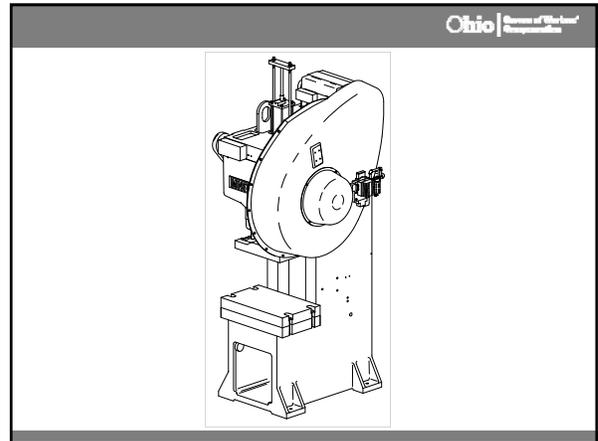
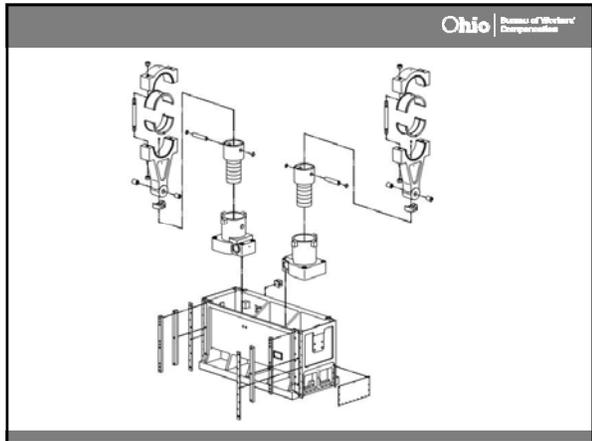
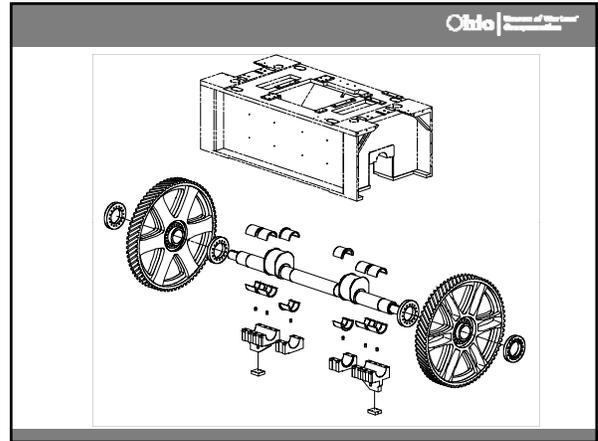
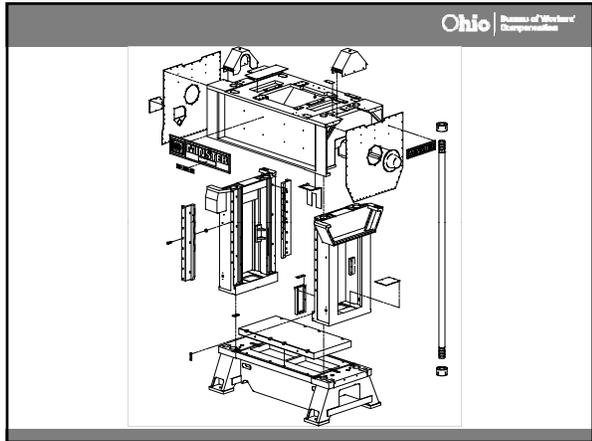
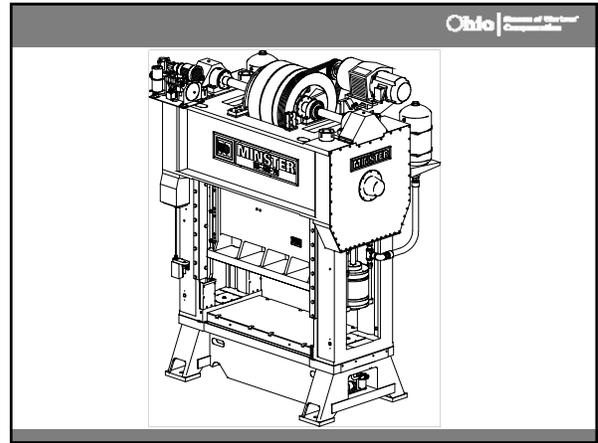


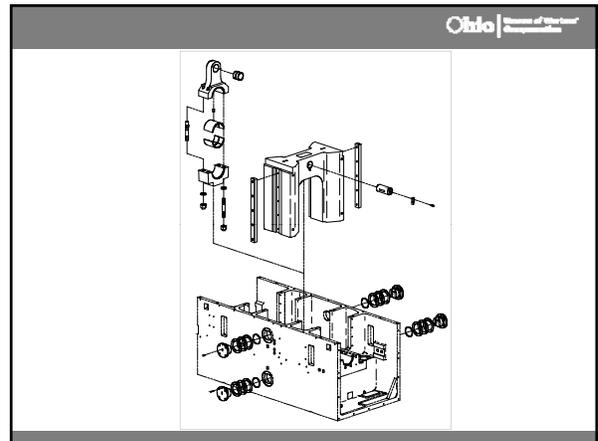
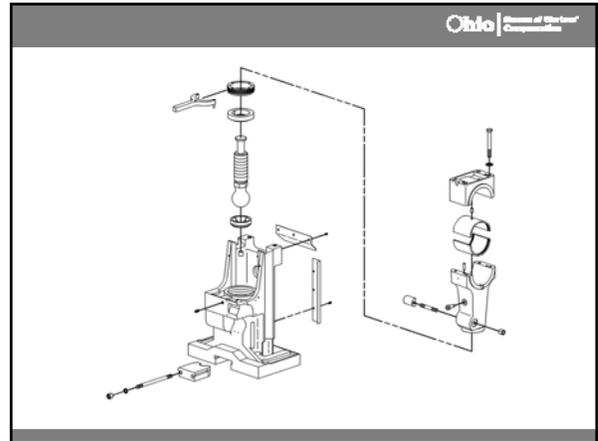
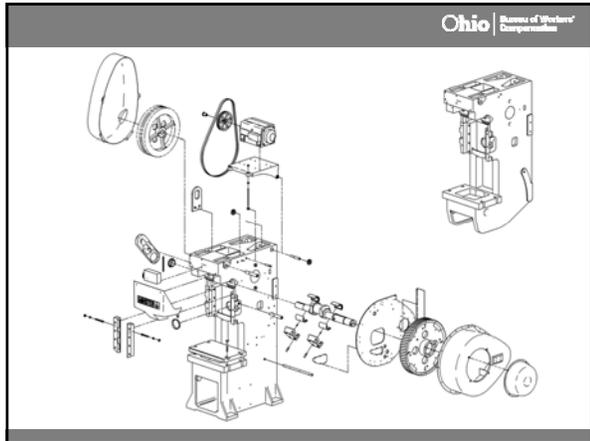
**OSC 10**  
Ohio Safety Congress & Expo

**Operator maintenance responsibilities on the power press 332**

**Rob Meyer**  
**The Minster Machine Company**

Wednesday, March 31, 2010 9:15 to 10:15 a.m.





**TOPICS REGARDING SAFETY** Ohio Bureau of Workers' Compensation

**Manufacturers Manuals**

- READ, UNDERSTAND AND FOLLOW SAFETY SUGGESTIONS AND REMINDERS BEFORE PERFORMING ANY DUTIES ON THE PRESS OR ASSOCIATED EQUIPMENT

## TOPICS REGARDING SAFETY

- LITERATURE PROVIDED IS INTENDED AS A GUIDE FOR THOSE WHO USE, SERVICE AND SUPERVISE THE OPERATION OF EQUIPMENT. HOWEVER THESE ARE NOT INTENDED AS A SAFETY CODE.
- ANY ARTICLES PERTAINING TO GOVERNMENT REGULATIONS REPRESENT INTERPRETATION AT THE TIME OF PUBLICATION AND ARE NOT TO BE INTERPRETED AS LAW.
- COMPLETE COMPLIANCE WITH OSHA REGULATIONS, BY LAW, RESTS WITH THE MACHINE TOOL PURCHASER

## MOST IMPORTANT

**SAFETY IS UP TO YOU!**

## HANDS OUT OF DIE

DURING OPERATION IT IS RECOMMENDED THAT USERS PRACTICE HANDS OUT OF DIE (HOOD) OPERATION.

## THE GOLDEN RULE

NEVER PLACE YOUR HANDS OR ANY PART OF YOUR BODY INTO THE DIE AREA UNLESS MAIN DRIVE MOTOR IS TURNED OFF, FLYWHEEL HAS STOPPED TURNING COMPLETELY, AND SLIDE OR DIE IS BLOCKED

## THE GOLDEN RULE

NOT ONLY APPLIES TO OPERATION

Stuck Parts

Tail Ends

Jams

## HANDS IN DIE

**NOT RECOMMENDED!**

IF NECESSARY, TWO HAND CONTROL, PRESENCE SENSING DEVICE, GATE OR MOVABLE BARRIER IS REQUIRED FOR SAFEGUARDING.

**HANDS IN DIE** Ohio Bureau of Workers' Compensation

**GUARDS:**  
 PREVENT ENTRY  
 CONFORM TO PERMISSIBLE OPENINGS

**HANDS IN DIE** Ohio Bureau of Workers' Compensation

Distance of Opening From Pinch Points (Inches)	Maximum width of Opening (Inches)
.5 to 1.5	.25
1.5 to 2.5	.375
2.5 to 3.5	.50
3.5 to 5.5	.625
5.5 to 6.5	.75
6.5 to 7.5	.875
7.5 to 12.5	1.25
12.5 to 15.5	1.5
15.5 to 17.5	1.875
17.5 to 31.5	2.125

**HANDS IN DIE** Ohio Bureau of Workers' Compensation

**GUARDS:**  
 NOT CREATE PINCH POINT  
 NO COMMON FASTENERS  
 FACILITATE INSPECTION  
 OFFER VISIBILITY

**HANDS IN DIE** Ohio Bureau of Workers' Compensation

**NOT RECOMMENDED!**

CONTROL MUST HAVE BRAKE MONITOR AND CONTROL RELIABILITY.

Fault will not prohibit normal stopping and will prevent initiation of successive stroke until fault is cleared.

**CONTROL RELIABILITY** Ohio Bureau of Workers' Compensation

Failure of the control shall be detected by a simple test or indicated by the control system.

Two hand concurrent inch and run  
 Anti-tiedown  
 Spacing and guarding of buttons

**BRAKE MONITOR** Ohio Bureau of Workers' Compensation

PREVENT ACTIVATION OF A SUCCESSION OF STROKES IF:  
 Stopping time or braking distance deteriorates such that safety distance does not conform  
 Top stop overrun  
 Control shall indicate deterioration and check each stroke

## 2 HAND CONTROLS & PSD



### MINIMUM SAFETY DISTANCE (MSD) REQUIRED!

MSD = STOPPING TIME (S) X 63 INCHES/S

MAKE CERTAIN PSD CANNOT BE DEFEATED.

## PRESS CONTROL CHECKS



Keyed mode selector switch (i.e.: Off-Inch-SS-Cont.) This mode selection should be lockable (or require a password if a PLC) and should not include the selection of method of activation i.e. hand or foot selection

## PRESS CONTROL CHECKS



Inch and Run actuating controls have two-hand requirement. The only exception would be if a single Run and/or Inch button is properly distanced from the die area ( at least your wingspan, i.e. 8 feet). This may be possible if the control, housing the single button, is not allowed to be moved (i.e. bolted to floor) after it has been properly located

## PRESS CONTROL CHECKS



Two-hand INCH and RUN controls have concurrent operation (requires use of both hands) and prevent inadvertent operation (ring guards). Press control requirements demand also that the RUN buttons be released after every stroke initiation,.

## PRESS CONTROL CHECKS



Prior action required for Continuous mode. One should not be able to go directly from choosing the Continuous mode to depressing the same single stroke two hand control to get continuous stroking without some sort of prior action

## PRESS CONTROL CHECKS



If press is used for Single Stroke (hands in die operations), the press control must have a brake monitor (BM)and possess a control reliability (CR) design.

## PRESS CONTROL CHECKS



Dual clutch valve with detector unit. Although OSHA does not require a dual valve for automatic operations, Minster still suggests the ANSI requirement of a dual valve be on all presses

## PRESS CONTROL CHECKS



Low air pressure switches on clutch/brake and counterbalance.

Forward motor starter contact is interlocked in Single Stroke and Continuous modes. Reverse in INCH only.

## PRESS CONTROL CHECKS



Power lockout arrangement for electrical system (electrical disconnect is lockable in OFF position).

Power lockout arrangement for pneumatic system. The incoming air lines should be able to be isolated and then locked out

## TOPICS REGARDING SAFETY



- WEAR PERSONAL PROTECTIVE EQUIPMENT.
- MAKE CERTAIN LIFTING APPARATUS ARE CAPABLE OF SAFELY HANDLING THE LOAD.

## TOPICS REGARDING SAFETY



- FOLLOW SAFETY PROCEDURES
- HOW DO YOU GET A PERSON OUT IF THEY ARE STUCK IN A PRESS.

## WARNING



A ZERO ENERGY STATE OF THE PRESS AND ITS AUXILIARY EQUIPMENT MUST BE ACHIEVED BEFORE ATTEMPTING ANY MAINTENANCE WORK. IF IT IS NECESSARY TO MOMENTARILY RESTORE ELECTRICAL POWER OR AIR PRESSURE, MAKE CERTAIN THAT ALL PERSONS AVOID PINCHING POINTS ASSOCIATED WITH THE PRESS AND ITS AUXILIARY EQUIPMENT.

WATCH TOOL STORAGE AND PROGRAMMABLE LIMIT SWITCHES.

## Lockout Procedures for Mechanical Power Presses

### Where in the stroke?

- Presses with pneumatic counterbalance (CB) should be placed at BOS when servicing. When servicing make certain to bleed air out of CB. When checking clutch, press may be placed on top to avoid jumpering CB pressure switch. Make certain to block slide completely with screw jacks when blocking in this manner.

### Where in the stroke?

- Presses with dynamic balancers should be placed at top of stroke and blocked completely. This will place the balancer near the bottom. The balancer is heavier than the slide and is out of phase with the slide.

### Where in the stroke?

- Presses with double slides should be approached with care. Depending on the type of service to be performed and if the press has a dynamic balancer, inner and outer slide placement is different.
- Presses with double slides may require a blocking between the two.
- May be able to let press find its own 0 energy state.

### Other Concerns

- When blocking, pay close attention to geared presses as a small movement in the slide can cause a large rotation in the clutch shaft.
- Eddy current motors may have to be on to engage clutch. To prevent turning of the flywheel, turn off the circuit breaker on the SCRB unit inside the control panel.

### Other Concerns

- Be aware of hydraulic quick-lift or hydraulic overload mechanisms. They can bleed off.
- Be aware of releasing any braking mechanisms during checking or disassembly.

**Ohio** Bureau of Workers' Compensation

**SAFETY LOCKOUT PROCEDURES**

**PRESS TYPE E2 GEARED**

**MINISTER**

**NOTICE** BEFORE SERVICING THIS MACHINE, NOTIFY AFFECTED PERSONNEL AND REFER TO YOUR COMPANY'S LOCKOUT PROCEDURES.

**ALWAYS PERFORM CONTROLLED SHUTDOWN BEFORE LOCKING OUT DISCONNECTS**

**DANGER: ONLY MAIN LOCKOUT POINTS WILL COMPLETELY DE-ENERGIZE THIS EQUIPMENT**

ENERGY TYPE SOURCE	LOCK OUT LOCATION	PROCEDURE FOR HOLDING ENERGIES AND LOCKING OUT EQUIPMENT	VERIFY PROCEDURES
Mechanical Motion	KEYSWITCH	PERFORM THE PROCEDURE FIRST WITH POWER ON, DEPRESS FIRST MOTOR STOP PUSHBUTTON TO STOP MOTION.	WAIT FIVE (5) MINUTES TO READ "STOP"
Electrical Voltage	ELECTRICAL DISCONNECTS IN NEAR BY MAIN PANEL	PLACE DISCONNECT SWITCH IN OFF POSITION AND LOCK. LOCKING DEVICE MUST BE ELECTRICAL POWER TO MAIN PANEL.	ELECTRICAL CIRCUITS AND INDICATORS POWERED BY THIS DISCONNECT MUST BE DE-ENERGIZED BY THE DISCONNECT SWITCH. VERIFY THAT ALL ELECTRICAL POWER TO PRESS CIRCUITS.
Pneumatic Air / P.S.I.	AIR LOCKOUT VALVE	CLOSE AIR LOCKOUT VALVE AND APPLY LOCKOUT DEVICE. BLEED AIR PRESSURE FROM THE PRESS PNEUMATIC CIRCUITS.	ATTEMPT TO MANUALLY OPERATE PRESS PNEUMATIC CIRCUITS. NO ACTION SHOULD OCCUR. VERIFY ALL PRESSURE RELEASED FROM THE PRESS PNEUMATIC CIRCUITS.
Control Circuitry	SAFETY BLOCKS	INSTALL SAFETY BLOCKS TO PREVENT ANY MOVEMENT OF THE SLIDE.	VERIFY EQUIPMENT THAT SAFETY BLOCKS ARE PROPERLY INSTALLED.

FOR ADDITIONAL INFORMATION REFER TO MINISTER TECHNICAL BULLETIN JOB# LOCKOUT PROCEDURES

**Ohio** Bureau of Workers' Compensation

**SAFETY LOCKOUT PROCEDURES**

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FOR ADDITIONAL INFORMATION REFER TO MINISTER TECHNICAL BULLETIN JOB# LOCKOUT PROCEDURES

**Ohio** Bureau of Workers' Compensation

**FINISHING THE JOB**

**BEFORE UNLOCKING THE EQUIPMENT:**

- CHECK THE MACHINE FOR TOOLS AND OBSTACLES, AND REPLACE GUARDING.
- CHECK CONTROLS
- CHECK EQUIPMENT AND MAKE CERTAIN EVERYONE IS CLEAR OF HAZARDS.

**Ohio** Bureau of Workers' Compensation

**FINISHING THE JOB**

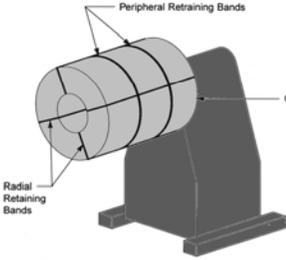
- CHECK CHUTES AND CONVEYORS, ETC.
- NOTIFY AFFECTED PERSONNEL.
- LOCKOUT DEVICES TO BE REMOVED BY THE PERSON THAT APPLIED THEM.

QUESTIONS? 




Coil Stock Safety 

Retaining bands that pass thru the center of the coil are called **Radial Retaining Bands**.



The bands that are placed around the periphery are called **Peripheral Retaining Bands**.

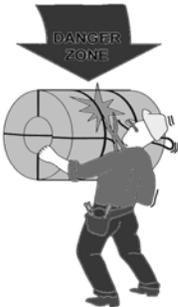
Coil Stock Safety 

- Coils of stock normally contain stored energy and one or more of the retaining bands surrounding the stock may be highly stressed.
- When these bands are cut, this energy may erupt suddenly and violently, thereby, creating a hazardous condition and the possibility of physical harm.

Coil Stock Safety 

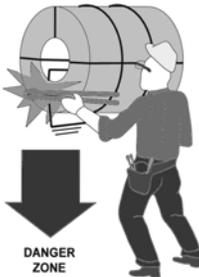
- The area of reactive forces thru which the band may travel is called a **DANGER ZONE**.
- All retaining bands, depending on location, will have this established **DANGER ZONE**.
- **WARNING!** NEVER position yourself or any part of your body within the danger zone when unbanding coils.

Wrong Position 



- The operator is standing in a **DANGER** area with regard to the Retaining Band being cut. NEVER use short handled shears to cut the Retaining Bands and NEVER position yourself in a **DANGER ZONE**.

Coil Stock Safety 



- Position the stock so that the Radial Retaining Band to be cut is positioned at the bottom of the coil. Then stand outside the **DANGER ZONE** and cut the band using long handled shears. Wear protective equipment.

**Coil Stock Safety** Ohio | Bureau of Workers' Compensation

**Secondary Danger Zones**

WRONG POSITION - NO HEAVY ERTV BARRIER

DANGER ZONE

COIL STOCK DANGER ZONE

- With clear access to the aisleyway, other personnel and equipment may also be struck by the coil's outer wrap.

**Questions on Safety?** Ohio | Bureau of Workers' Compensation

10

**PRESS FUNDAMENTALS**

**CAPACITY** Ohio | Bureau of Workers' Compensation

THE PRESS TONNAGE RATING DESCRIBES THE STRUCTURAL STRENGTH OF THE FRAME AND DRIVE MEMBERS

**CAPACITY** Ohio | Bureau of Workers' Compensation

**Clutch Torque = Friction Force x Distance** Ohio | Bureau of Workers' Compensation

Friction force = normal force x Coef. of friction

Piston/pressure area

Friction force

Distance

Normal force

Normal force = clutch pressure (psi) x piston area

**TONNAGE DEVELOPMENT** 

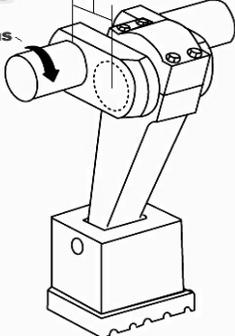
**Using the Force Equation:** Lever Arm (L)= 6 in.

Torque is a constant: 600 in.-tons

$$F = \frac{T}{L}$$

$$F = \frac{600}{6} = 100$$

**Force = 100 Tons**



**TONNAGE DEVELOPMENT** 

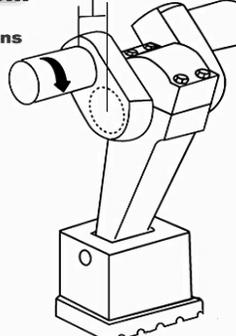
**Using the Force Equation:** Lever Arm (L)= 3 in.

Torque is a constant: 600 in.-tons

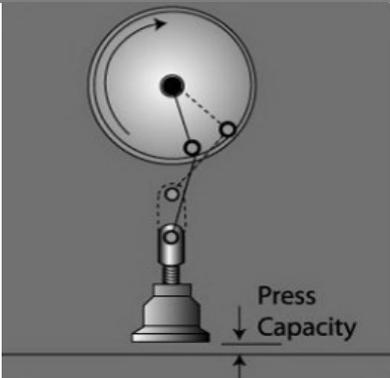
$$F = \frac{T}{L}$$

$$F = \frac{600}{3} = 200$$

**Force = 200 Tons**



**RATED DISTANCE** 



**STROKE LENGTH** 

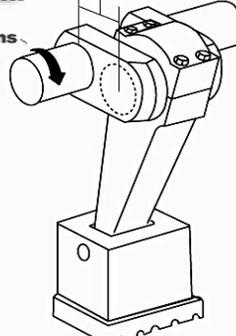
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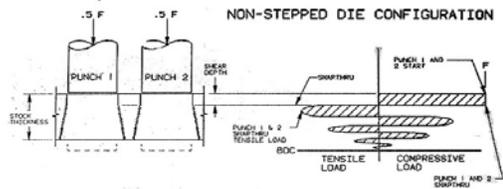
**TONNAGE REQUIRED** 

**Different Angles of Shear On Punch or Die Reduce the Work it is Doing at Any Instant**

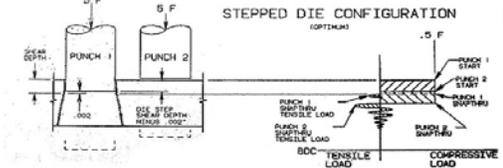


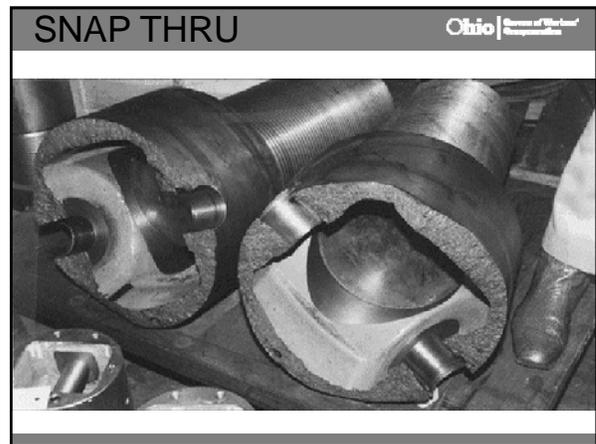
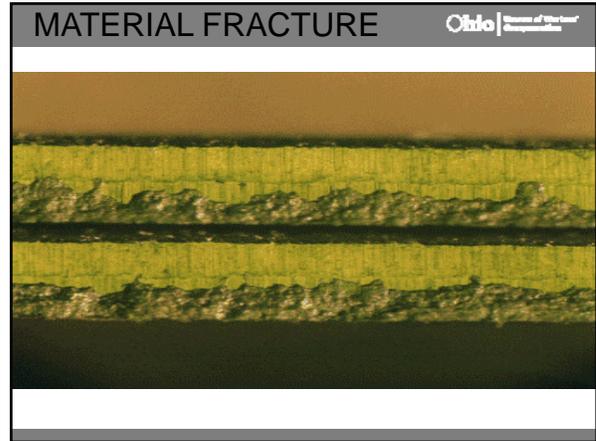
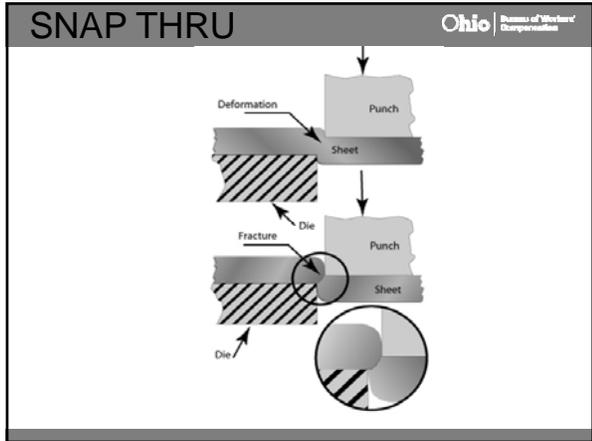
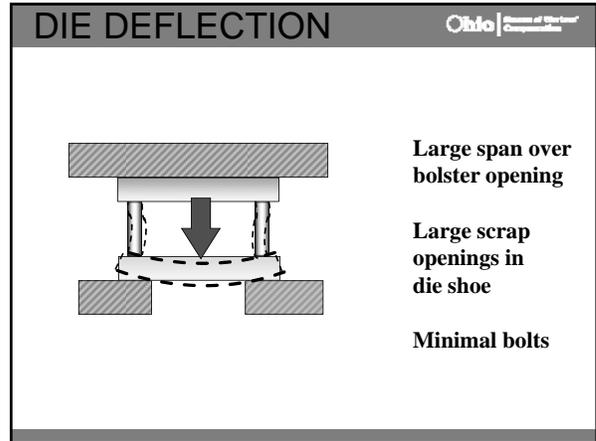
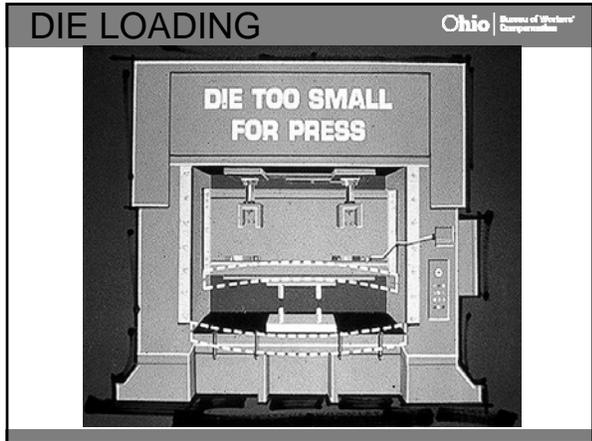
**TONNAGE REQUIRED** 

**NON-STEPPED DIE CONFIGURATION**



**STEPPED DIE CONFIGURATION (OPTIMAL)**





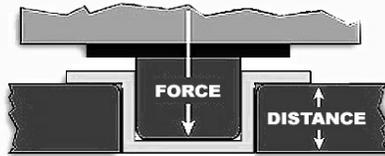
- Part's Tonnage Requirement  
*DON'T STOP HERE!*
- Check Part's Energy Requirement

- Energy is the ability to do work.
- Work is force times distance.

**Energy Rating:**

The ability of the press drive to Sustain Force through a distance (Do Work)

This concept is not generally understood by press users...



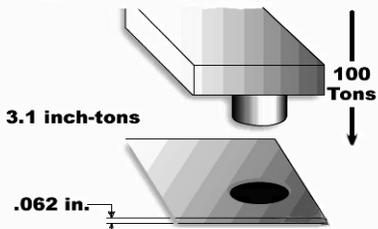
**Example:** How to calculate required energy for blanking

**Job:** Blank a disc from .062 in. thick steel with 100 tons of pressure

**Equation:** Tonnage x 1/2 Thickness

**Solution:**

$100 \times .031 = 3.1 \text{ inch-tons}$



**Example:** How to calculate required energy for draw work

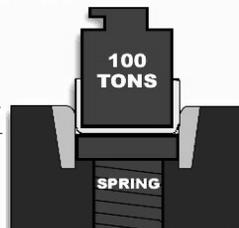
**Job:** Create a 1/4" draw on a press with spring pad at 100 tons of force

**Equation:** Tonnage x Thickness

Length of Stroke: .25 inches

**Solution:**

$100 \times .25 = 25 \text{ inch-tons}$

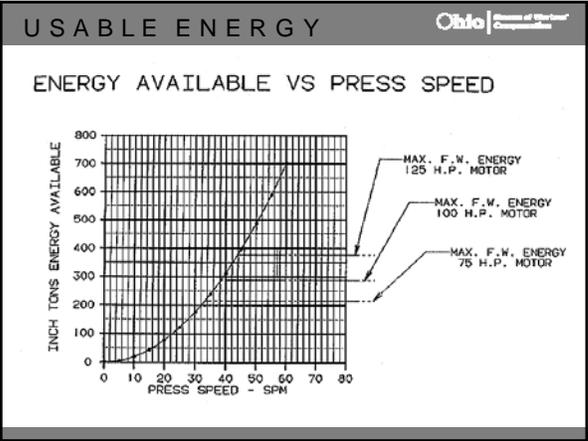


*The Available Energy is usually the limiting operating factor for Mechanical Presses*

(not available tonnage)

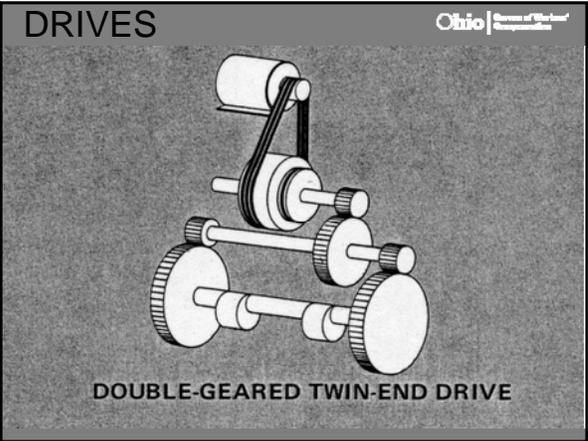
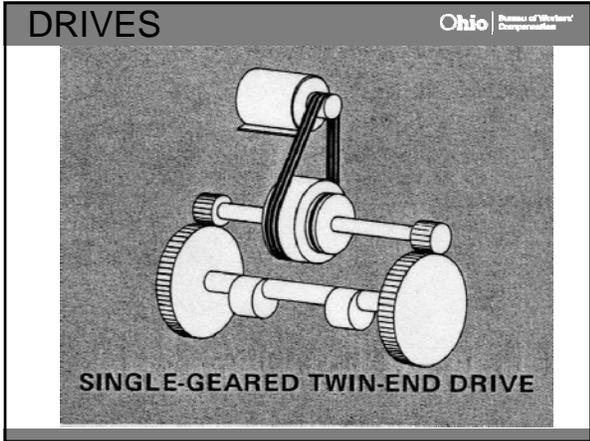
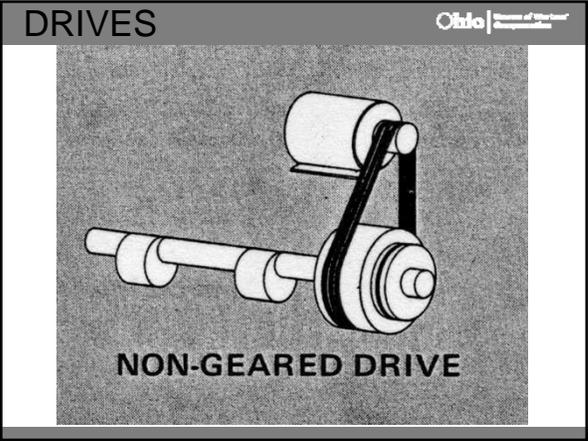
Where Does The Energy Comes From? **Ohio** Bureau of Workers' Compensation

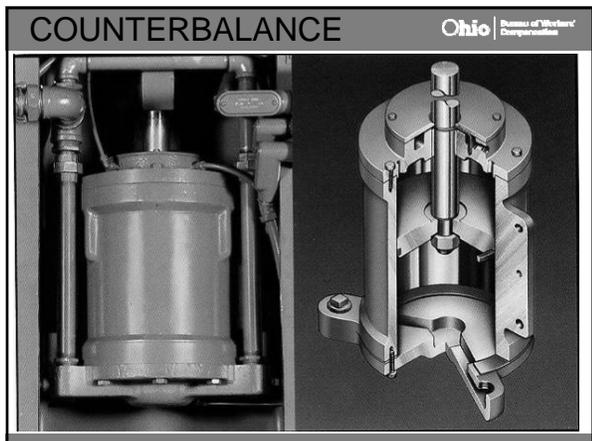
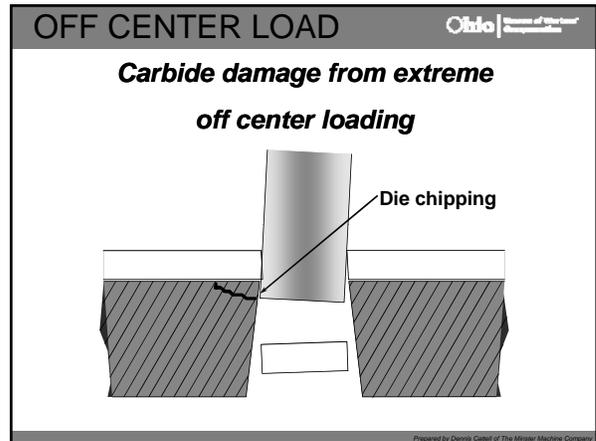
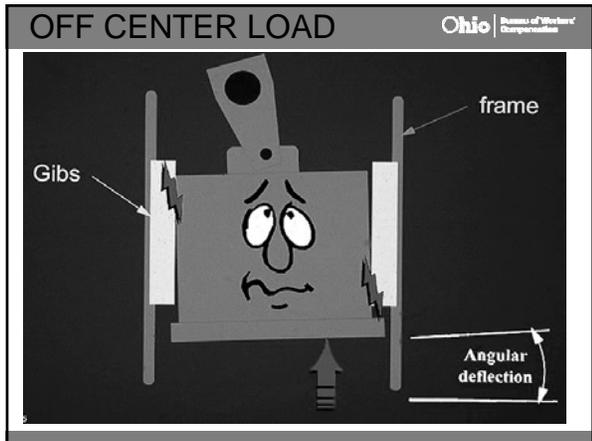
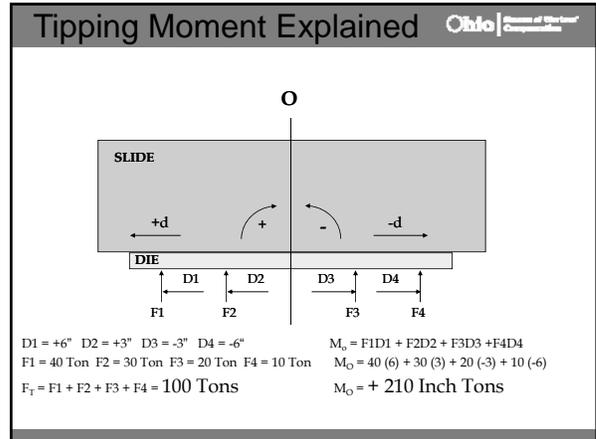
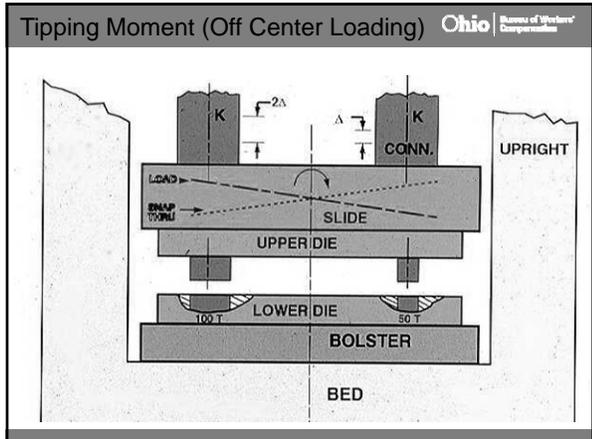
The Flywheel:  
The flywheel stores energy through its weight and speed.

$$E = 1/2mV^2$$


CAPABILITIES AND CAPACITY **Ohio** Bureau of Workers' Compensation

“Energy is a Force Working Through a Distance.”

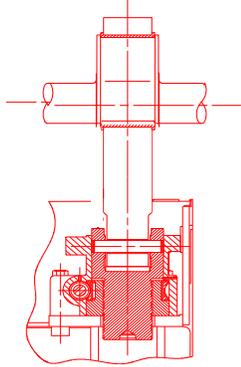




- ### COUNTERBALANCE
- MAINTAINS AND REDUCES LINKAGE CLEARANCE
  - AN AID TO MAINTAIN GEAR CONTACT
  - AIDS CLUTCH AND BRAKE TO OVERCOME SLIDE DYNAMICS
  - AIDS SHUTHEIGHT ADJUST MECHANISM TO RAISE OR LOWER THE SLIDE

## COUNTERBALANCE

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## COUNTERBALANCE

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### NOT ENOUGH PRESSURE

- LINKAGE CLEARANCES ARE OPEN CAUSES HAMMERING AND DIE BOUNCE
- SAGS ON HEAVIER END OF SLIDE
- MOTOR AND FLYWHEEL REQUIRED TO LIFT UNBALANCED WEIGHT TO TOP OF STROKE CAUSING EXCESSIVE STRAIN OF MOTOR AND CLUTCH
- LOW PRESSURE MAY ALLOW DOWNWARD MOVEMENT WHEN CLUTCH AND BRAKE ARE RELEASED

## COUNTERBALANCE

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### EXCESSIVE PRESSURE

- EXCESSIVE PRESSURE MAY FORCE SLIDE UPWARD WHEN CLUTCH/BRAKE IS RELEASED
- TAKES ENERGY OUT OF THE FLYWHEEL
- ADDS ADDITIONAL FORCE TO START/STOP
- RAISES ENERGY/AIR COST
- ADDS FORCE ON DRIVE COMPONENTS AND MAY CAUSE MORE WEAR.
- MAY NOT ALLOW PROPER LUBRICATION

## COUNTERBALANCE

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- NEVER OPERATE PRESS WITHOUT COUNTERBALANCE AIR PRESSURE
- ADJUST AIR PRESSURE TO REFLECT SLIDE AND DIE WEIGHT
- DO NOT OPEN AIR LOCKOUT VALVE WITHOUT FIRST REDUCING COUNTERBALANCE PRESSURE.
- MAKE CERTAIN GAUGES AND REGULATORS ARE WORKING PROPERLY
- REFER TO COUNTERBALANCE LEGEND PLATES

## COUNTERBALANCE ADJUSTMENTS

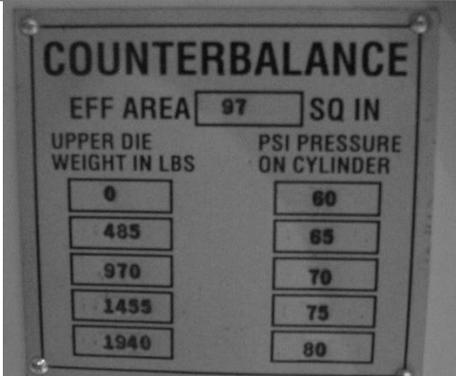
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- INCH SLIDE TO MIDWAY UP STROKE
- TURN OFF DRIVE MOTOR, STOP FLYWHEEL
- REDUCE C'BAL PRESSURE TO "0" DIE WEIGHT
- INTERMITTANTLY INCH AND OBSERVE SLIDE MOVEMENT
- INCREASE PRESSURE SLOWLY UNTIL C'BAL. HOLDS SLIDE AT MIDSTROKE WHILE INCHING CIRCUIT IS ACTUATED.

## COUNTERBALANCE ADJUSTMENTS

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- DIE INSTALLED NO MATERIAL
- INCH PRESS CONTINUOUSLY
- OBSERVE PERCENT OF LOAD INDICATOR (OR MOTORLOAD) NOTE SWING IN INDICATION
- ADJUST PRESSURE UNTIL SWING IS AT A MINIMUM



## DIE SETTING

- Bed, slide, and die should be stoned to make certain these areas are free of burrs.
- Parallelism should be checked to verify slide to bed/bolster parallelism.
- Check with feeler blade making sure bottom die shoe is setting flat on bolster/bed.
- Make certain counterbalance is set for correct die weight.
- Check press for level.

## DIE SETTING

- Proper die clamping procedures are used.
- Avoid horizontal forces on the slide or die set while clamping.
- Proper shutheight is set to make a good part.
- Support the material.
- Place die in press such that tipping moments are minimized and the load is evenly distributed.
- Check shutheight periodically for thermal expansion.

## SLIDE SHUTHEIGHT ADJUSTMENT

### PRECAUTIONS

- MAKE CERTAIN NOT TO ADJUST THE SLIDE BEYOND ITS LIMITS.
- NEVER ATTEMPT TO ADJUST THE SHUTHEIGHT WHEN THE DIE IS CLOSED OR UNDER LOAD.
- NEVER ADJUST SHUTHEIGHT TOO LOW FOR THE DIE BEING USED.
- MAKE CERTAIN COUNTERBALANCE IS SET FOR CORRECT DIE WEIGHT.
- MAKE CERTAIN SHUTHEIGHT IS LOCKED BEFORE ATTEMPTING TO STROKE THE SLIDE.
- MAKE CERTAIN SHUTHEIGHT INDICATOR IS READING PROPERLY.

## Question?



## Operator Preventative Maintenance

- Check gauges for correct pressures.
- Check operation and function of systems.
- Drain Counterbalance weekly.
- Counterbalance pressure
- Check Drive Systems (motor, belts).

Operator Preventative Maintenance 

- Check Flywheel for wobble, grease as required.
- Oil at the split lines
- Temperature and other indicators
- Black oil
- Bad parts

Operator Preventative Maintenance 

- Clutch engagement
- Stopping time
- Clutch pressure
- Communicate unusual sounds, sights and vibrations

Operator Preventative Maintenance 

- Shutheight adjust
- S.A. limit switch
- Electrical controls
- Percent motor load
- Load monitor
- Fasteners and guards

Failure Analysis 

- Need to determine root cause of problems.
- Need to move systematically through the process of investigation - ask questions, make measurements, use resources.
- Keep logs and documentation of problems.

Question? 



**Operator Maintenance**  
**Responsibilities On The Power Press**

Session Number 332  
Presented by Rob Meyer  
The Minster Machine Company

THANK YOU  
meyerr@minster.com