

Procedure to Install Mechanical Power Press (H-Frame Mechanical Press)

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Abstract— Mechanical Power Press is widely used machine in industries for making sheet metal and forging components. Sheet Metal components are widely used in automobile segment these days and specially used for making doors, roof, bonnets, etc. Sheet metal components are manufactured using various processes like- blanking, forming, piercing, trimming, etc. For performing all such operations we need a machine which must produce the power required to deform or modify the sheet metal sheet. Sheet metal components have steel as their base, steel sheets comes in coils with different grades (hot rolled or cooled rolled) and thickness (mostly varies from 0.27 mm to 6 mm). These coils first cut in blank on blanking machine equipped with de-coiler, straightener, blanking press, etc. These different shape blank's go to different line for making required components. In this paper we will discuss about the types mechanical presses and installation of one such machine.

Index Terms— Application areas, Thickness of sheet used, Processes.

I. INTRODUCTION (TYPES OF POWER PRESS)

Power Presses fall in the following categories:

- 1) Mechanical Power Press
- 2) Hydraulic Power Press
- 3) Pneumatic Power Press

Depending on design these presses are further classified as:

- 1) C-Frame or Gap Frame Press
- 2) H-Frame Press
- 3) Ring Frame Press

Depending upon use of such press we classify them as below:

- 1) Transfer Press
- 2) Blanking Press
- 3) Transfer Press

II. COMPONENTS OF MECHANICAL H- FRAME PRESS

- 1) Cushion (Required only where draw operation is needed)
- 2) Bed
- 3) Fixed or Moving Bolster
- 4) Tie Rods
- 5) Columns/Up-rights
- 6) Ram/Slide (May also come with cushion)
- 7) Head

Press also contains following accessories for better operation:

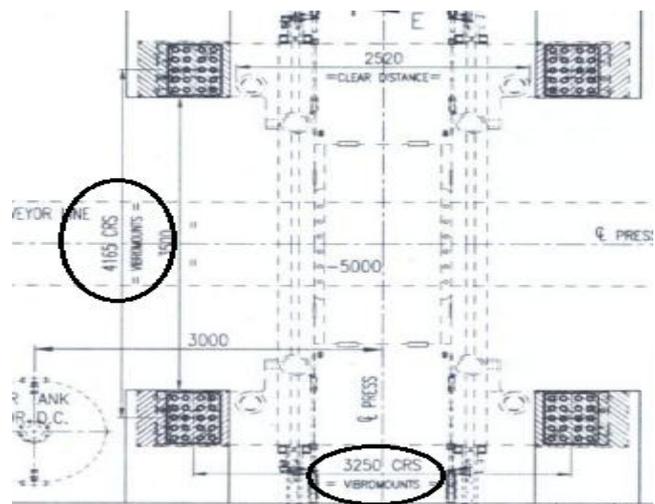
- 1) Lubrication Tank for slide over load
- 2) Hydraulic Tank for clutch and brake
- 3) PLC (Programmable logical control) Panel

4) Heat Exchanger

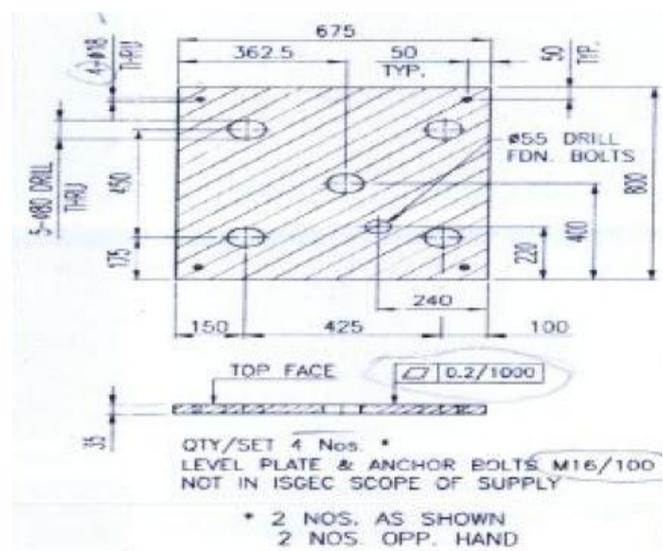
Now day's new type of presses have also come in market, known as Servo Presses. These presses does not have flywheel with them, required power is directly given by servo motor hence no need to store energy as in case of flywheel. Major players worldwide in Press making are Schuler (Germany) and Komatsu (Japan). In India ISGEC (Indian Sugar and General Engineering corporation, Yamunanagar) is Major Player, rest are Pneutech, Press Master, SEW, etc.

III. STEPS OF INSTALLING A PRESS

- 1) Constructing foundation as per press manufacturer drawing.



- 2) Fixing of Base Plate: -



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Purpose of Base Plate: - Base Plates are used to provide a smooth and levelled surface to install the press on the casted Pillars. It is consisted of 4 holes on corner to level it with 5 centre holes to fill the GP2 (Grout in Powder Non shrinkable type) which work as a bonding media between casted Pillars and base plate. Material of base plate should be MS. There is another hole for the foundation bolt in the above drawing which is used to fix the press with foundation bolt. In case we are using anti vibration mount there is no function of this hole. Wait for 48Hrs before giving the load on base plates.

3) Positioning of AVM (Anti Vibration Mount)

Do the proper cleaning of upper face of base plate before placing the AVM. Provide marking on base plates as per drawing to maintain the centre distance between anti vibration mounts. Keep space (approx. 100mm) on base plate to put jack for final levelling of press and for maintenance point of view in future. Use adhesive pad at bottom and top face of AVM.



4) Placing of Lubrication and Air Tanks: -

Place the pit material in the pit before installing the bed on foundation i.e. lubrication and air tanks as per the foundation drawing.



5) Placing and Levelling of Bed: -

Unload and clean the Bed properly before installation. Use proper clamping and slings as per the load. Place the Bed on the AVMs as the foundation layout. Check the levelling of bed before installing the die cushion. (I.e. within 0.1 mm).



6) Installation of Die Cushion: -

After bed placement die cushion was inserted from the top. This is the different design as we uses in our other mechanical presses in which die cushion placed before Bed positioning. Die Cushion is having damper at its bottom to dump out the vibration and to reduce the noise due to metal contact.



7) Placing of Moving Bolster:-

Moving Bolster is used to place the Die on it and is capable of moving Left to Right for loading and unloading of Die. The no. of MB is two to reduce Die change over time.



8) Fixing of Tie rod and column:-

One by one all four tie rods were inserted in the bed by crane. Tie rods are used to tie-up the press components (Bed, Column, Crown) in a single unit. The material of tie rod is such kind of material which can withstand vibration load.

Uprights are having lubrication & pneumatic piping, Electrical wiring, HMI, Push button station to control & operate the press. It is also having guide ways to guide the slide which controls the parallelism & perpendicularity of the slide with respect to bolster plate.



9) Placing of Slide:-

Slide is used to hold the upper Die and transmit the power from eccentric gear to lower Die placed on the Bolster plate. It is having the motor to adjust the slide with the help of universal joints and worm gear which helps in using the Dies of different shut heights. It is also having the Hydraulic over load assembly in it which is helpful at the time of die jam and in die over load condition. H.O.L. having oil at its bottom which goes back in the oil tank at the time of over load by Haskell pump and dump valve and this help the slide to move upward (20 – 30 mm). In slide there are hydraulic clamps to Clamp the upper Die with the slide in order to reduce the Die change over time.

10) Fixing of Counter balancer cylinder:-
Counter balancer cylinders are used to counter balance the slide weight to avoid the down fall if press break fails. It is having that much amount of air pressure in it so that it can balance the slide weight, upper Die weight. Also if air is less, it causes the wear out of the clutch as clutch has to work more in lifting the slide.



11) Fixing of connecting rod with slide:-

Likewise working of connecting rod in engine piston cylinder to transfer motion and power. Here also connecting rod transfer power from gear fitted in crown to Slide/Ram on which upper die is mounted. Also the rotating motion of gear is converted into reciprocating motion of slide. Connecting rod is connected with slide by using pin as like gudgeon pin.

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12) Placing of crown:-

Crown is the top portion of press. It transmits the power generated by the motor to slide where we mount the upper die. Crown works like a gear box in which there are many gears which are used to transmit motion and power. It is also used for speed reduction. The main motor is mounted on top of the crown which is connected with the flywheel through pulley and belts.

The flywheel is itself mounted on the main shaft. Flywheel is always in rotary motion due to connection with motor. In this condition breaks are always engaged with the main shaft. When we engage the clutch the break become free and the main shaft transmit the power to idler gear and one intermediate gear.

The second intermediate is driven by the idler gear. Then the pinions on the intermediate gear further transmit the power to eccentric gear. The eccentric gear is connected with the slide through connecting rod. Thus the rotary movement of eccentric gear is converted into reciprocating motion of slide.



13) Tightening of Tie Rod with hydraulic nut:-



13) Fixing of Flywheel, Clutch & Brake:-
Flywheel rotates by rubber belts using motor power and provide stored energy to gear throw clutch whenever required.

These day we are using single unit of clutch and break operated through hydraulic oil.



14) Fixing of other Accessories

Other accessories are required to enhance the safety, power and working of machine.

A) Fixing of counter balancer air tank-

Air required to balance the slide weight by the counter balance is supplied through this tank. Air in these tanks came from Air compressor by pipe lines.



B) Fixing of Safety Guard:-

Safety doors were inserted both sides (left & right) in the columns with the help of EOT crane. Safety doors are mainly used for safe and continuous operation of the press. It also avoids any obstruction from sides of the press.



C) Fixing and Levelling of Rail Track:-

These rail tracks are grouted with floor and provide the path for bolster movement. We read in books that die is placed on bed, but due to competitive market no one want to waste time in die changing.

So we use Moving Bolster for die changing. Bolster came out from press and new die placed for production. For saving more time we use 2 Nos of MB.



D) Joining of Connecting rod with Crown:-

Connecting rod connects the gears in crown with housing of slide. This is done by using connecting pin which is same as gudgeon pin used in engine cylinder.



E) Pneumatic, water & oil piping with required modification:-

We need air, water and oil at different places in any machine. The movement of air, water and oil from its source to required place is done through pipe lines. These pipes came as per the manufacturer drawing but we do modification in them as per site condition.



F) Electrical wiring and dressing:-

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We all know that to run a machine we need electrical power and the same is given in this case too. High voltage power from main grid come in factory and using Air and Vacuum circuit breaker the voltage it taken down at desired level. Then the power is connected to machine electrical panel which also come with the press manufacturer. Power to all machine component is then routed through cable trays, for safety of wire and to avoid short circuit there dressing is done and wires are placed in flexible and PVC pipes.



G) Separate Earthing to Press and panel:-

In industries separate earthing is provide to all machines and panels mainly for safety point of view like in case of any fault in machine the operator will not feel electrical shock and also the fault will not transfer to machine panel and vice versa. Also separate earthing maintain required resistance value for the electrical circuit and hence improves the system efficiency. Also all earthing should have separate pit for best results.



ACKNOWLEDGMENT

We uses mechanical presses to modify the components of steel, below formula can be used to calculate the required press tonnage:

Formula:

Tonnage for Mild Steel = $3.1416 \times \text{Dia of Hole} \times \text{Thickness} \times (\text{Yield strength})$

Example: $3.1416 \times 2.000 \times .250 \times 25 = 39.26 \text{ TONS}$

Same way we can calculate the tonnage required for any component and can purchase/use required press. Price of such presses are very high.

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