Case Study: Turret lathe live tooling overheating

Problem:

Planet Products Corporation is a Cincinnati-based contract manufacturer that produces components for various industries. One product was giving them fits– a 2.5 inch diameter CNC milled titanium cup machined to extremely close tolerances. A critical feature in the cups was over 400 precision serrations that are spaced 0.001" apart, yet could not touch or overlap. The serrations were originally machined on a Mazak turret lathe using state of the art live tooling. However, the total time to mill the serrations was over 20 minutes, and the typical live tool can only run 3-5 minutes continuously due to heat build-up. Most live tool manufacturers recommend keeping a duplicate tool in the turret and change tools often to keep from overheating. This was not an acceptable solution since due to the critical nature of the serrations, they had to be machined continuously.

The initial solution was to produce the cups on a Mazak Integrex multi-axis lathe. However, this solution was less than ideal due to a couple of reasons: First, the Integrex is a complex machine costing several times that of a turret lathe, and second, repeated machining of 400 serrations per cup was rapidly wearing this expensive machine in one place.

Solution:

The company has a long relationship with a customer that integrates the Planet radial piston hydraulic motor into tooling for use in machining centers driven by high pressure coolant. The bearings in this motor have been lubricated by the tool coolant with very good results. Brian Conroy, project manager states "live tool manufacturers go to great lengths to keep the lubrication and coolant separate, using complicated sets of seals". Planet decided to forgo the seals and utilize the design features from it's coolant powered hydraulic motors for lubrication and cooling of the tooling. After a lengthy development and testing process, a prototype was released. The resulting tool was tested non-stop for 24 hours, with no appreciable amount of heating.

This tool is now used to produce the serrations on the titanium cups on the turret lathe. Planet has leveraged this knowledge to patent the tool, and now offers straight, offset, and right angle tools for Mazak, Okuma, Daewoo and other popular turret lathes..

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