

NOTES ON HOW TO SET A POWER PRESS

INTRODUCTION

The aim of these notes is to give an overview of the requirements for correctly setting a die in a press, to give an understanding of the safety issues involved and to highlight some of the points that require maintenance.

A tool setter should always try to obtain good stampings with minimum wear on press tools and press, and ensure that the press is not overloaded through incorrect setting. He is generally confronted with three types of tool action:

CUTTING (Blanking or Piercing)

FORMING (with or without bottoming)

DRAWING

More than one of these actions is often encountered on the one press tool, but once the basic setting techniques are known and understood, the setter will be able to set any press tool correctly. The use of die sets has simplified and reduced the time for press tool setting, but there still remains a right and wrong way of setting even these.

Other factors, closely related to correct setting procedures, which merit attention are; press care and maintenance, tools, cleanliness and safety. These will be dealt with later, but we should start by identifying the various parts of the press.

Die design is also a very important area in being able to produce a quality stamping from a given press. It is also important in reducing the stresses on the press and careful consideration of all areas should be exercised before starting the die design.

IDENTIFYING THE PARTS OF THE PRESS

Main Frame

The main frame provides rigidity to maintain alignment of the tools. It can be inclined so that formed or blanked articles may pass through the space between the sides of the frame at the rear of the die, or left upright to allow articles to fall through the bed, depending upon requirements for the particular job in hand.

Flywheel

Designed to store the energy required to do the work. These days, it is mounted on ball races to eliminate the possibility of seizure of the bush (giving an uninitiated power stroke).

Crankshaft

To operate the press, the foot pedal is depressed which causes the **cam plate** to move aside allowing a sliding key in the crankshaft to come out to engage the flywheel. It

engages into one of three **splines** in the hardened **splined bush** in the flywheel. When the foot pedal is released a **knockout steel** in the cam plate returns the key into the shaft as the stroke is completed.

Connecting Rod

Connects the crankshaft to the slide. The **connecting rod** (con rod) casting is attached to the slide by means of a **ball ended screw** (ball screw), which is the means of providing adjustment to the lowest position of slide when setting dies. A patented open-lock screw is provided on the split connecting rod to enable easy rotation of the ball end screw when adjusting the punch height, and for locking it firmly when the adjustment is completed.

Slide

The slide operates in a pair of **slide ways** (V strips), which are machined and precision fitted by special methods developed by "JOHN HEINE" to ensure utmost accuracy. It has a specially fitted **die cap** for clamping the spigot (die shank) of the die. This die cap is machined together with the slide to ensure that the complete underside of the slide is perfectly flat for even load distribution on the punch or top die plate.

Brake

A brake is provided to control the movement of the crankshaft after the clutch has been disengaged. Brake pressure is varied by adjusting the lock nuts above the spring and should be set so that the slide comes to rest at top dead centre. A quick method of checking this is to observe the position of the centres in the end of the crankshaft (these centres will be vertical on a fixed stroke crankshaft when at top centre). Incorrect adjustment will increase wear on the clutch parts or may allow the slide to fall backwards or forwards under its own weight, thus endangering the operator. Since the brake warms up when the press is in operation, it may be necessary to make several adjustments to it during the day.

Clutch/Brake Interlock

This safety device engages a lever into a notch in the brake drum to stop the crank rotating when the clutch is not engaged. The cam plate shaft withdraws the lever at the same time the clutch is engaged, to allow a normal power stroke.

DIE SETTING PRACTICE FOR THE BASIC TYPES OF TOOLS

Blanking Tool with Separate Punch and Die (ie not on a die set)

First, be sure **the power is switched off**, the **flywheel is stationary** and the bedplate, slide face, top and bottom die faces are thoroughly clean and burr free.

Place the top punch or punch holder into the slide and clamp it lightly. Irregular punches

must be positioned so that the bottom die will line up (a mark on the punch or punch holder to indicate front centre will make this easier to achieve).

Place the bottom die in position, but loose. Next, place a piece of wood between the punch and die and bring the slide down until the punch contacts the wood. Slacken the die cap nuts and move the slide to bring the punch down firmly on the wood. Re-tighten the die cap nuts whilst the pressure is applied.

The shoulder of the punch or punch plate is now hard against the face of the slide.

Remove the wood.

Take the slide to the top of the stroke and adjust the ball-end screw until the distance between the cutting edge of the punch and that of the die is approximately 1 mm less than the stroke of the slide. Lock the ball end screw after adjustment.

Bring the slide down until the cutting edge of the punch (or the longest punch if more than one punch is involved) is approximately 1 mm above the mating part of the die.

Insert a tommy bar into a hole specially drilled in the front of the bottom die plate. By this means, lift the front of the die gently over the front edge of the punch.

Gently lower the slide and die plate simultaneously until the punch is completely entered. Check that the punch and die are as concentric as possible, then clamp the bottom die. Make a trial cut on paper, or something similar, to indicate whether or not the clearance is even. If it is not, enter the punch into the die and move the bottom bolster accordingly and make further trials until it is seen that the punch is concentric with the die. Maximum die life will not be achieved unless this condition applies.

Next set the punch to the proper depth. As a general rule, punches should be set just deep enough to cut the material and push the blank out of the strip; for example, on tinsplate material, a punch should enter no more than 0.25 mm when machine clearances are taken up. Setting punches too deep only reduces their life unnecessarily.

After any adjustment to the slide, see that the **con rod is locked tightly**. This is important because the thread in the con rod can be damaged if the press is operated with the con rod left open.

Important: rotate the crankshaft one complete revolution by hand to be sure everything is clear!

If so, switch on the motor and operate the press once or twice, then enter the material and produce a stamping. Check for excessive or irregular burrs and if satisfactory, produce several more. If still satisfactory, replace guards etc. remove all spanners and superfluous items from the vicinity of the die and produce several dozen components. All screws should then be checked for tightness and finally see that the brake is adjusted correctly before handing the press over to the operator.

Blanking Tool Fitted to a Die Set

As before, the flywheel must be stationary and the slide, bedplate and die set faces clean and burr free.

See that a piece of packing is placed between the punch and die, or between the die set plates, whichever is preferred.

Measure the overall height of the tool and check if it will fit between slide and bedplate and if necessary adjust the slide before the die is placed on the bedplate. Remove the die clamping cap and place the assembled die set on the bedplate with the die shank located in the slide. Replace the die cap and slide the tee head bolts into the clamping slots in the bottom die. Bring the slide down firmly onto the packing and tighten the die cap. The die bolts at this stage must remain free. Remove the packing and adjust the punch to enter the die at the bottom of the stroke, then clamp the bottom die. **Always clamp the top half first!**

Adjust the slide to enter the shortest punch approximately 0.5 mm at the bottom of the stroke after all machine clearances are taken up.

The die is then ready for trial under power but before switching on the motor, remember to **rotate the crankshaft one complete revolution by hand**. If all is clear, produce a component under power, inspect and if satisfactory, produce several more. Check the tightness of all clamping bolts, clear the vicinity of the die of all spanners etc. and see that the oil cups on the guide bushes are filled with the correct grade oil. Replace all guards, check brake adjustment and the press is ready to run.

The foregoing is the recommended procedure for setting simple blanking dies.

The advantages of mounting dies on die sets do not need to be discussed here as anyone concerned with setting dies will appreciate. However, when storing these dies it is recommended packing be used to protect any delicate punches or cutting edges.

The packing must not be placed beneath any fine punches (for obvious reasons). It can be used to aid the setter when fitting the die to the press by providing a means by which pressure can be applied to bring the top plate hard against the face of the slide.

Forming and Bottoming Dies

Setting such a tool requires considerable care as it is easy to overload a press by over setting. Initial setting procedures are carried out as before and if the die is not mounted on a die set a previously formed stamping should be retained for placing in the bottom die. Alternatively, strips of material from the sheet or strip to be used are bent and laid across the forming block so that the die will be centralised when the punch is brought down over the forming block. In this position the bottom die is clamped.

Even if the die is mounted on a die set, it is good practice to place a stamping in the die and bring the dies together before clamping the bottom plate particularly if the die set

pins and bushes are worn.

Setting the slide for the correct punch depth requires extreme care. As stated earlier, it is very easy to over set this type of die to the point of **seriously over loading the press**. One method to set a die which bottoms is to place a piece of metal (of the thickness being formed) onto the bottoming section of the die. Another method is to use a previously formed stamping.

Bring the slide down to bottom centre and adjust the ball end screw until light pressure is felt when the crankshaft is rotated by hand backwards and forwards over the bottom centre.

This is a safe starting point for setting dies which bottom.

Remove the piece of metal, or stamping whichever is used, and operate the press once or twice under power, produce a stamping and check to see if the desired form or impression has been obtained. If not, adjust the slide down slightly and produce another component, repeating this cycle until the desired form or impression is obtained.

Always lock the ball screw after each adjustment. When the correct setting appears to have been obtained and to be absolutely sure that the press is not hitting harder than necessary, adjust the ball end screw back a fraction of a turn; produce another stamping and see if the impression has changed.

If the impression now is not satisfactory, the original setting is proved correct and only enough pressure is being exerted to do the job. In this case the ball end screw is returned to the former position and locked. If the impression is still satisfactory after the ball end screw was backed off, repeat until only the minimum pressure is being applied.

The utmost care when setting bottoming dies cannot be too strongly emphasised. It is quite easy to overload a press as much as 300% or 400% with this type of die. The fitting of permanent setting blocks to press tools is a practice which, unless carefully controlled, can cause severe press over-loading.

Unless specifically designed to control the thickness of a component, setting blocks should be made so that they are set correctly with a feeler gauge between them to ensure that they do not contact, so adding a further load to the press.

Adoption of the above safety methods will prevent undue strain on the press and possibly save a press or press tool from being damaged.

Embossing dies, particularly the chisel branding type, should be regularly brushed to see they remain clean and free from scale etc. Presses are often heavily overloaded through the slide being adjusted down to get the right impression when lack of impression was caused by the punch or die being choked with scale or dirt.

Drawing Dies

Use the initial die setting procedures as outlined previously.

This type of die usually incorporates a top knockout (or spill) by which the stamping is ejected from the punch. A knockout pin projects through the die shank and makes contact with the knockout bar in the slide.

The knockout brackets on the press must be adjusted after the punch has been set to the correct depth and these adjustments must be carried out when the slide is at top dead centre. Be sure to allow a little free play in the knockout spill when setting the brackets so that the knockout parts will not be damaged in any way.

Drawing operations require the application of pressure to the outside edge of the blank to prevent the metal from wrinkling during the draw stages. This pressure is usually provided by blocks of rubber, springs or an air cushion. The air cushion is far superior because it applies an even pressure through the full depth of draw, whereas the pressure applied by the rubber or springs increases substantially as the slide moves towards bottom centre. This buffer pressure, as it is known, must be controlled so that the metal does not wrinkle during the draw. Even if very slight wrinkle is permissible they should still be eliminated otherwise the draw edge of the die quickly becomes corrugated.

Too much buffer pressure retards the drawing process causing the metal to tear.

The correct setting therefore is between these points preferably using the least amount of pressure necessary. To save a lot of trial and error each time the die is set up, a record should be kept of the amount of pressure required. When one side of a draw is wrinkle free but not the other, either the die faces or the press slide and bedplate faces are not parallel. Often this condition is caused by dirt or burrs.

RELATED FACTORS

Press Care and Maintenance

A power press will give many years of trouble-free service in return for a small amount of care and regular maintenance, however, mechanical maintenance must always be carried out by a competent engineering tradesmen.

Firstly a press must be given regular and proper lubrication. Working instructions supplied with each new press contain full details of the type of oil and the regularity with which parts should be lubricated. Anyone concerned with the maintenance of these machines must familiarise themselves with these instructions.

Modern press flywheels and gearwheels are mounted on ball races which should be cleaned and repacked every 12 months with good quality ball-bearing grease. Inspection of clutch parts is desirable approximately every 6 months and a spare clutch key and spring should be kept in stock so that the clutch can be maintained in good order with a minimum of down time.

The slide face must be parallel with the bedplate if good die life is to be obtained. Many people are under the impression that because the die is fitted to a die set then good

results are assured. A die set will not completely offset "out of parallelism" between the slide and bedplate nor will it always maintain true die alignment if the press slide is a slack fit in the slide ways. Off centre loads in press tools can deflect the guide pins of a die set. Consequently, the press slide should be kept well adjusted to minimise off line movement.

A die set is designed basically as a **setting aid only!**

Special equipment is available to check slide and bedplate parallelism on all John Heine presses. The John Heine service department is available to call and check, and if required, correct the press. Press slides must be adjusted evenly allowing approximately 0.05 mm clearance for oil.

Tool setters should familiarise themselves with the allowable slide adjustment for each press in the shop and see that the ball end screw is not extended beyond this amount. Failure to observe this can result in a bent ball end screw. Oil, not grease, must be used to lubricate the ball seating.

The brake must be kept adjusted so that the crankshaft is held at the top of its stroke when the clutch is disengaged. A brake set when a press is cold often requires further adjustment after the press has been in use for some time.

Die Setting Tools

The tool setter cannot work efficiently unless he has suitable spanners and tommy bars for each press under his control. Spanners should be either set or ring type, not adjustable. His equipment should include a good smooth file for removing burrs, and a pair of tongs to remove stampings from the die (to avoid placing hands between the dies).

The spanner length has been designed to provide sufficient leverage for an average person to effectively tighten a nut or screw so **it is entirely unnecessary to extend the spanner length to gain more leverage**. This practice only succeeds in reducing the life of the nut and screw. Each press should be equipped with die bolts, thick washers and clamp plates etc. in good condition so that a press tool can be correctly set in the shortest time.

Cleanliness

Cleanliness during press tool setting is important. Dirt, metal floss, burrs, even oil, if present under the die can cause misalignment and increase tool wear. The slide face, bedplate and die set faces must be clean and free from burrs, oil etc. before the die is fitted.

Safety

The tool setter must always be safety conscious. A few safety rules which should always be observed are listed below:

Ensure that the motor is isolated and the flywheel stationary before commencing any work, (a precaution which may prevent injury to the setter, or extensive damage to the tool; or both). Rotation of the ball end screw can be carried out when the motor is running, but the safety interlock must be engaged to prevent accidental engagement of the clutch.

When a bar is used to rotate the crankshaft, make sure it is removed after each adjustment. It is a **dangerous** practice to leave a bar in the crankshaft under **any** circumstances. John Heine produces a spring loaded (self ejecting) bar to minimise this danger.

Avoid placing hands between the dies at any time. Make a practice of using tongs to place or remove a stamping from the die.

When all adjustments have been completed and before switching to power rotate the crankshaft one revolution by hand to see that all is clear. This is a most important habit to develop.

Before handing the press over to the operator, see that all screws etc. are securely tightened, all tools and scrap material etc. have been removed, and all safety guards securely replaced. Check brake adjustment.

Treat a press with respect always, and do not take chances with unsafe practices.

SUMMARY OF MAIN POINTS WHICH SHOULD ALWAYS BE KEPT IN MIND WHEN DIE SETTING

- Be safety conscious always.
- Press and die faces must be clean and burr free.
- Always clamp the top half of a die set first.
- The top face of the die set must be hard against the base of the press slide.
- Set cutting tools no deeper than necessary.
- Be particularly careful when setting tools that bottom.
- Lock the connecting rod after each adjustment.
- Rotate the crankshaft one complete revolution by hand before switching to power.
- Always produce several components and double check tightness of clamping screws.
- Clear away all unnecessary items from the vicinity of the die and see that adequate guards are fitted and brake is properly adjusted before handing the press over to the operator.

If there is ever any doubt in your mind, please ask someone who knows the correct procedure. It is always better to be safe than sorry!