Valve Seat and Guide: Insertion Monitoring

Overview:
Identifying unseated seats is one of the biggest challenges of head cylinder production lines. Failure to detect defective parts can result in engines not running to specification, poor compression, high emissions or complete engine failure. Press monitoring systems that can detect even the smallest anomaly with seat depth will help manufacturers achieve better quality. The Sciemetric Multi-Ram Press Monitoring System is designed to identify even the most subtle valve seat and guide defects and to ensure proper seat depth.

Benefits:
- Immediate quality improvements
- Minimized false accepts of parts with unseated seats
- Decreased cycle time
- Obtained insight for continuous improvement of production

Challenge

A major engine manufacturer was experiencing quality issues as a result of false accepts when seats were not being inserted to depth. Their most difficult defects to detect were when burs or debris prevented the seat from fully seating. Unseated seats can result in a range of engine issues including increased emissions, engines not running to specification, or in the worst case scenario, complete engine failure. In some cases undetected seat defects caused damage to down-stream production machines resulting in downtime.

In most cases the defects were not being identified until hot-testing. As a result of unseated seats, the manufacturer faced frequent quarantines that had a severe impact on inventory levels, production costs and throughput. Some defective units were not being identified during engine or vehicle assembly. These units eventually resulted in poor engine compression and were detected by drivers who noticed a loss of power in their vehicle's engine. Warranty claims as a result of undetected seat issues were impacting both customer satisfaction and profits.

Solution

Due to the quality spills the manufacturer was experiencing, it became apparent that they needed to augment their existing method of window analysis to better detect valve seat and guide defects. They required a press monitoring system that would identify even the most subtle defects in their head seat press production. Upon evaluating options the manufacturer decided to implement a Sciemetric Multi-Ram Press Monitoring System. They chose the system based on its advanced defect detection capability. The core technology uses algorithms designed specifically for valve seat and guide applications. The system evaluates the entire force-distance test waveform to identify anomalies of features unique to press applications. In addition to unseated seat issues the manufacturer required consistent and reliable detection of other valve seat and guide defects such as: bad seats, pockets or guides, reversed seats, missing seats and improper seat or valve pocket size. Based on the flexibility of the system and its embedded valve seat and guide intelligence, the manufacturer was able to detect even the smallest press defects that were previously processed as false accepts by their traditional monitoring methods.

The manufacturer upgraded the system to include QualityWorX® as a mechanism to archive full press waveforms for each insertion. The birth history and traceability functionality of the system appealed to them as it would enable them to demonstrate each part's adherence to specifications. Using the failure pareto detail provided by the system the manufacturer was also able to identify and fix key problem areas in their head cylinder production line.

Achievement

As a result of implementing the Sciemetric Multi-Ram Press Monitoring System and QualityWorX, the manufacturer experienced an immediate quality improvement by minimizing false accepts of defective heads. Productivity was improved as fewer quarantines were required to address quality spills. As a result of the process improvements the manufacturer made to their production line they processed fewer defective units and reduced their waste.

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