



APPLICATION NOTE

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Effective Tool Protection Multi-Spindle Screw Machines

Multi-spindle screw machines are powerful, but difficult to monitor due to their design. An acoustic sensor was used with an IMPAX PASS monitor to protect all tooling on a machine.

Project Goals

Multi-spindle screw machines are excellent for quick production of high-quality precision parts. But because of their parallel nature, a problem with one spindle's tool can quickly become a problem for the entire machine. And if such a problem is left to grow out of control, the result can be very costly in tooling, and in setup and adjustment time.

A customer who utilizes precision screw machines (including Acme Gridley, Schütte, Davenport, and Euroturn machines) had this problem. Their process involved a main drill creating a hole in the center of a part, and several follow-up tools enlarging the hole and doing other work on the part's interior. The problem was that if the main drill chipped or broke, the hole would not be completed, and all the following tools could be wiped out by the malformed part. This required replacing all the tooling, and many hours of work to re-setup the machine. They wanted a way to detect any drill failure any stop the machine immediately.



Implementation Notes

In this unique application, monitoring one tool (the main drill) would provide protection to all the tools following it in the process. A variety of systems and sensors were tested to examine the drilling process. The best results were obtained from an acoustic sensor, feeding a signal conditioner to smooth the acoustic signal from the drill.

This sensor signal was fed in to the IMPAX PASS monitoring system. The PASS is ideal for the application because it learns the peak and average value of any sensor signal; in this case, that corresponds to monitoring the peak and average oscillation of the drill. Any tool damage or extreme wear would change the drill's acoustic signature, which the PASS would notice as being beyond its learned limits.

Project Results

Once installed, the PASS monitor is able to sense the drill's cutting signal on each cycle, and determine if it is out of spec, in which case it stops the process before the part is transferred to the next tool. Crash protection is also enabled, so that if the drilling energy passes a critical level, the machine is stopped immediately, in mid-cycle. Cascading tool damage is prevented by catching drill problems right away.

An unexpected benefit was also realized, in that the sensor was sensitive enough to detect problems with tools adjacent to the main drill. Several times during the trial period, issues with nearby tools caused enough distortion to cause the PASS to stop the machine. This adds a further level of protection to the system. By directly watching the main drill, and also keeping an eye on neighboring tools, the IMPAX PASS ensures that problems are caught quickly before they snowball out of control!