Punch Press Noise Reduction Suggestions

These suggestions are provided for your information and noise control program assistance. Not every suggestion may be applicable to every type of press or operation. It may take two or more controls to obtain a satisfactory noise reduction.

Mechanical power presses (punch presses) have long been considered to be among the loudest industrial machines. Manufacturing plants with punch press operations routinely generate area noise levels that exceed the 90dBA OSHA criteria for an eight hour time weighted average (8 Hour – TWA).

Reducing punch press noise is a complex problem. The first step in controlling noise is to identify the specific source(s). The primary sources identified for a typical press are the following:

- Impacts of the die
- Metal impacts of parts leaving the press
- Air ejection turbulence
- Clutch and brake mechanism on the drive shaft
- Transmission of press vibration

Capacity
Structure-borne noise will develop when the force exerted by the press reaches 30%-50% of its capacity. The structure-borne noise can be reduced, if the press can operate a smaller tool that requires less force. Use a press that has a capacity of 80%-100% greater than required.

Die Design
If the face of the die can be slightly inclined, a shearing action could be developed. The shear distributes the force over a greater part of the stroke. A similar reduction of total force can be attained by stepped punches verses punching several holes at one stroke. The punching of successive holes occurs progressively. Not all of the punches operate at the same time. Blanking operations should be performed in multistage dies.

Stock Feed
Rolled stock is often positioned into the press using clamp indexer. The metal stock vibrates during the press’s impacts. The indexer may be enclosed and vibration-damping pads applied to the hold down clamp that strikes the stock. Pneumatic exhaust indexers should be muffled. An acoustic in feed tunnel enclosure is another approach. The best control would be to replace the indexer with a mechanical roll feed.

Clutches and Brakes
Pin type clutch noise is a primary noise contributor. Satisfactory designs for nonmetallic pin clutches have not been developed. The use of air clutches is the recognized solution. Air clutches are also noisy but may be quieted by applying a damping material to the metal surface.

Installing a barrier between the press and the press operator is another solution to clutch noise problems. The barrier reflects the noise away from the press operator.
Parts Conveyors
Parts falling into tote bins or rattling down chute conveyors when ejected from the press produce noise. Applying a visco-elastic damping layer on top of the metal chute’s surface, or replacing the metal chute with a wood chute, would eliminate metal striking metal noise.

When the falling parts’ impact noise into an empty bin is the problem, then try to install a fall breaker. The fall breaker is an enclosure made from plywood that has rubber “plates” installed. The metal parts would fall onto the rubber plates thus slowing down the fall and reducing the impact noise.

Reflection Barrier
Most of the press operator’s noise is directly from the die area. Installing a moveable barrier or curtain between the press and the operator would block the noise path and lower the direct noise energy. The partial barrier is effective when no one works behind the press and the press is operating in an automatic versus manual feed manner.

Enclosure
A total acoustical enclosure around the press will reduce the noise, if frequent die accessibility is not required. Assuming appropriate materials are used and assembled in a nearly airtight construction, a noise reduction of 10-20 dBA may be obtainable. Various companies manufacture ridge panels and also movable curtain products that can be assembled easily onsite by the purchaser. The key word is “airtight”. Openings for stock-in, parts-out and power lines would have to be sized appropriately for maximum noise reduction effectiveness.

Stripper Plates
Parts can attach themselves to the top half of the die, then release and fall. The fallen part strikes the bottom half of the die and creates an additional noise source. The stripper plate pushes the part away to eliminate the potential impact noise.

The metal stripper plate may generate an additional noise. Where this noise is identified, the plate may be damped or a nonmetallic contact surface may be used. Damping may result in noise reduction of up to 10dBA.

Structural Vibration
Large lightweight parts such as flywheel guards, frames and legs often vibrate and radiate noise. Use of vibration damping material increases stiffness of the metal surface and hence lowers noise but only slightly. Fabricating the belt drive and flywheel guard from heavy gauge perforated sheet metal and wire mesh will reduce the guard’s vibration noise.

The drive belt can generate a loud vibrational noise. Substituting narrower belts for the wider belt can lower the noise.

Air Discharge
Air ejection is commonly used to remove small parts or scraps from the die area and is a source of high frequency noise. Reduction of noise can be obtained by silencing the air system. The following are approaches to consider:

- Double the diameter of the nozzle’s opening and reduce the air velocity to one-forth. The air thrust will be reduced so the nozzle must be aimed more accurately at its target. This control will change the predominate noise frequency. The larger hole opening will produce a lower frequency noise which is less annoying.
- Position the compressed air stream so that air doesn’t strike sharp edges of the die or part. Air shear noise is an irritating high frequency like a whistle.
• Connect the air ejection to an electronic switch that engages the compressed air release for only a short time. The switch can be set to operate when the press has completed its cycle and the die is out of the way.

• Consider a mechanical ejection system to replace the use of compressed air entirely. Preference should be given to “push-through” evacuation for stamping ejection. The stampings should simply fall on the press-bed (bolster plate) and pushed out from there. Use direct evacuation if the press is inclined or the press bed and bolster plate have sufficient openings.

**Counterbalances**
A loud noise is created at the end of the cutting action when the slug or blank snaps out suddenly. This can be reduced by counterbalances. Counterbalances are more effective in case of heavy stock.

**Bumper Blocks**
Bumper blocks are customary for limiting the chute height of the dies in delicate cutting. A resilient shock-absorbing plastic ring or disc on the block is a very effective noise reduction control. Hold punch penetration to a minimum distance.

**Gears**
Geared systems may be extremely noisy. Some principles used for reducing noise in a gear system are:

• Select a suitable gear. A helical gear is quieter that a spur gear. A worm gear is still quieter but is restricted to low speeds.

• Obtaining a high accuracy in all gear parameters results in a quieter system.

• Detune the gear assembly when the operational frequency coincides with the natural frequency of the press. A resonance may take place that amplifies the noise.

**Vibration Mounts**
Vibration isolation will reduce vibration transmitted to the floor. Floor vibration noise is not a major noise problem to the press operators. But, vibrations can be transmitted long distances throughout a building causing irritation and annoyance to other workers. Vibration transmission reduction is mainly done to reduce structural damage to the building.

Small capacity presses have been able to use vibration reduction springs or coils. Also, presses located on elevated floors might be able to use this form of noise reduction. Large capacity presses, that are located at grade-level, would require a “floating concrete slab” to isolate the heavy impact vibrations.

**Blanking Press Runs**
Large blanking presses have hollow rams. Slots located on the side of the press allow the parts to be removed from the die area. These slots are not required when the press is being used in the forming mode. Noise may be reduced by simply plugging these slots. The plugs may be removed from the press to reconver to a blanking operation. A 6dBA noise reduction may be obtained using a plywood plate cover with a neoprene gasket.

**Double Impact**
Presses frequently create unnecessary noise because of double impact. The mass of the moving head carrying the punch tends to accelerate the crank as it approaches its lowest position. This acceleration causes the head to get ahead of the flywheel and takes up any lost motion in the clutch.
One impact occurs when the punch hits the work. A second impact is the result in the clutch mechanism as the flywheel strikes the crank. A properly equipped press is provided with a brake, an air cylinder, or a counterbalance to retard the downward motion of the moving head. Care in adjusting and maintaining these features will eliminate unnecessary impacts and reduce mechanical wear to bearings, gears and clutch parts.