Axle Suspension Component Assembly: Press Force Verification of Bushing Assemblies

SCIEMETRIC SOLUTIONS

Challenge

Since the part is welded to the front axle, the assembly of the front axle bushing into a stamped metal bracket is a critical process. The visual and random mechanical inspections conducted post-assembly by a manufacturer were insufficient to identify defective parts and provide 100% guarantee of the integrity of the assembly during the service life of the vehicle.

Solution

The Sciemetric process monitor delivered real-time verification of the assembly by monitoring the force required to insert the bushing into the metal bracket using signature analysis. The force is dependant on the interference fit between the parts and is an indicator of the tolerance spread and alignment of the components. The press incorporates an LVDT (Linear Variable Displacement Transducer) to measure ram travel and a load cell between the ram and the press head. The system then compares collected waveform signatures to a statistically derived envelope (shown highlighted in green in the screenshot below) obtained from a sample group of known good part press operations and returns a PASS/FAIL indication to the operator all in real-time.

The screenshot shows an overlay of waveforms from several parts that were monitored. P1 shows the press alignment force of the bushing into the metal bracket, P2 shows the seat force required to seat the bushing and P3 illustrates the ultimate applied force. The overall relationship between force and distance forms the “signature” for the operation.

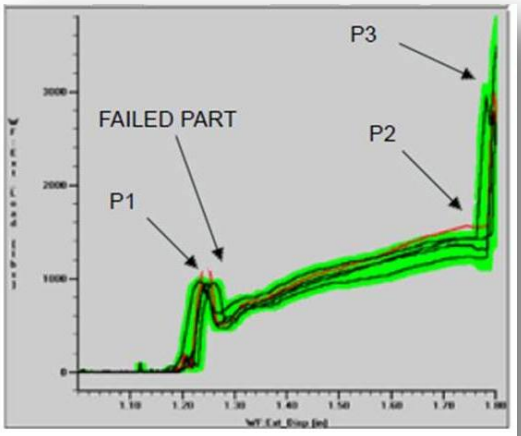
AXLE SUSPENSION COMPONENT ASSEMBLY KEY TEST FEATURES

- Full waveform analysis facilitates the display of knee (p1) and cusp (p2) values for most accurate verification
- Real-time PASS/FAIL analysis display
- Load cell and LVDT are monitored simultaneously
- PLC interface accommodates assembly system error proofing accessories
- Decreases repair and warranty costs

the science of quality

Results

By implementing Sciemetric technology, the manufacturer was able to eliminate visual inspection and other unreliable methods to measure assembly quality. The reliability and traceability of the in-process verification improved their confidence that defects were being caught during this critical phase of assembly.



sigPOD screen showing Bushing Press PASS/ FAIL signatures

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