

■ Thread Quality Verification for Aluminum Engine Block Castings

Overview:

Manufacturers of engine sub-components must ensure the quality of their units before they are shipped to engine plants for final assembly. If a sub-assembly part arrives at a station during final assembly and does not have a thread, has the wrong thread (English vs Metric) or has a partial thread, it will not be able to be properly attached to the engine block. This situation will result in a return or quarantine. Customer satisfaction is also impacted when thread issues result in line downtime or increased cycle time on the engine assembly line.

Sciometric's thread quality verification™ system helps sub-component manufacturers ensure the quality of the parts they ship to their engine customers.

Benefits:

- Improved gage R&R (repeatability and reproduceability) of thread verification leading to improved quality.
- Substantial cost savings
- Reduction in warranty costs
- Decreased scrap

Challenge

A supplier of engine block castings was experiencing costly quarantines and negative customer satisfaction as a result of thread quality issues. Reliable thread verification was particularly challenging on their aluminum castings where traditional eddy probes can not work properly. Their existing testing approach yielded inconsistent and unreliable results, in many cases even failing to detect the basic absence of a thread. When defects occurred as a result of a broken tap, many castings could be processed before the problem would be identified and rectified, resulting in wasted cycle time and quality spills.

Correct threading is imperative for all sub-components to be joined together during final engine assembly. Subcomponents with defective threading will impact engine assembly cycle time and yield. In some cases, subtle thread defects make it through engine assembly and are only detected by end users once the vehicle is in use. Engine blocks with defects such as missing or shifted threads may eventually lead to vibrational loosening of fasteners causing inefficient engine performance and ultimately resulting in a costly warranty repair.

The engine block casting manufacturer required a test solution that could accomplish more than basic thread detection. They required a solution that would provide full thread integrity verification in real time.

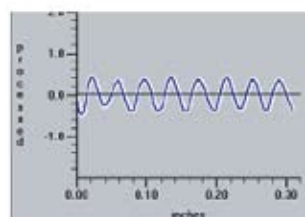
Solution

The manufacturer implemented the Sciometric thread quality verification™ solution to help them achieve their quality objectives.

In order to obtain the most accurate measurements possible, Sciometric used a specialized third-party probe and amp that can be optimized for use on aluminum threads. The probe is axially rotated in the hole to scan threads at a different angular location, therefore sensing individual threads in a tapped hole. Advanced analysis is applied to determine if the thread should pass or fail. Sciometric's thread quality verification™ can detect such defects as missing threads, partial threads and incorrect pitch.

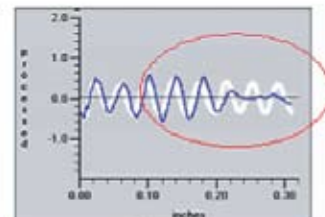


An additional benefit of the Sciometric solution is that the advanced analysis techniques allow for ongoing "correction" of the waveform to minimize or eliminate negative influences caused by test probe angularity and linear spacing relative to the part under test. Without these corrections, the sensor signal will not yield production stable results when evaluating sensitive parameters such as thread pitch.



PASS

Illustration of a good thread. The blue waveform mirrors the white waveform. The white waveform represents a good thread.



FAIL

The blue waveform represents the test result data for a partial thread. The circled area shows the partial missing threads and the deviation from a known good thread as represented by the white waveform.

Achievement

As a result of implementing the Sciometric thread quality verification™ solution, the manufacturer is able to not only detect thread presence, they can also assess the integrity of threads. Shipping only components with good threads will allow the manufacturer to immediately improve customer satisfaction and to reduce quarantines. Longer-term, the manufacturer will experience a reduction in warranty claims resulting from the elimination of subtle thread defects that eventually wear and effect engine performance in the field.

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