



# 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. A specialized strain sensor was used with an IMPAX/SK 400z process monitor to protect all tooling.

### 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 four main drills 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 any of these drills 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 four tools would provide protection for the whole machining process. A variety of systems and sensors were tested to examine the drilling process. The best results were obtained from specific strain sensors, feeding a signal from the drilling station arm through a specialized programmable amplification module.

This sensor signal was fed in to the IMPAX/SK 400z monitoring system. The 400z is ideal for the application because it learns the entire profile of the cutting sensor signal; in this case, that corresponds to monitoring oscillation of the drill. Any tool damage or extreme wear would change the drill's sensor signature, in which the 400z would notice as being beyond its learned limits. Additional software tools are added to monitor peak and trending of certain areas of the curve for better overall tooling studies.

### Project Results

Once installed, the IMPAX/SK 400z 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.