Verification of Piston Type & Orientation Using Laser Scanning

SCIEMETRIC POWERTRAIN SOLUTIONS

Challenge

A major automotive assembly line integrator needed to determine a way to easily and quickly test any one of four different engine blocks right after piston insertion as they were finding many defects post engine assembly.

The integrator could only test for correct piston insertion after complete engine assembly and the only way to repair any defects involved costly tear-downs, resulting in increased production costs. In some cases the defects were not caught until it reached the customer which lead to costly warranty claims.

They required a solution to test the pistons in the block right after insertion to ensure correct positioning and find defects such as bent and under or oversized pistons

Solution

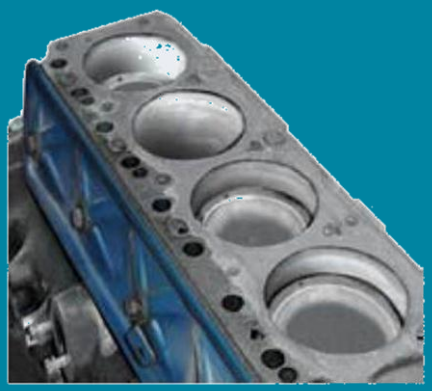
Sciemetric's test and analysis solution used laser scanning and signature analysis to verify the four different engine block types after piston insertion.

First, a longitudinal profile is acquired from the centerline of each piston using two CCD (Charge Couple Device) type lasers. The lasers are angled toward each other and lie along the same line of travel, one being behind the other. The two lasers are angled to ensure that at least one of the lasers will directly "see" into the bore along the wall while the other is shadowed by the top edge of the bore. The laser scanning of each block will automatically happen directly after the piston has been inserted.

Second, the Sciemetric system analyzes the two laser traces to determine if the engine block is actually the one indicated on the RFID. If not, the operator is alerted. Once that is completed, the same Sciemetric software then uses a series of powerful built-in waveform analysis tools and specific

VERIFICATION OF PISTON TYPE TEST KEY FEATURES

- Finds defects at point of introduction to improve quality and reduce both manufacturing and repair time
- Easily identifies RFID tags not matching block type
- Detects one or more pistons under or oversized where traditional methods did not
- Reduces analysis to common set of algorithms



the science of quality

manipulation functions along with parameters specific to the engine block that creates eight individual normalized waveforms windowed around features of interest outlined by the operator.

Third, the same set of analysis algorithms are then applied the newly created waveforms. The type of piston is then identified as being dished or flat top. The orientation is established by the location of a "dimple" drilled near the edge of the piston head and piston-to-bore wall clearance is used to identify undersized and oversized pistons. PASS/FAIL results are automatically graphically provided to the operator by combining all of this information into Sciemetric's Test Analysis System screen, as well as relayed to the PLC.
The impact of this test on cycle time is negligible since testing all pistons in an engine block takes approximately twenty seconds.

Results

Only a month after Sciemetric's system was installed on their line, the integrator reported an immediate reduction in tear down costs due to piston ring defects, decrease in waste and an increase in time savings and production efficiency.

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