



Piston Ring Verification System: Laser Gaging Using Signature Analysis

SCIOMETRIC POWERTRAIN SOLUTIONS

Challenge

A major manufacturer was experiencing customer complaints and expensive tear downs after engine cold/hot test due to the inconsistent quality of their shipped engines. The problem was traced to improperly stacked compression rings. The compression rings were automatically inserted onto the engine piston during engine assembly and the traditional testing methods failed to identify when the rings were not stacked on the shipping magazine correctly. The manufacturer required a solution where the orientation of each compression ring would be verified and defects detected with minimal disruption to the line.

Solution

Sciometric solved the problem by seamlessly installing advanced laser gaging technology along with our unique signature analysis technology to test for the correct orientation of individual rings within a stack of compression ring being installed on shipping magazines. The system accurately detects even slightest common defects such as upside down, bent, and incorrect positioning of each compression ring.

Signature data is analyzed as the laser scans the stack for profile measurements. Enhanced Signature Analysis algorithms break the data stream into small sets of data, each set representing the profile of a single ring. Modern statistical trending techniques are then applied to each ring data set to determine the taper orientation of each ring's surface. Notched rings, known as 'scraper' rings are also tested for correct notch positioning.

Sciometric's flexible and configurable software allows for a single stand to test numerous different part types as selected by the operator from a predefined complexity matrix. Batch order summary reports are printed and electronically

PISTON RING VERIFICATION SYSTEM: LASER GAGING TEST KEY FEATURES

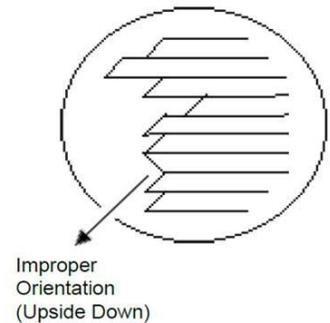
- Improved quality of shipped compression rings
- Identifies location and position of defective rings(s) within the stack
- Tracks and stores test results for every part within the test, data including signatures, are automatically stored in a central database and cross-referenced by serial number
- Uses signature analysis for most accurate verification



the science
of quality

stored on the system after each order is complete including the number of good parts tested along with an operator identification number, ensuring complete traceability of each order. The 'good' parts are then validated with a dab of paint after verification of compliance to test parameters.

The Sciometric system enables storage of the data contained in the process signatures obtained from each test. This information can be used to easily generate yield and trend reports with full drill down to the individual compression ring using simple Windows®-based tools. In addition, quick identification of root cause of issues affecting quality. The manufacturer now is equipped with invaluable advantage in providing the utmost quality in their products all with little to no impact on disrupting the line itself.



Results

By implementing Sciometric's laser gaging system and signature analysis technology, the manufacturer was to objectively identify previously undetectable defects prior to shipping, while providing the ability to demonstrate proof of quality and traceability. Two months after the system had been installed the manufacturer reported decrease in tear down costs as compression ring defects that were once found during end-of-line testing were caught at the source.

Sciometric's laser gaging solution was a practical, efficient and low risk choice to solve this problem.

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