

One Measurement: Profile, Flatness and Waviness

ShaPix® Case Study #911

Surface profiling of large and complex surfaces has been difficult to perform, often taking hours to program and acquire data. ShaPix can capture Surface Profile, Flatness, and Waviness in a single measurement of a large part in minutes, providing insights that reduce cost, increase part performance and customer satisfaction.

Surface profile challenges

Power train parts require precise measurement to assure peak performance. These include leak detection, minimizing warranty recalls and capturing other costs of quality failures. Complex surfaces with multiple heights and related surfaces contain many GD&T parameters to measure.

CMM tools require programming by metrology experts to just acquire a data set. Running a part can then take hours and the data density is often low, increasing uncertainty in the measurement.

Profilometer gages used to measure waviness are tricky to position, are delicate and are limited to where the surface measurement can be made. What is required is immediate, easy to use, clear visual identification and quantification of the surface parameters.

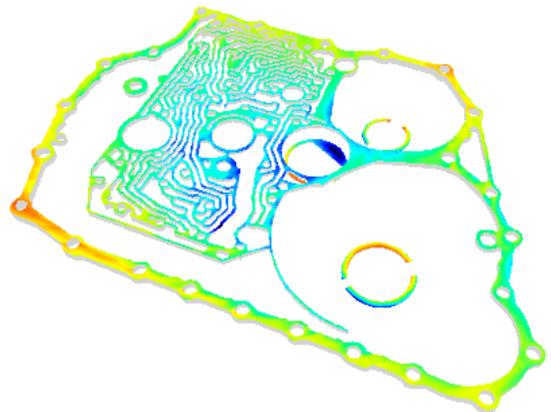


Rapid high-resolution data is needed

To produce timely process control feedback and avoid scrap, profile, flatness, and waviness measurements of the entire machined surfaces must be accomplished in minutes. Reports must be immediately produced with clear visual identification of the nature and location of any dimensional or finish issues. Complexity increases with the number of gages required for process control, including calibration, fixturing, setup, training, operation, and interpretation of outputs the many gages generate.

Micron-level accuracy and repeatability are essential. Complete surface coverage is required to ensure that any deviations or defects are found. The waste from producing out of tolerance large parts is naturally high.

Identifying defects with quick, visually obvious and complete information immediately lowers costs by providing insights that can be acted upon. This is difficult or just not possible with multiple, low information density gages.

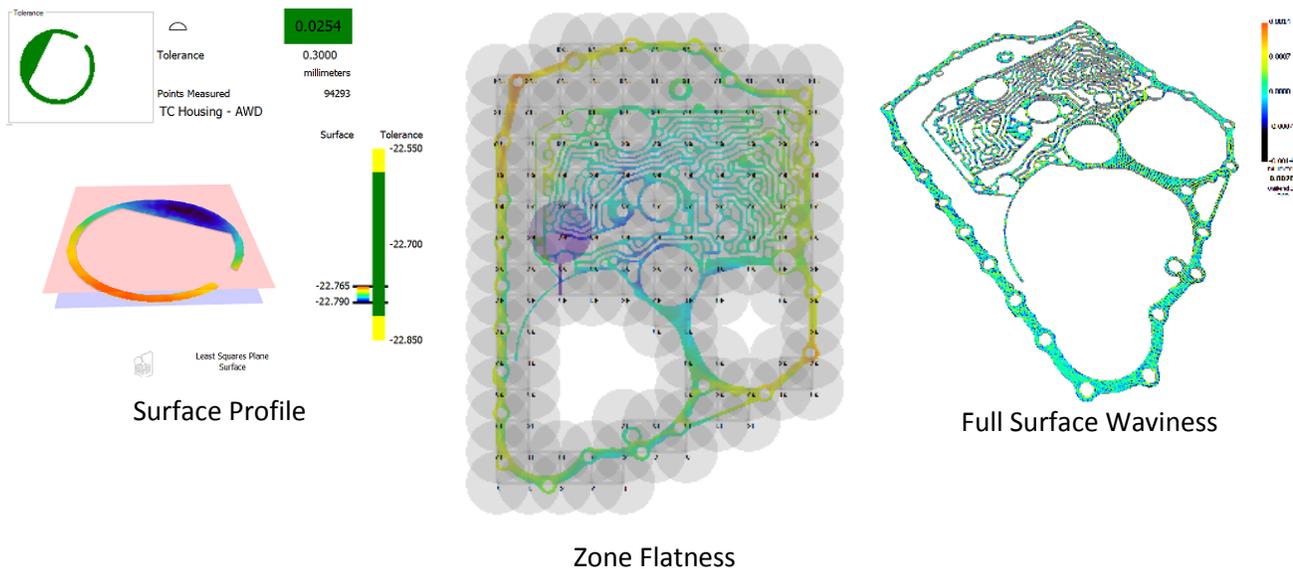


ShaPix high-resolution 3D surface maps

ShaPix produces a height map with a high resolution images throughout the specified surface region of interest. Overall flatness, local or zone flatness, waviness, profile and parallelism can be measured in a single capture.

The ShaPix results

ShaPix visually highlights the flatness variations and other surface relationships across the entire part. The machined surface of the transmission case shown below is approximately 600 mm by 430 mm (24" by 17"). Five (5) ShaPix views were "stitched" to produce the complete surface profile. Much larger surfaces can also be automatically "stitched" with the unique ShaPix 3D processing software.



The ShaPix set-up operator has a variety of analysis tools to choose from. These include surface profile, local zone flatness measurements, color-coded surface waviness maps, W_{void} or "virtual gasket" surface-leakage-susceptibility maps for a gasket bead path, and multiple selected patches or traces across the entire part surface. Savings from using ShaPix that prevents just a single part "spill" event can pay back the entire cost of the metrology system.

Multiple measurements at one time = bottom line value

Milled and ground surface relationships are challenging and critical to control. ShaPix measures these from small areas to entire large surfaces, and clearly reports multiple part surfaces when co-planarity, parallelism, surface profile, pocket depth or other surface relationships are critical.

The "bottom line" value delivered includes higher product quality, tighter process control, and reduced maintenance and scrap. Avoiding costs due to wasted production, and warranty, leading to increased profits, customer satisfaction, and often paying for the cost of a ShaPix system with one event capture.

Coherix designs and delivers high-speed, high-definition, 3D metrology and inspection tools for product development and manufacturing process management in the precision manufacturing and semiconductor industries.

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