

The stiff bottom layer prevents bending of the compliant layer and forces it to be compressed between the top and bottom layers. Effective damping of the movement of a piece of heavy sheet metal is accomplished by this technique, whereas even thick layers of undercoat applied to a single piece of sheet metal of equal weight produce an almost negligible improvement.

Plant installations of the "sandwich" kind of treatment produce noise reductions of about 10 db providing other noise sources are less important. Figure 27 shows one such installation.

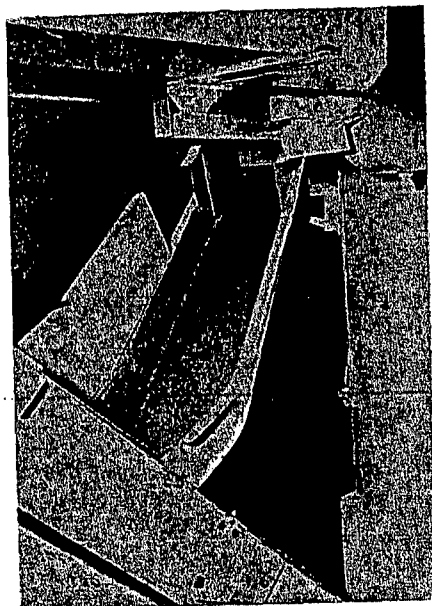


Figure 27. Shells (30 caliber) drop several inches onto the chute and then slide down the incline to be picked up by the upward slanting conveyor. Rubber has been placed at important points along the sides of the chute. The bottom of the chute is lined with a metal-card-on-metal "sandwich." (Courtesy-Remington- Arms Co., Inc.)

e. Sand Chutes. The movement of sand through ducts and chutes may be a source of noise in foundries. The installation of heavy gauge ducts is usually impractical, but the application of a thin layer of abrasion-resistant rubber to critical points on the inside of the duct is simple and effective. The rubber-lined duct usually outlasts a metal duct since the particles of sand bounce instead of cutting into the rubber.

f. Punch Presses. The principal sources of noise in the common punch press are: (1) the impact of the die striking the work, (2) the impact of the

parts of the crank and ram against one another as the slack is taken up at the moment the die meets the work, and (3) the noise of the air blast used to eject the completed part.

The noise of the die striking the work may sometimes be reduced by specially prepared dies. These dies should be ground to cut by a gradual shearing of the metal rather than by punching through the work at all points at the same time. A good "shear-ground" die is difficult to make, but will last longer than a "flat-ground" die. A "multiple-stage" die should be stepped so that the stages shear through the work one after another instead of all at once.

Unnecessary noise is produced if the work is positioned well above the bottom of a stroke. The minimum amount of noise is generated if the die begins to shear through the work very near the bottom of a stroke and completes the punching of the part just as the crank passes dead center. The velocity of the impact is minimized and, therefore, a machine of larger capacity may be required.

Quieting of an operation on a small, high-speed punch press may sometimes be achieved by transferring the job to a press with a greater capacity, but with a slower speed. Equal production can be regained by punching more than one part with each stroke of the larger press.

Liberal lubrication of many punch-press operations, particularly drawing, will produce work of better quality more quietly. An overhaul is needed if the noise produced by a punch press emanates from the vicinity of the crank, bearings, or gears rather than from the dies. In such cases the noise at the instant of impact results from the elimination of the slack in the mechanical chain connecting the motor to the die. A maintenance program that includes regular inspection and overhaul is, therefore, an important part of a hearing-conservation program in plants using punch presses.

The noisy air blast used to eject parts from a punch press can be eliminated by substitution of mechanical ejection. This substitution will not always be possible and other alternatives are discussed below (page 684).

g. Materials Handling. An important source of noise in steel-fabricating shops is the handling and straightening of metal plates and beams. Improved materials-handling procedures may pay dividends of reduced noise and less damage to materials. In production operations the handling equipment can be customized to eliminate the dropping of materials.

The alignment of bent and damaged plates is often accomplished with a sledge hammer and careful handling may also help to eliminate this source of noise. Noise from metal-to-metal contact can be minimized by the use of wooden frames, pallets, or shims. The principal requirements of such a noise-control program are foresight and a willingness to try new techniques.

h. Cans/Conveyors. The conveyor lines that carry cans are usually constructed of two stationary guide rails and a moving wire rope that travels under-

© E. Crede, "Control of Impact Noise," *The Acoustical Spectrum*, Univ. of Mich. Press, Ann Arbor, 1952, p. 117.