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With art: image of author Bill Malanche

How long do you need your machine tools to last?

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In the aerospace industry it's common for OEM contracts and programs with their component suppliers to extend 10 years, 20 years, and sometimes even 40 years! The very nature of many, if not most, aerospace parts is that they demand efficient and productive metal removal rates – in tough materials; with tight tolerances; and with a reliable, robust, and automated process. The time and resources to dial the system in can take many months. There's a huge investment by all parties to ensure that all aspects are operating as designed and built, essentially to press a button and walk away without a worry. And that's exactly how it is for a year, two, maybe even four years. All is well.

Until it isn't.

Maybe a tolerance becomes troublesome to hold. Maybe machine tool service technicians have to be called in frequently. Maybe the "system down" condition is bordering on unacceptable. Meanwhile, the supplier is barely into the decades long program! Now what? Keep repairing and retrofitting? Buy new again and hope it lasts this time? That ROI report would certainly be cringe-worthy, wouldn't it? Unfortunately,

we see this scenario play out time and time again. There is a solution, however it needs to be embraced and seriously considered before the supplier officially gets the order and that is this: *a long contract warrants a long view of the manufacturing technology required to fulfill it. Otherwise the company opens itself up to risk with all of its stakeholders.*

There are differences in machine tool construction and design attributes. There are good solutions available that can perform very well in the short term. And then there are those that are crafted for the long haul and ideally, designed for that particular application with the appropriate spindle, table, cutting tool package, and engineered process that is proved-out in advance. Yes, of course those dedicated machines have a heftier price tag at the onset, however they actually cost less to operate over time in the form of zero to minimal downtime for machine failure, longer tool life, and less scrap – along with a predictable, reliable work flow and process.

For example, optimal hard-metal machining as is often found in the aerospace industry lies in the ability of the machining system to perform low frequency machining without chatter at low spindle speeds and to extend cutting tool life. The system also needs to hold tools tightly with heavy-duty tool tapers. The system's design and construction must be directed at increasing machine stiffness to resist heavy cutting loads. It also must deliver the power necessary to take large, rough cuts – meaning adequate spindle horsepower, torque, and large servomotor drives on the ballscrews. As such, the machines must have the structural design to machine at low amplitude ranges. Hand

scraping the way surfaces and spindle-mounting surfaces is the only way to achieve predicable frequency control. Further, all of the materials in the machine structure must stay within a specific range of static and dynamic stiffness and resiliency so that when cutting, the spring memory of the machine is highly repeatable. This repeatability is paramount for tightly controlling the cutting edge as it passes through these hard materials. To aggressively cut titanium, for example, the machine needs high torque motors and spindles with a large taper interface. Further, high pressure, high volume coolant systems are mandatory when cutting titanium. It goes without saying that the correct cutting tools are of paramount importance. For these requirements, a horizontal platform lends itself very well for these large, heavy parts.

That description above, ladies and gentlemen, is a machine tool that will last *decades*. And if a supplier has a contract that spans many years, that's what is needed to mitigate risk – the risk of failing a customer, the risk of neglecting stockholders, the risk of forsaking the employee profit-sharing plan. There's too much at stake to take the short-term view in a long-term relationship.

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