Dynamatic®
DRIVE SOURCE INTERNATIONAL, INC.

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METAL FORMING & PRESS STAMPING

We are very familiar with metal forming applications. A large portion of our work has been with presses and press drives. It is desirable to have variable speed on a press when the press is used for making more than one type of part. As the type of part or function of the press changes, the speed of the press may need to change significantly to produce the highest quality part at an optimum rate.

The drives used on presses must be able to operate a constant torque load. The constant torque characteristic of the press load comes from the fact that the energy used during each stroke of the press is constant. Therefore, the rate that energy is used by the press (horsepower) is directly proportional to the number of strokes per minute (SPM) or the speed at which the press is operating. If the speed is reduced, the horsepower required is reduced proportionately. This is what happens with a constant torque load.

Drives on presses rarely operate the press alone but are most often connected to a flywheel which stores the motor energy. The flywheel is designed to deliver most of the energy required during the short work portion of the press stroke. The drive is then selected with enough horsepower to restore the extracted energy to the flywheel during the long dwell portion of a press stroke. The press speed is then controlled by the drive setting the average flywheel speed.

This design has some significant effects on the drive to be used with it. First of all, the flywheel allows the use of a smaller horsepower motor than a press would require without a flywheel. If a flywheel were not used, the drive would have to be sized to deliver the peak load torque of the press to keep the press rotating. The peak torques exceed those which the drive of the flywheel version could generate. Thus, the flywheel gives the system the capability of satisfying the peak load torques without demanding that the drive also be sized to do so. The second effect the flywheel has on a drive concerns the acceleration requirements. The flywheel usually has a large inertia compared to the drive to which it is connected. The torque and time requirements to accelerate the flywheel to speed from zero must be considered to prevent excessive drive overload.

Another overload condition that may occur is the slowdown of the flywheel caused by going through the work portion of the stroke. The flywheel delivers its energy to the press by slowing down. This slowdown is not related to the variable speed capability of the drive but is a function of load and flywheel energy. A properly designed flywheel can slow down as much as 15% during the worst load case. The drive output, usually belted to the flywheel, also sees this change in speed and must be able to accommodate it on a repetitive basis.

Our Dynamatic® Eddy-Current drives have been used on these applications successfully for many years.

Punch Press Applications

The Eddy-Current Drive has been used on small through large variable speed metal forming presses for over 50 Years. Their low initial cost, simplicity, and reliability have made them favorites of press users and manufacturers all over the world. The Eddy-Current Drive is well suited for this application for many reasons.

The Eddy-Current Drive has an inherent separation between speed control operation and controlling load torque. This separation allows better control for the Stamping Press application. It permits an operating mode where slowing or stopping of the output is a natural and not detrimental part of the drives operating characteristic. When the punch occurs the reaction to the de-stabilization of the output speed is controlled. Through the use of Torque Limit, the speed command during the punch becomes a secondary consideration and torque required for the punch takes over as the independent variable as speed becomes the dependent one. This means that speed is allowed to vary when the limit torque, during the punch, is reached. Once the punch is complete the same torque accelerates the flywheel until speed is once more satisfied. So what we have is a load limited speed regulator. It is this sharing of control that can only be emulated by VFD Drives.

The natural magnetic coupling or slipping of the clutch during operation offers a softened impact load to the drive train as well. This adds to the life of gears pulleys and belts on the press. These benefits are not offered by the VFD Drives because they cannot reduce torque impact during punch. They merely absorb the regenerative energy and bleed it off as heat in DB resistors. However, the motor, belts, gears and pulleys feel the full effect of the motor overload torque during the punch.

The standard Eddy-Current Punch press control offers other functions including “Speed Trip”. If the Die should become jammed during the punch, the trip function can be used to halt further output from the clutch by sensing either that a preset minimum speed has been reached or that a difference between set-point and feedback has occurred. This same function can eliminate the cycling of the press at speeds detrimental to the die or material.

The Eddy-Current drive has a higher output inertia that also helps control the punch better than a standard AC Motor. The magnetic Clutching action of the Eddy-Current Clutch also softens the shock loading to the AC motor extending its life. The AC Motors runs cooler than the AC motor used in a VFD Drive. The VFD output is filtered by the

AC Motor stator causes it to run hotter. Heat is detrimental to AC motors and shortens the life of the motor.

The controller used with the Eddy-Current Drive is insensitive to power fluctuations as is the Mechanical unit, therefore they are well suited to areas with poor power regulation.

- The controls have no trip function and therefore continue to run during most situations. This includes frequency and voltage fluctuation in incoming power.
- The control is smaller, less complex and less expensive than the VFD Controller.
- Inherently, the parts for the Eddy-Current Clutch, Motor and Control are available for longer than the equivalent size VFD Control parts. This allows the customer's initial investment to last longer and reduces replacement control costs. It also reduces the life cycle cost of the drive making a better investment over time.
- Long wire runs between the Mechanical unit and Control create no problems. Conduit is adequate to limit noise and wire current carrying capacity is the only limiting factor with regard to wire lengths.
- Standard power factor correction schemes may be used in proximity to the Eddy-Current drive without faults or tripping and restarting the flywheel controller. This equals less headaches, and more up-time.

User customers appreciate the limited downtime, long life and reliable performance of the Eddy-Current Drive. The controls are simple, and the installation only requires AC Starter wiring for the motor and power plus 6 wires for the Eddy-Current drive. Two clutch wires, two tachometer wires and to Current transformer wires. The wiring is so simple that reversing wires 1 and 2 of any of the pairs is allowed without changing the operation in any way.

With today's specialty metals, the Dynamatic® CES press drive (1000 ton presses and up) or our PDC 2000 press drive control packaged with an Eddy-Current drive that utilizes built in non-friction braking (1000 tones and lower) can save the user time and money and ensure consistency, with a
drastic reduction in die fatigue and metal tearing.

Drive Source International's long history in the metal forming and stamping industry speaks for itself, with press manufacturers such as:

- The Minster Machine Company
- Verson
- Danly
- Bliss Clearing
- Niagara
- Stamtech
- Seyi
- Komatsu

Our support experience and product reliability are key when making your press drive selection.