it would be cheaper and faster to run elsewhere. This common failing has caused many accidents.

You have a responsibility to find the most practical machine in which to run your operation or job. Perhaps the work could better be run on a punch press or roll forming machine. It may save you money on the cost of your operation and could be a better method.

Considerations in the safe use of press brakes include the following points: die or tool design, set up, load and unload, die or tool storage, material storage, operator training, and maintenance.

We are talking not only of the operator getting hurt but you as a person cringe when a person gets hurt. We don't want to see people injured. Our company gets hurt when an accident happens, because there is no longer efficient production. Quantity and quality will suffer. Remember the three-legged milking stool (Quality, quantity, safety). Accidents hurt you in any or all three areas.

Die or tool design. Design tooling with the operator's safety in mind. If we are to follow our objective of preventing accidents we can help ourselves by designing the hazards out. Far too often we find tooling designed for anything and everything but safety. After the accident, we react. Then perhaps we take action we should have taken in the first place. You know the old saying "Never enough time to do it right but always time to do it over." This, of course, is foolish waste.

If we are to prevent accidents, we should follow good die principles. For example:

1. Design so the hand need never be placed under the ram. Use alternate feed methods. Provide hand feed tools, etc. Select an alternate machine.

2. Be sure the material gage or back stop is high enough. This will prevent the material from sliding over the back stop and thereby allowing the hands or fingers to go under the ram.

3. On large heavy dies or tooling have you considered ways of getting it into or out of the press brake? I recommend you include design features that facilitate the set up and tear down portion of your work. By doing so, you will certainly help your accident prevention work.

Set Up. The set up of a job can greatly reduce the accident potential by taking full consideration of the danger zone.

All set-up work should be performed only by qualified and experienced personnel. He is called a VIP. This very important person is a key man regarding your operator's safety. He must see that proper and safe tooling is selected and installed correctly. Proper gaging must be installed. All fasteners must be tight. All set-up work must be complete and all tools, bolts, and miscellaneous parts removed from under the ram before turning the machine over to the operator.

If more than one operator is assigned, each must have his own operating controls.

Load and Unload. Most fingertips in error are left in female dies. Loading and unloading seems so basic that safety is often overlooked. Yet, most accidents occur at this step. The hands should *not* be placed under the ram.

It is the user's or employer's responsibility to provide safe tooling. The machine manufacturer is unable to provide it because he is unaware of the jobs you will be running in the machine. When you provide safe tooling, consider safe use of hand feeding tools or having the part held in place by a magnet.

Often we expect the operator to go on his own. He is left to protest or defend himself while operating the machine. This, of course, is unsafe and an incorrect procedure. Operators are often distracted. This causes many accidents.

Die or tool storage. Safe storing of dies and tooling can prevent injuries and property damage. Many hundreds of dollars are lost each year due to damaged or broken tooling as a direct result of inadequate storage.

Personal injury accidents occur when the damaged tools are put into the machine and shatter the first time the machine is tripped. Inadequate storage racks have been known to tip over causing leg and foot injuries.

Back injuries can occur when the set-up man tries to get the tooling into or out of the poorly designed storage racks.

Adequate and safe parts, material, or tooling storage room is vital to operator safety.

Operator training. Without question, it is the responsibility of the press brake owner or user to properly and completely train his operating personnel. To prevent accidents on press brake machines we should:

1. Select physically and mentally qualified people. Some people are afraid to run press brakes or punch presses. If they are, we should not put them on the machine. If we do, we set up a very highly probable situation where an accident is likely to happen. A nervous or emotionally upset person is a top candidate for an accident.

2. Orient the person to the plant people around him and then his job. By orienting the person to the plant and people around him, you are more assured of his attention when you explain his job and the machine to him. Make sure he understands what you are communicating to him.

3. Impress upon him that you are interested and concerned about his safety. Explain that you will be insisting that he perform his work in a safe manner. These first-day discussions are important ones.

4. On every new job you assign to your press brake operator, be sure to point out the safety points that you expect him to follow. This will reinforce in his mind your concern for his safety. He will soon get the message that you want to run a safe operation.

5. Follow up from time to time to be sure the operator is following your instruction. Discipline if you have to, but be sure to compliment good safe practices when and where you see them.

Maintenance. Regular maintenance is good practice both from the standpoint of protecting your investment and in your accident prevention efforts. Without good regular maintenance, parts vital to the safe operation of your machine will be allowed to deteriorate to the failure point. When they fail, accidents can and will happen. Some points to check are: clutch and brake lining; air lines and pressure gages; electrical wiring and hook up; hand or foot control switches; loading and unloading devices and tooling. Make sure they are in place. Make sure the manuals and safety instructions are available to the press brake operator.

At times, warning signs become oil covered, scratched, and unreadable. This creates the impression in the operator's mind that safety is not really very important. When you see poorly maintained safety signs, have them cleaned or replaced, but make sure they are readable.

The safe use of press brake machinery requires more than an operator and common sense. It requires that you plan, design, build, and install safe tooling, and it requires that you establish safe operating objectives and exercise your management control to see that safe methods are followed. When you do these things you will be performing true management leadership. Management is a people problem but accidents can and must be prevented.

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