Stressed Out Parts Seek Relief from ZERO

The Problem:

A manufacturer of fuel injector parts was experiencing failure of fuel injector nozzles. This failure was costly because not only did it affect the injector nozzles themselves, but also it caused considerable damage to the engine in which they were installed when broken pieces fell into the cylinder.

When fuel-injection technology was introduced in the early1950s, fuel was still relatively inexpensive. The injection method offered engine-performance improvement, and was welcomed by manufacturers and customers alike.

Herb Tobben, Manager of the Sample Processing Lab for ZERO Automation, creates solutions to customer problems.

Over the years, fuel costs have risen, providing the impetus for manufacturers to produce more fuel-efficient engine systems. And, in order to meet the demands of the market, automotive manufacturers have had to find ways to make smaller, lighter-weight vehicles. In addition, increasingly stringent environmental legislation demands cleaner vehicle emissions.

Manufacturers achieved greater fuel efficiencies by injecting fuel into the engine at higher pressure through smaller orifice nozzles. The pressure range of early systems was in hundreds of pounds per square inch. The pressure range commonplace today is above 30,000 pounds per square inch. The combination of higher injection pressure, a smaller nozzle orifice, and higher engine RPMs very effectively reduced fuel consumption. However, the unfortunate consequence of this new technology was fatigue-failed injector parts. The injector nozzles had been heat-treated to prolong their useful life, but this performance-enhancing treatment proved no longer adequate.

A ZERO distributor, well familiar with automotive applications, brought his customer along with sample parts to ZERO to evaluate the application and to apply shot peening technologies to the problem.

The Solution:

Shot peening uniformly compresses the surface, relieving stress and enhancing its durability. Initially we processed the customer's injector parts manually using glass beads in a suction-style cabinet. The customer then subjected those parts to rigorous testing and found that the peened parts performed well at more than twice the original test pressure compared with non-peened parts, an improvement of more than 100%. They considered this result an overwhelming success.

Their production requirements demanded an automated solution. ZERO configured an indexing turntable cabinet with fixtures designed and built specifically for the injector nozzles. The cabinet has a suction-style media feed system with one gun per part to ensure complete coverage of the injector nozzle. The ZERO system enables the customer to produce more than 1200 parts per hour. The new process has eliminated the customer's fatigue failure problems.

Compared with the expense associated with changing the fuel injector nozzle material or, even worse, changing the part specification, the ZERO system provided a quick payback and continues to produce a substantial return on investment.

The customer has expressed great satisfaction with the system.

Beyond this example, there are many similar success stories in the automotive, aerospace, and transportation industries. Cycle loading at high pressure causes fatigue failure in all kinds of parts in diverse industrial applications. ZERO has designed and built shot peening systems for a variety of parts, such as stress relieving gears, splines, valve springs, torsion bars, landing gear, and wing struts, as well as many other applications. Through controlled shot peening, ZERO has solved numerous customer problems by improving the wear-life of components in high-stress applications.

Got a question about shot peening, abrasive blasting, or sample processing? Clemco can help. Call 636 239 8130 or submit your request online at www.clemcoindustries.com.