PERFORMANCE **PRODUCTS, INC.**

The Industry Leader in Milling Machine Optimization

Common Symptoms that Indicate an Underlying Tooling Problem

If you are experiencing any of the following, you may have a tooling problem:

- Increased tooling costs
- Vibration and chatter
- Excessive harmonics on the mill
- Lengthy set up times
- Shortened tool life
- Poor tolerances
- The need for excessive polishing and finishing time
- Run-out
- Tool rigidity issues
- Non-repeatability
- Costly downtime

Toolholder expansion can guite often be identified simply by looking at the wear patterns on the toolholder itself. Wear marks at the small end, and at the gauge line, with no wear in between are a clear indication of toolholder expansion.

Toolholder with uneven wear pattern Fretting marks caused by the torsional stress of a standard retention knob. Gap where there is no engagement with the toolholder and the spindle. Fretting marks caused by the toolholder moving in the spindle.



An even wear pattern indicates there is no toolholder expansion.

A toolholder that is properly engaged in the spindle can increase carbide tool life 10 to 300%.

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