TSB DXX 0007

TECHNICAL SERVICE BULLETIN

DESIGN AND MAINTENANCE OF 90ADEX AND 75ADEX FEEDROLLER SHEAR PIN

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GENERAL DESCRIPTION

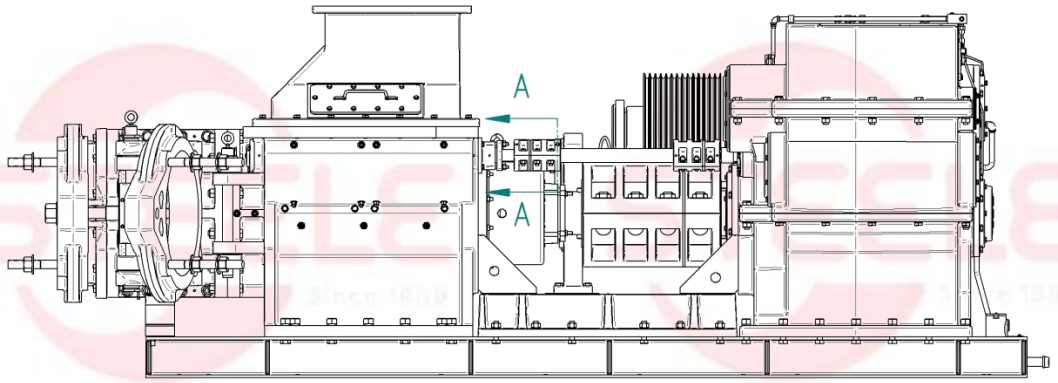

FIG 1: Side view of the 90AD Extruder with the feed roll shear pin labeled.

This Technical Service Bulletin will cover the design and maintenance of the feedroller shear pin on both the 90AD Extruder and the 75AD Extruder. The diagrams in this bulletin utilize a model of the 90AD Extruder, but the same principles can also be applied to the 75AD Extruder. The purpose of the feedroller is to feed material to the fast feed augers, as well as create active surfaces to prevent bridging (see Figure 3). Bridging is when material builds up on either side of the auger shaft to create a “roof” over the fast feed augers. When this occurs, very little material can get through to the augers. Problems in the feedroller occur when high torque is applied to it, causing overload. The shear pin serves as an indicator of high torque so that the issue can be solved before important and expensive parts break.

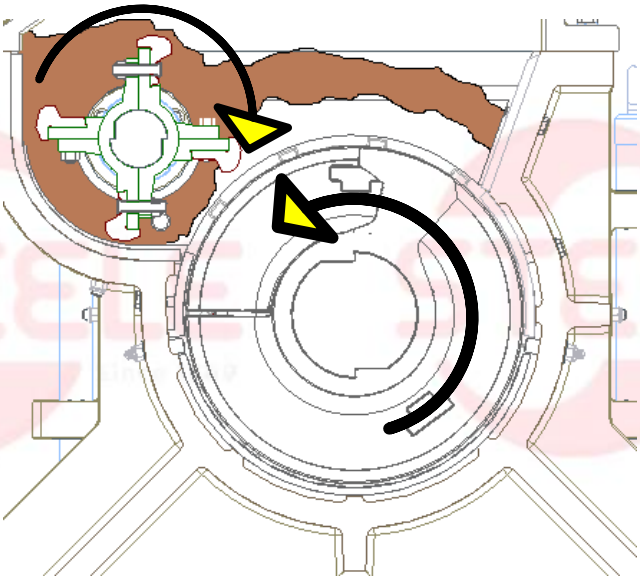

FIG 3: Bridging shown from a cross-section of the machine viewed from behind

PROBLEMS IN FEEDROLL OPERATION

Because the 90ADEX and 75ADEX gearboxes have a PTO without a clutch, all motor torque can potentially go into the feed roll shaft. This means that the torque applied to the feed roll shaft has to be limited. High torque can occur due to a variety of circumstances. For instance, foreign material can get wedged between the feed roll knives and the feed roll liner, causing the feed roll shaft to stop rotating, as shown in Figure 4.

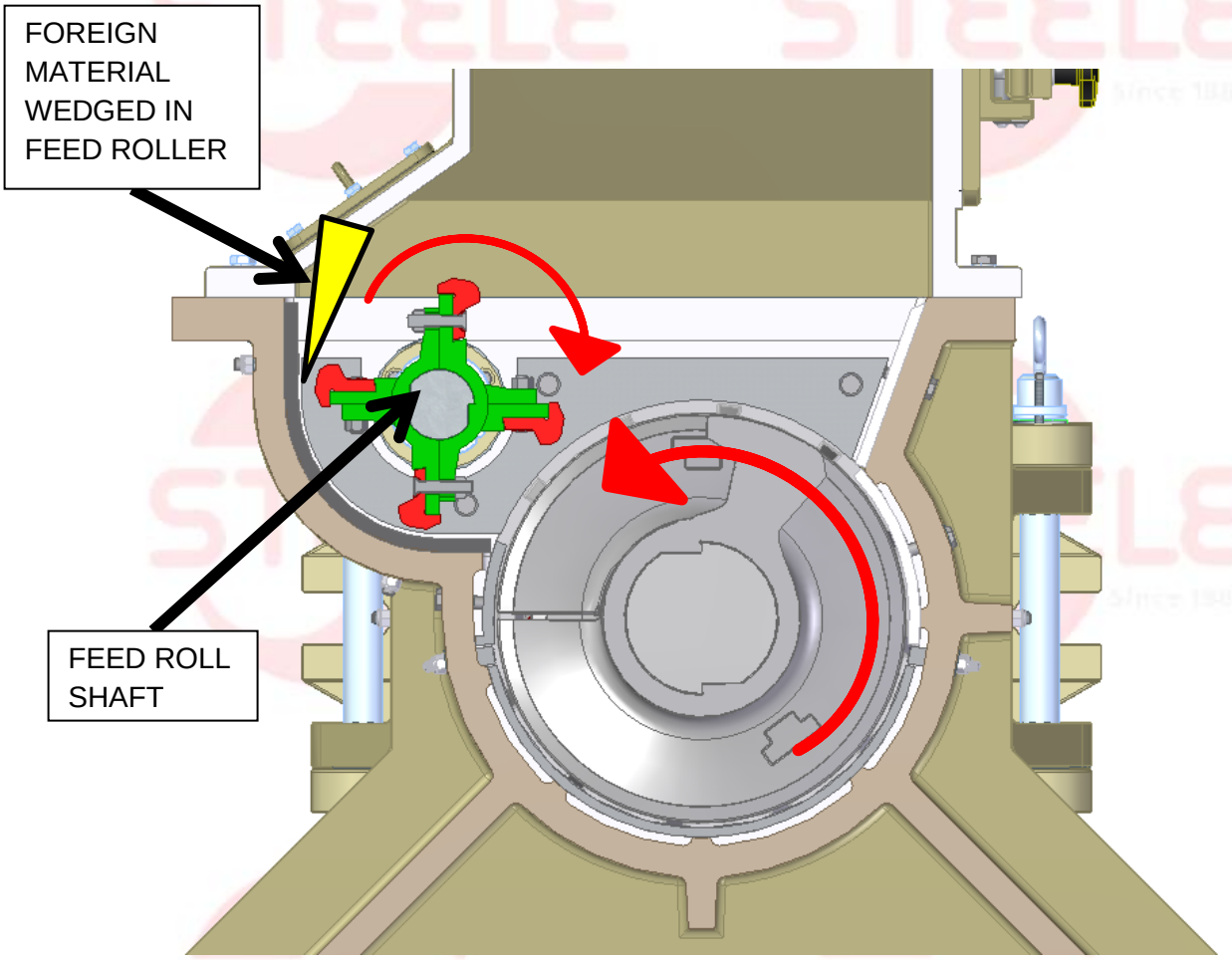

FIG 4: Foreign material wedged in the feedroller, causing resistance to shaft rotation (as seen facing the back of the augers)

The feed roll shaft can also experience high torque due to hardcaking (see TSB GEN 0004) or due to highly sticky material. If this torque isn't limited, components of the feedroller can break.

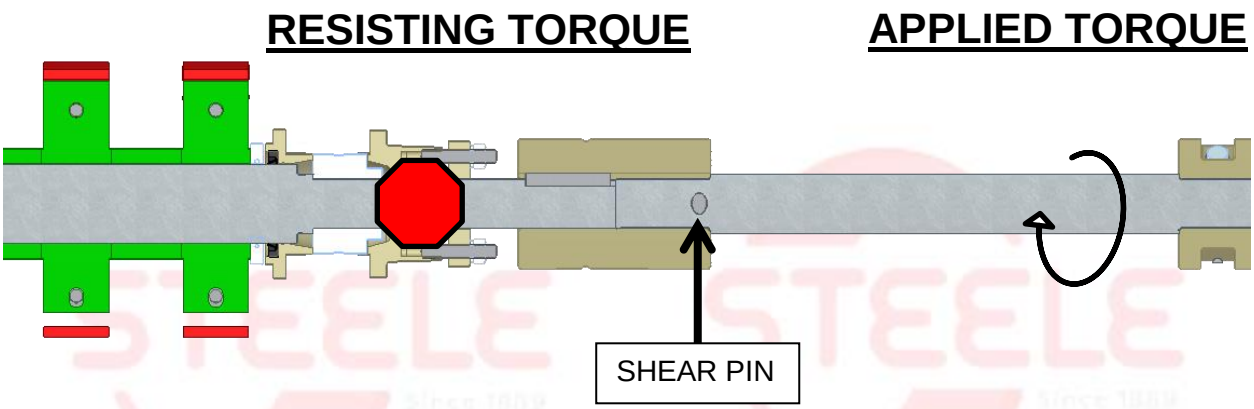

FIG 5: Application of torque to the feed roll shaft

SHEAR PIN DESIGN

The shear pin design forces a controlled mechanical failure at a prescribed torque of approximately 4,000 ft. lbs. (5420 Nm). The shear strengths of all other joints, including the coupling keys, are well over this limit. As such, the shearing of the shear pin provides a warning sign, which is intended to save other feed roll assembly components and make replacement simple. When the pin shears, the middle shaft spins inside the bore, meaning that the feed roll shaft is stationary. Typically a shear pin will break at 6% of the FLA of a 400hp motor.

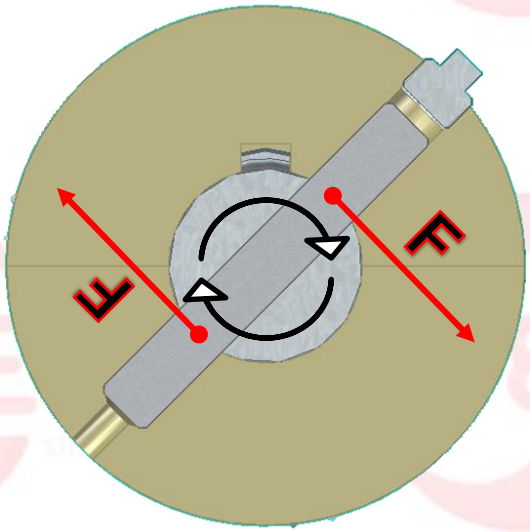

FIG 6: Force application to the feed roll shear pin

Refer to Figure 6. The pin will shear at two different points of force application on either side of the pin, as shown in the diagram. The point at which this happens is a property of the shear pin material, the shear strength. The shear strength of the pin, σ_{pin}, is equal to the force applied to the shear pin divided by twice the cross-sectional area of the pin (because there are two points of application). This shear strength is equal to 75% of the tensile strength of the material. The shear pin is designed to have a low shear strength compared to the coupling keys so that it serves as a warning. Replacing the shear pin with a material with a higher tensile strength will not solve the problem. Instead, this will make it more likely for more expensive feed roll components to break.

NOTE: A common mistake is assuming that the feed roll couplings are designed the same way as the main auger shaft coupling. The difference is that the main auger shaft coupling halves clamp to the auger shaft, while the feed roll coupling halves clamp onto each other, as shown in Figure 7.

MAIN AUGER SHAFT COUPLING **FEED ROLL SHAFT COUPLING**

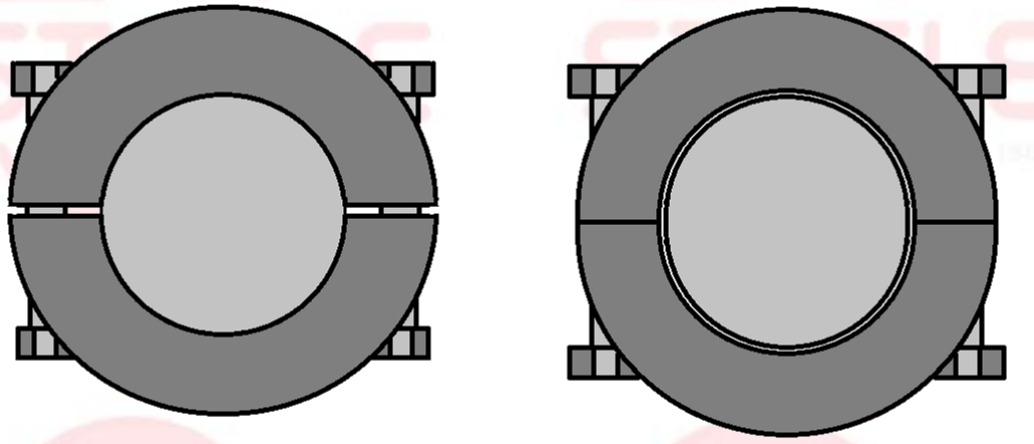

FIG 7: Differences between the design of the main auger shaft coupling and the feed roll shaft couplings

The feed roll coupling shaft is designed so that there is a 0.001”-0.004” bore between the shaft and the coupling. This allows for a small degree of assembly misalignment. When a shear pin breaks, sometimes it can cause deformation in the shaft (Figure 8) or severe gouging of the coupling bore. If this is the case, the feed roll shaft and the coupling bore need to be flattened out before the coupling is tightened. If the feed roll shaft cannot be smoothed, it needs to be replaced. Deformation in the shaft can cause the coupling halves to clamp onto the shaft

instead of onto each other, like in the main auger shaft coupling. If this occurs, the function of the shear pin is completely compromised.

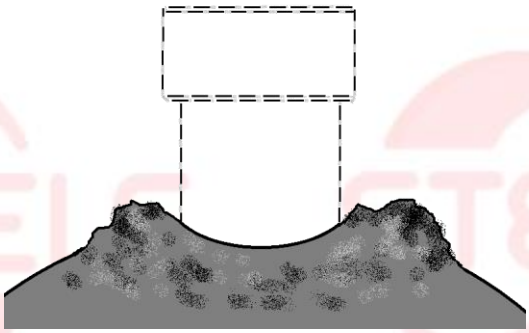

FIG 8: Deformation of the feed roll shaft due to the shear pin

SHEAR PIN REPLACEMENT

1. Loosen and remove the **six 0.625" NC hex screws** connecting the **halves** of the **coupling** containing the **shear pin**.

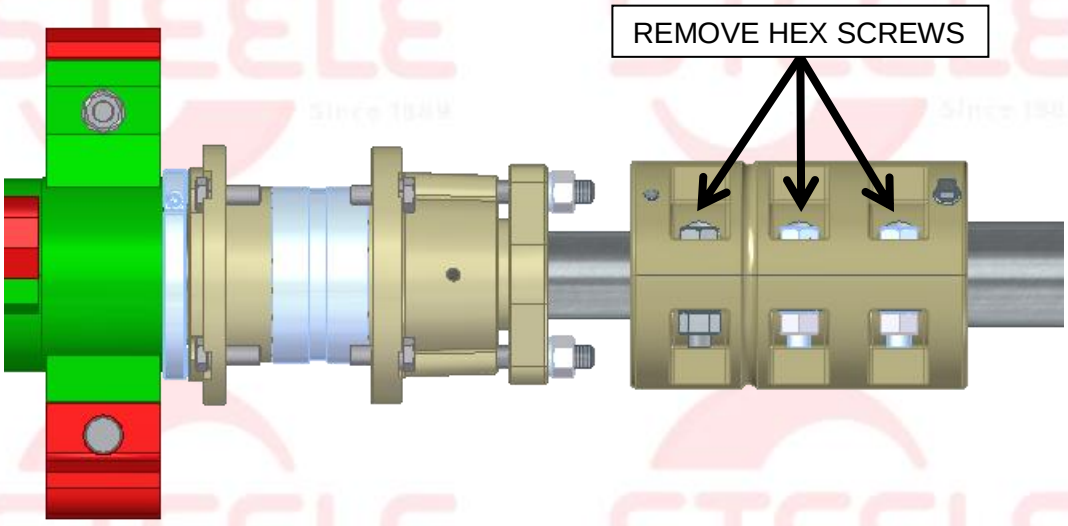

FIG 9: Removing coupling from feed roll shaft

2. Remove the **coupling halves** from the **feed roll shaft**.
   - This task may be difficult depending on how the **shear pin** is broken.
3. Remove the broken **shear pin**.
4. Inspect the **shaft**, **coupling**, and **keys** for damage and replace parts as necessary.

- Repeated exposure to high torque can cause deformation in the **coupling keys**, as shown in Figure 10.

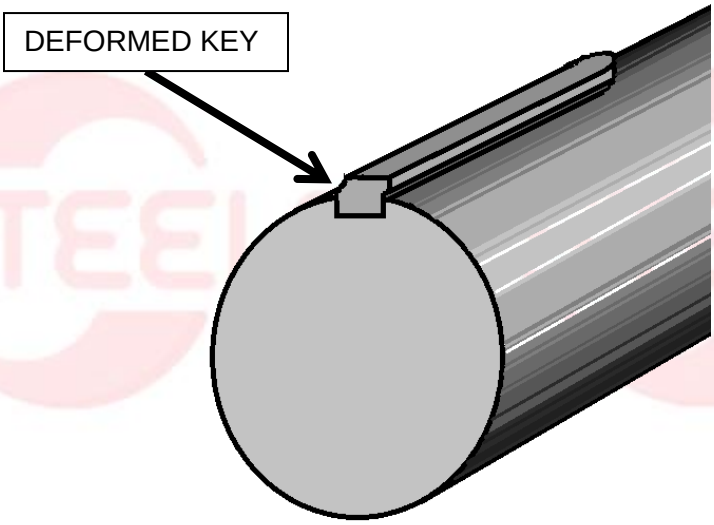

FIG 10: Deformation in the feed roll shaft coupling key

1. Determine the reason for **shear pin failure**.
   - Inspect the **feed roller** for **hardcaking** or wedged **foreign material**.
   - If **hardcaking** is observed, consult TSB GEN 0004 for potential solutions.
2. Ensure that the surface of the **feed roll shaft** is smooth around the area where the **shear pin** was.
3. Install a new **shear pin** in the feed roll shaft.
4. Install the **coupling halves**, lining them up with the **key**.
   - There should be no gap between the **coupling halves**. If the **couplings** clamp onto the **shaft** instead of onto each other, there is probably a problem with the **feed roll shaft** or **coupling bore** (Figure 8)