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Protecting Your Press and Dies from Snap Thru Damage

Snap thru occurs when a shearing operation occurs within the die space. As the punch, or other shearing elements, build up tonnage to shear the material, the press frame naturally deflects and stores energy. Once the shearing element reaches half way thru the material, the remaining portion of the unsheared material will fail with a brittle shearing failure. As this happens, the stored energy in the frame is very quickly released. This causes reverse tonnage in the die space along with the entire press frame snapping back. The snap thru loading causes press and die damage that can egg shape link eyes, develop random failures on press crown components, and cause damage in the press mounting. These failures have less to do with the peak tonnage of the applied load and more to do with the amount of shearing. In progressive and transfer press applications, the shearing is accompanied with bending and forming die loads that tend to dampen the snap thru. However, if the die has a high majority of shearing, snap thru is a recipe for damage.

With more flexible press frames (i.e. gap and obi press designs), the amount of stored energy goes up along with the potential for more issues. The plot below demonstrates the energy amount by focusing on the area shown under the curve. This area equates to the amount of snap thru energy that is present.

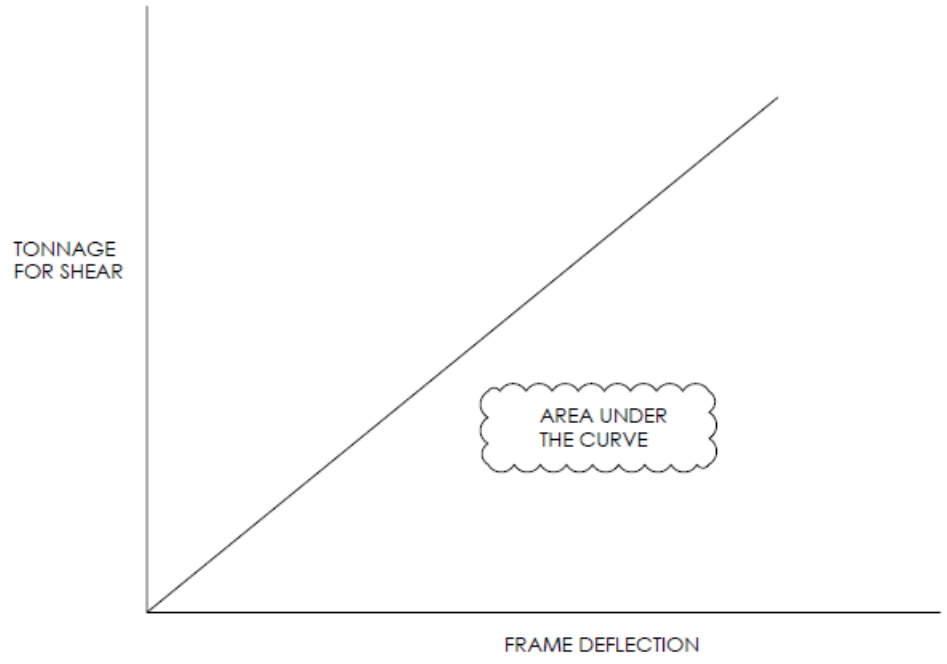

Figure 1 – Energy Curve for Shearing

One way to reduce the effects of snap thru is to use a stiffer press frame, or size the operation with a larger press. The stiffer frame will store less potential energy for the release. Another method is to add stagger in the die design. If the design includes several areas of shear, staggering the punches or shearing will create several smaller episodes of snap thru rather than a single larger one. When these approaches are not possible or not practical, consider adding hydraulic damping. The use of hydraulic damping will absorb or catch the energy release and turn it into heat in the hydraulic oil.

The following example produced significant improvement in shock reduction and will no doubt prevent additional press and die damage. These dampeners stroke about .25 inch with each press stroke. They include a cooling system that keeps the components from overheating. The press cycle is continuous, but with the water cooling in place, the steady state temperature remains under 95 deg F.

Figure 2 – Die space with snap thru dampeners

The dampeners can be mounted in the die space, or as shown in the above example, outside the die space using auxiliary brackets. In this case, accelerometers readings at various frame locations were taken before and after the dampeners were installed. On the press crown, a reduction in shock acceleration was documented from about 20 to 3 g's for a reduction of 85%.

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