APPLICATION NOTE

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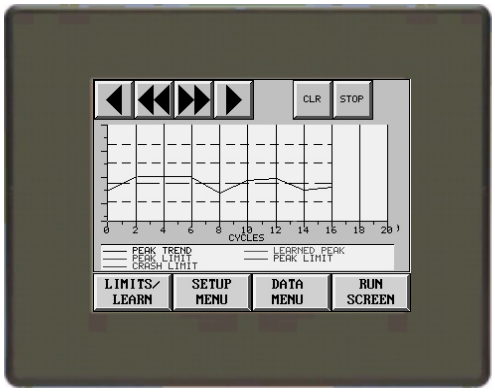
Quality Monitoring for High-Performance Fastener Tapping

Fasteners used in aerospace applications must comply with tight tolerances. A monitoring system was put in place to ensure the quality of the tapping process, with minimal operator intervention.

Project Goals

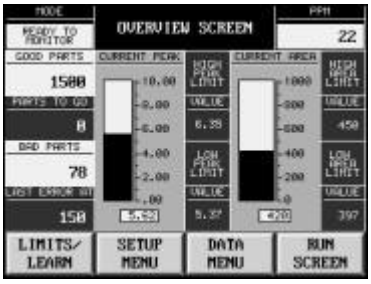


The challenge of ensuring that parts are tapped correctly is increased when tighter tolerances are required, and when parts of different sizes and materials are introduced. A manufacturer of advanced aerospace fasteners, made from various metals and alloys, falls in this category. Their fasteners are used in commercial, military and space applications, and are subject to high stresses and temperatures, which makes meeting the tolerances all the more important.

The client was looking for a monitoring solution that could check the quality of their tapping processes, while the tap was ongoing. They needed to be able to detect bad taps, double-taps (which could occur due to feed and ejecting problems), and any damage to the tapping or feed equipment.

Implementation Notes

In order to monitor the entirety of the tapping process, a motor power monitor was chosen for a sensor. The power monitor reads the real-time power usage of the tapping motor, using voltage and current samples from the control panel. The advantage of power monitoring is that it produces a signal that reflects everything that is happening in a process, from the orientation of the material to the sharpness of the tool. As an added bonus, no intrusive sensors need to be installed or maintained. A simple magnetic prox is configured to signal the beginning of each cycle by detecting the motion of the machine.



To process the sensor signal, the IMPAX PASS monitoring system was chosen. The PASS monitor observes the power signature of each cycle, and enforces customizable tolerances on the upper and lower bounds. The results of each cycle are displayed on a large graphical screen, along with a trend view to identify changes over time. The monitor tracks the total power signal, as well as the peak power of each cycle, which is often indicative of tool wear (see summary screen at left).

Project Results

With the power sensor configured for the tapper's motor, the IMPAX PASS displays each cycle's power level. For correctly-made parts, the sensed power levels are within 1% of the learned level, while double-taps show up as a 25% variation in power. Bad taps and feed problems show up as even larger variations. The machine is stopped after each suspicious part, eliminating the risk of contamination. After a lengthy trial run, LISI Aerospace has approved the PASS monitor and plans to protect the entire tapping division with this monitoring technology.