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The ShotMeter and the Aerospace Industry

THE SHOTMETER is a success story for Progressive Surface, particularly due to its acceptance in the aerospace industry where it improves accuracy while reducing the development time of a shot peening process. For example, a major aircraft engine manufacturer recently benefitted from reduced development time, thanks to the ShotMeter. The manufacturer purchased a Progressive Surface 6-axis robotic shot peening system and required process recipes for five different intensity ranges at three different impingement angles with three different nozzles. Utilizing traditional methods, developing the 45 distinct saturation curves would have taken several weeks to complete. But with the use of previously developed process models and the ShotMeter, preparing a new development methodology consisted of a few simple steps.

Step 1. Collect a velocity fingerprint for the machine using the velocity profile factors that are unique to that machine (for example, hose length and diameter).

Step 2. Enter the desired angle of impingement and required intensity into our empirically developed process model for the specific media size and type. The output of this model is a target velocity needed to achieve the required intensity.

Once the target velocity for a particular intensity is known, the process engineer uses the fingerprint data developed in Step 1 to select his air pressure and shot flow. Using this methodology, no trial and error was needed. We reduced the time required to complete this task from several weeks to just a few days. The customer was able to take delivery of their machine weeks earlier, and was presented with a process model and machine fingerprint to use now and in the future.

Another advantage of the ShotMeter is its ability to integrate with machine process monitoring software. PRIMS Pro, Progressive's updated software released earlier this year, has many new features including enhanced user-friendly graphics, part queuing, expanded process/image association for individual parts, alarms with diagnostics, and simplified scheduling and tracking of preventive maintenance. To date we have several customers in varying industries, including medical, aircraft engine and airframe, enjoying the improved level of in-process control offered by an integrated ShotMeter.

Before and after each part is processed, the nozzle is moved in front of the ShotMeter sensor head and the velocity is measured, recorded with the process record for that part, and checked against the pre-established process limits. This ensures that the process is consistent and the same as previously determined. If the velocity is recorded outside of the approved range, the part processing is halted and maintenance is called to correct the problem. If the velocity is out of range at the end of the process, then quality is alerted and the part quarantined until proper engineering disposition is made. This new level of process control is becoming the standard for today's lean, quality-driven manufacturing environment.

THE SHOTMETER G3 was developed in collaboration between Progressive Surface and Tecnar Automation. It uses a simple method of particle illumination and two electro-optical sensors of a known spacing to sense particles as they exit the shot peening nozzle. The signals from the two sensors are compared and the resulting phase shift is used to calculate velocity, with accuracy within 1%. There are currently more than 40 ShotMeters in use worldwide.

The ShotMeter system is offered as a portable configuration, or integrated with PRIMS Pro, Progressive's process control and integrated monitoring system. Both configurations provide the user with adjustable setpoints and alarms for shot velocity.