

E. GEAR BACKLASH

A number of things affect punch life including:

1. Converting material and its punchability
2. Gear condition, wear, and lubrication
3. Die sharpness
4. Good punch replacement procedures
5. Handling of the punch unit
6. Storage of the punch unit
7. Rotating the punch unit only in its normal direction of rotation
8. **Having zero gear backlash**

The most difficult item to understand, and the biggest culprit affecting punch life, is gear backlash. Often gear backlash is present but cannot be easily detected. A number of things can introduce gear backlash into the punch unit's gears. Some of these things include:

1. Normal wear
2. Rough handling or shipping
3. Severe web wrap-up around the punch rings or cylinders
4. Hard press stops or excessive E-Stops
5. Poor punch shear (make sure that shear is generally even all around)
5. Lack of gear lubrication
6. Debris in the gear teeth
7. Harsh and fast acceleration and deceleration rates of the press

Therefore, in order to increase punch life and improve punched hole quality, all gear backlash must be removed between the punch and die gears. Gear backlash must be **zero**. Checking for gear backlash must be done with all punches removed; any restrictions will not allow for backlash to be felt or removed effectively.

In its most severe form gear backlash can be seen and heard with the two gears clanging around; the excessive clearance between the gear teeth is obvious. Wear on punches will also be obvious, and a round punch will take on an oval shape. The punched holes will be hanging significantly in the web direction and the hole quality will be very poor. Severe backlash can cause all of the holes to hang in the web.

The less severe form of backlash will be more difficult to detect. This more subtle type of backlash will cause the same problems on a smaller scale, especially if the converting material is a difficult material to punch.

The maintenance period for backlash removal is difficult to quantify and ultimately must be determined by the user. Some users remove backlash routinely every few months; others have never removed backlash for several years. Generally backlash should be removed whenever a full load of punches is being replaced.

Gear backlash can be removed by utilizing one of two methods: “By Feel,” or “By Torque”

Removing backlash by feel:

To check for and remove gear backlash do the following:

1. Rotate the punch unit around by hand and note the rotational resistance or lack of resistance.
2. Tighten the gear backlash per instructions. It is important to observe the movement between the two gear halves. If no movement is observed, then the gear halves have bonded together and must be removed and cleaned.
3. Rotate the punch unit around by hand and note the additional rotational resistance. If no additional resistance has been noted then backlash is probably still present. It may be necessary to remove the backlash 2 or 3 times until satisfied with the rotational resistance.

Removing backlash by torque:

An alternative to removing gear backlash by feel is to torque the gear’s backlash cam utilizing a torque wrench using a 12 point socket. The amount of torque, however, depends on a number of factors including the cleanliness of the gears and freeness of movement of the gear halves to name a few. A torque value that has worked successfully is 75 lb in. The split gear (anti-backlash) gear segments must move freely for this torque to be effective.

The effects of gear backlash usually show up after running a few hundred feet of material. If a great number of punches wear prematurely then gear backlash is present and must be removed.

CAUTION: Setting the gear backlash too tight can cause gear damage. If the gears do not rotate smoothly by hand and if a binding is felt when rotating the punch unit then the backlash is probably set too tight.