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High-Definition Metrology and Vision Application Note #09-04

Wheel Bearing Failures Solved - - A *ShaPix* Case Study

The Powertrain Challenge



In one start-up project at an OEM, launch of a new vehicle model was delayed due to low mileage failures of the rear wheel bearings. This created day-for-day slippage, costing the OEM an estimated \$10 million/day in revenue. The OEM's brake engineering group conducted a root cause analysis of the problem, focusing on the rear trailing arm assembly. When Coherix was first consulted, the root cause was still undetermined and launch on hold. CMM measurements did not reveal any issue with assembly. With the help of Coherix *ShaPix* technology, the OEM was able to determine that the geometry of the trailing arm mounting face was causing bearing failures.

The Metrology Need

The OEM brake engineering group brought to Coherix 2 complete rear trailing arm assemblies that had failed wheel bearings. Using the advanced capabilities of *ShaPix*, Coherix measured each mating surface of the assembly and produced 3D graphic images of:

- Wheel Bearing Flange
- Brake Adapter (both sides)
- Dust Cover (both sides)
- Trailing Arm Mounting Face



The OEM's engineers waited at Coherix while the parts were set up and measured.

The Measurement Requirements

The OEM's engineers needed to know the root cause of the bearing failures. They also needed to know specifically which parts were causing the failures and in what way were they out of specification. In just a few hours, Coherix set up the *ShaPix* system, measured all of the parts, and provided 3D and quantitative reports for the rear trailing arm assembly relative to specified tolerances. Miniature reproductions of the various part outputs are shown on the next page. The machining process implications of the *ShaPix* results were immediately obvious to the OEM engineers from the 3D high-definition measurement outputs of the *ShaPix* system.

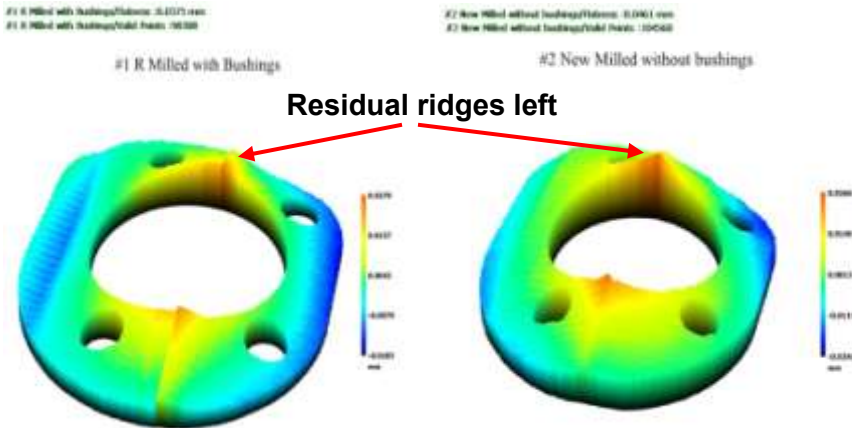
The Coherix Solution

Immediate feedback was provided to the OEM engineering team members who were present.



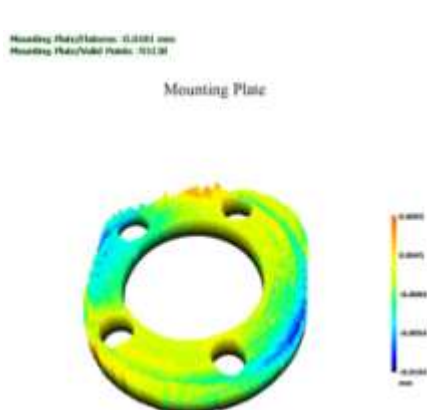
The ShaPix Results

ShaPix measurements showed the flatness for the trailing arm mounting face (MF) to be well out of specification. Several additional trailing arms on failed units were brought to Coherix on the next day and these also measured in the 300 – 350 micron range for overall flatness. It was determined that the trailing arm MF needed an additional milling step to bring the flatness into specification. An additional milling step was added to the Trailing Arm manufacturing process, with initial results transported to Coherix on the same day for measurement. ShaPix showed that the overall flatness had been reduced to approx: 40 – 50 microns, but that the 2 pass milling operation was leaving an uneven ridge in the middle of the part.

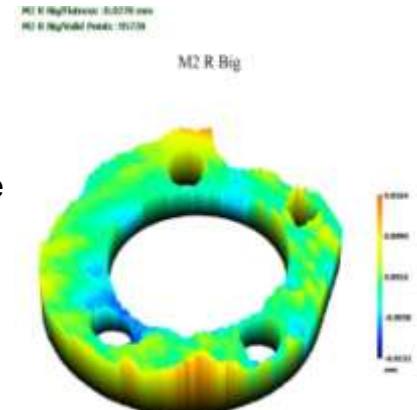


A single-pass milling operation replaced the 2 pass operation. The next day, Coherix measurement results showed that the overall flatness had been reduced to approx: 18 microns. Additional trailing arms were measured for long term testing.

The Powertrain Value Delivered



The final step in testing of the new process was to measure the Trailing Arm Mounting Face after it was painted, which is the final step in manufacturing. Parts were measured at Coherix on the third day. The results showed that the overall flatness was approx: 27 microns, within specifications, so launch was re-started.



The Coherix ShaPix enabled the OEM brake engineers to determine that the root cause of the failed wheel bearings was the geometry of the trailing arm mounting face, debug, correct and dial in a modified process in only three days. Launch of an extremely important product was back on track and millions of dollars were saved.