Causes and Symptoms of Roll Feed Length Inaccuracy

1.0 Feed Roll Gear Backlash
Feed roll gearing backlash can cause erratic feed lengths as the tooth mesh position varies with the final positioning of the feed. With correct trim, the error is independent of part length. The solution is to mesh the gear teeth in a consistent manner upon finalizing position. The last move should always be in the same direction; a gentle "blip" feed in the forward direction to finalize position will remove any error in backlash position.

2.0 Feed Roll Slippage / Measuring Roll Slippage
Feed roll slippage (with no LPG measuring roll) will cause erratic short lengths. Measuring roll slippage will generally cause erratic long lengths. The best solution is to eliminate the slippage. Providing a measuring roll for position loop control in an attempt to solve feed roll slippage can exacerbate the problem by causing increased roll velocity during slippage (causing more slippage). The slippage might be corrected by changing the velocity profile, increasing the acceleration time, adding jerk time, or increasing roll pressure. In cases involving minor slippage, an LPG measuring roll can help.

3.0 Poor Drive Tuning / Drive in Current Limit
Poor drive tuning can cause feeder UPID position error during the cut, resulting in erratic lengths. Poor drive tuning can be identified by increasing the settle time to a relatively large value; if the positioning improves, it is likely that the inaccuracy was caused by poor tuning. If the drive current is saturating during the feed, the result will also be poor positioning at the time of cut.

It should be noted that the variables that determine drive tuning are motor design, inverter or amplifier design, and load inertia. Since these values normally do not change, tuning should not. So if the drive performed well at an earlier time verifying that tuning and other motor set up values have not changed should help determine if there is a problem with set ups. On occasion excessive gear box wear can cause drive oscillations that lead to length inaccuracy, but retuning to try to compensate for that usually does not produce good results . So if excessive machine wear is suspected by far the best approach is to rectify the mechanical problem.

4.0 Excessive Acceleration Rate
Excessive acceleration rate can cause slippage, and material "humping" on the catenary during deceleration. If the deceleration rate exceeds that due to gravity, the material will lift off of the catenary supports during deceleration. This lifting may introduce a torque

disturbance in the UPID during the cut, or slippage prior to cut. The solution is to reduce the acceleration/deceleration rate, or to provide a mechanical restraint in the looping catenary to disallow humping.

5.0 Roll Eccentricity
Feed Roll or measuring roll eccentricity, runout (roll out of round, or mounted off of center), or roll irregularity will cause a trim variation throughout the profile of the roll circumference. The result is accurate feeds at lengths which are multiples of the roll circumference, and inaccurate feeds at other lengths. A cycloidal trend is usually noticed if the feed errors are tabulated.

6.0 Shear Clearance (gap) Problem
Improper shear clearance can cause material to tear (stretch) during a cut. The tearing action can cause inconsistent burr on the sheet edge. If this burr is normal and consistent, the best solution is to use a length micro-adjust to compensate for the offset.

7.0 Conveyor Contention With Feeder
Exit or Runout conveyors will exert a forward force on the material during the feed. This pulling effect is increased with heavier (longer, heavier gauge) parts. The result could be contention between the conveyor and feeder at the time of the cut, in turn resulting in poor motor positioning at the time of the cut. Solutions include: index the conveyor with the feed, detune the conveyor, tighten the feeder tuning, remove some conveyor magnets where applicable.

8.0 Loop Violence
Looping pit violence will cause poor motor positioning at the time of the cut. This theory can be tested by checking feed accuracy at reduced line speed.

9.0 Electronic Hardware Problem, Electrical Noise, Pulse Generator Problem
Lost pulse generator pulses cause long sheets. Unico 2000 and 1100 Series drives all have very sensitive fault detection. The "Marker" fault is the most sensitive fault detection and that should be enabled if a marker signal is available and wired in. Unico drives have up to three pulse generator sockets. The MOTOR socket is the socket on the DSP board itself. In addition, a LOAD socket and FOLLOW socket may be used. Most commonly the MOTOR socket is used for the motor pulse generator, and if a line measuring wheel is used it is likely going to the LOAD or FOLLOW socket. The LOAD socket would be the right add on module and the FOLLOW would be on the left. Verify on the FAULT / MASK screen that all sockets used on that application have these faults enabled.

On earlier Unico systems using DC motors and analog drives, pulse generator signals need to be monitored with an oscilloscope as marker faults did not exist and other pulse generator loss detection faults may not catch a partially failed pulse generator.

Electrical noise can cause length variations just as a bad pulse generator can. One thing to keep in mind with that possibility is that that normally shows up right away on start up since the causes of that are normally wiring problems. One can also check our recommendations for

Unico System Grounding if there is a question about that.

10.0 Strain Rate Effects of Rolls
Elastic feed and measuring rolls (such as polyurethane) will compress. The compression will directly affect the trim. If the feed length decreases as the line speed increases, the problem is most likely related to the strain relaxation rate of the roll; the effective roll diameter decreases as the velocity increases (at higher velocities, the roll has less time to relax throughout one revolution, therefore the roll continues to compress as it turns).

11.0 Mechanical LPG Assembly Problem
Crowned LPG measuring rolls that pivot to a different position with different materials will cause feed length variation as material gauge changes (this is most noticed on double roll LPG assemblies with non-parallel pivoting axes). Crowned measuring rolls with a "meandering" contact point will cause problems similar to eccentric rolls. Mechanical assemblies which mount the LPG to the lower roll (underside of steel) can exhibit loss of contact on LPG roll during deceleration.

12.0 Pulse Generator Coupling Problem
Loose or poor pulse generator couplings will cause erratic feed lengths. This may trigger one of a number of drive faults, but in some cases it does not. So this should be inspected manually.

13.0 Shear Rock
As a shear cuts, it also tends to rock forward. This rocking effect can cause the lengths to vary with different gauge or hardness. Inconsistent rocking may cause small inaccuracies during a run.

14.0 Position Loop Feedback Source Switching Within a Part
A disturbance introduced by the shear cut will be processed differently during feeder MPG (motor pulse generator) control versus feeder LPG (line pulse generator) control. A minute amount of feed roll slippage may occur during the cut; during LPG use the slippage will be compensated for, during MPG use it will not. The result of this can be an inaccurate first part (most likely long) if the first (or crop) cut is made under MPG control and the consecutive cuts are made under LPG control.

15.0 Long Part, Short Part Pattern With Oscillating Die
If a long, short, long, short... feed length pattern is noticed during oscillating die use, the material center is not aligned with the pivot point of the die (material is running off of center).

16.0 Trim / Offset Problem
Consistently long or short parts (length is wrong but consistent) is a trim problem; the length error will change as the part length changes. A consistent error that does not change with the part length is an offset problem. Offset problems can occur with excessive burr or draw during the cut; the best solution to the offset problem is a length micro-adjust feature.

17.0 Popping Feed Rolls Open

Self staging dies, progressive dies, and pilot pins often require popping open feed rolls during the cut. Length variation is usually caused by a die problem or a anti-backup roll problem.

18.0 Insufficient Settle Time
If the settle time (function of setup value for single stroking, function of press feed angles for continuous operation) is insufficient, the result can be feeder UPID position error during the cut, in turn resulting in erratic lengths.

19.0 Over Speeding a Profiler Feeder
Over speeding a profiler feeder will result in an improper velocity profile. The result can be feeder UPID position error during the cut, in turn resulting in erratic lengths.

20.0 Part Flatness Problem
Part flatness can affect measured feed length; for example, during LPG use, sheet Center buckle can result in short measured parts (the linear part dimension is measured rather than the sheet contour). Although the part measures short, the actual length could be correct. This problem can be observed during both LPG and MPG use. Excessive camber will also cause a part to appear short (as viewed from above, the part tends to curve as it is fed).

21.0 Draw During the Feed
If the feed rolls are working the steel, the steel may draw (stretch) as it is fed. This is typically noticed on feeder/straightener systems. The solution is an LPG measuring roll.

22.0 Draw During the Cut
If the die draws (stretches) as it cuts, the part will tend to measure long. This is similar to a shear gap problem. The best solution is a length micro-adjust to compensate for the offset.

23.0 Part Square-ness Problem
Parts should be checked for square-ness when evaluating length. Length should always be measured down centerline.

24.0 Improperly Measured Parts
Parts that are not flat, out of square, of irregular shape, measured with a tape measure, or measured down the edge (rather than on centerline) are all subject to measurement errors. Parts must be square and flat; length should always be measured down centerline (with a reliable measuring device).

25.0 Excessive Camber in Material
Camber is a curving of the strip as it is fed (as viewed from above). Excessive camber will result in parts that measure short (the LPG tracks the curve, the measured length is linear). The length error will grow as the length increases (as if a trim problem exists). The parts will measure square (corner to corner dimensions are the same). To test for sweep camber, measure part length down both sides of the part (near and far edge). If the two dimensions are different, and the part measures square from corner to corner, camber exists. It is also possible that camber will "snake" back and forth within a long part (the direction of the curve alternates); this might result in parts that measure square, and pass the above camber

test.

26.0 Material Wander During Feed

If the strip wanders from side to side during a feed, the final part dimension will measure short (the LPG tracks the meander). Check the feeder side guides for proper positioning. The part might measure square, and will probably pass the excessive camber test (#25).