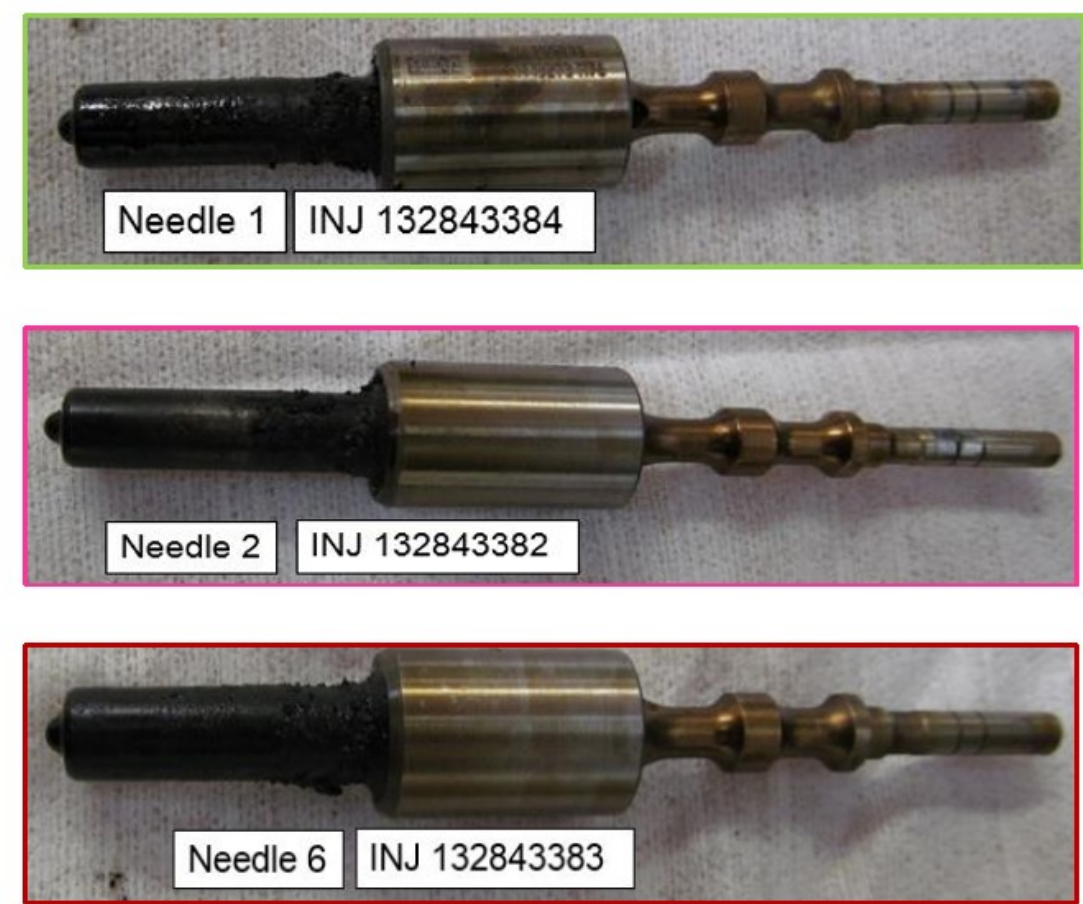




Introduction

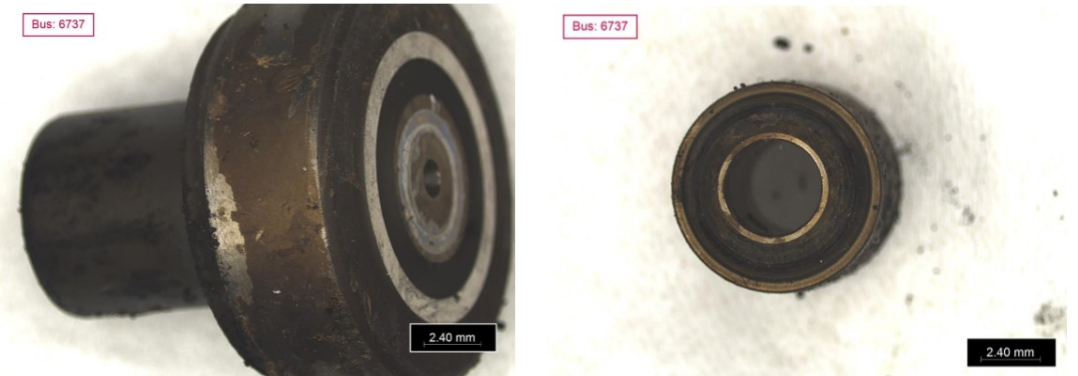
The detergent technology in the Power-Max deposit control additive (DCA) has consistently proven that it is highly effective in preventing and removing internal diesel injector deposits (IDID) both in extensive laboratory engine testing and in real world usage. This case study is an example, of a real-life situation where Power-Max DCA solved serious and costly problems arising from IDID.



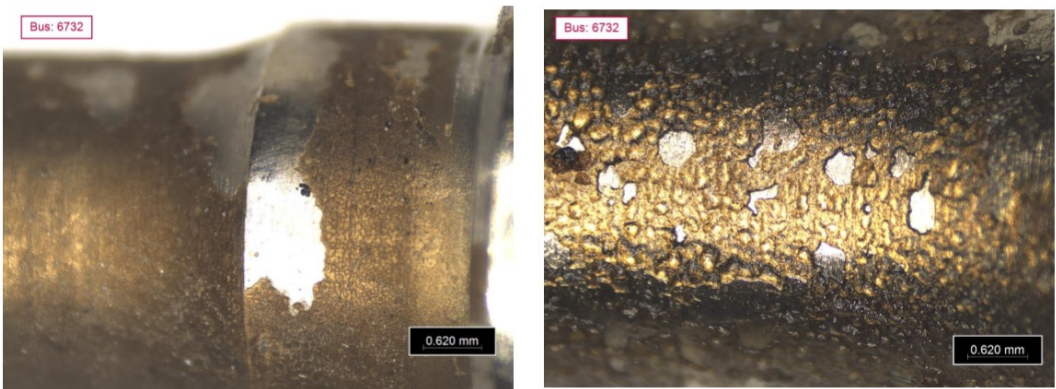
Before A

The Problem

A public bus service for the Greater St. Louis Region was experiencing system wide injector failures in their bus fleet leading to vehicle down time, poor engine performance and efficiency, and very costly repairs. Their fleet was fueling at four different locations which they owned, and they were using a fuel additive that contained detergent technology manufactured by a competitor additive company. Despite the use of detergent additive, injector failures were occurring at a consistently high rate. In response, an investigation was carried out with the help of a major OEM to find the cause of the failures and provide a solution that could be rapidly implemented.



Before B



Before C : Close Up

Analysis

Several injectors that experienced issues in the field were sent to laboratory for analysis. Most of the injectors that were sent in for performance bench testing experienced failures and were taken apart in order to identify what components were causing the failures. Tear down of injectors revealed that needles were stuck in nozzles, and deposits that were similar in appearance to each other were adhered to the injector. From this analysis, it was clear that deposit formation was occurring at an accelerated rate and was the cause of the maintenance costs that the fleet was experiencing. Injectors were then sent to a lab to identify the composition of the deposits in order to create a solution.

Deposit Analysis Results

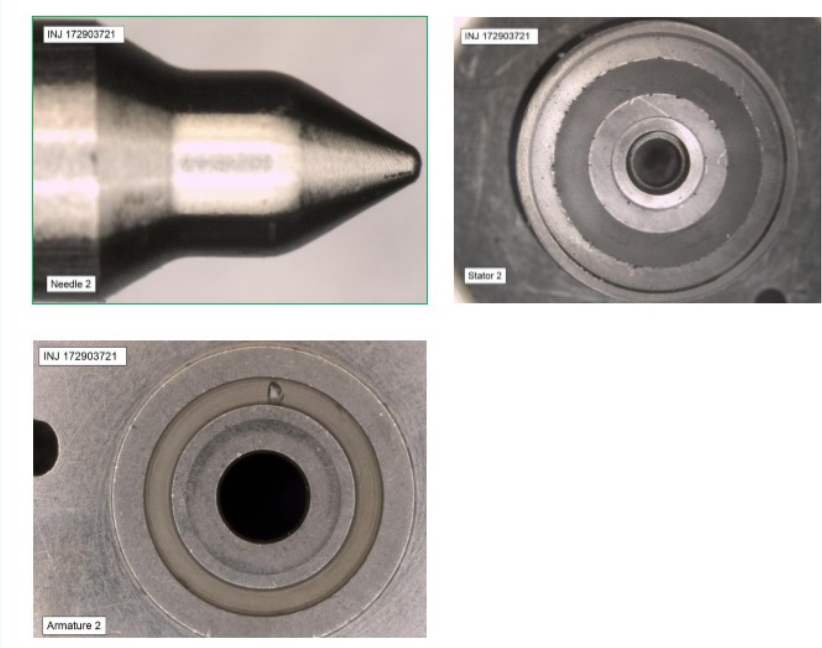
Chemical analyses of deposits from the fuel injectors showed all injectors had the same type of deposits. The deposits were primarily composed of low molecular weight PIBSI detergents which are commonly seen in injector deposits. They also contained some carboxylates which are common as well. Experience suggested that the Power-Max deposit control additive was an effective way of preventing the deposit build up, as it had been shown to be highly effective in both removing and preventing these types of deposits in the field and in dynamometer engine testing.

Resolution

Results from laboratory analysis showed that the previous additive being used at the time did not contain detergent chemistry that could effectively prevent deposit formation, or remove existing deposits. Consequently, it was decided to use Power-Max detergent chemistry at a clean-up treatment rate for the initial period, followed by a lower constant use treatment level. Injector failures and vehicle operation were monitored, with no injector failures being observed over the next sixty days. The cost of the failures before Power-Max usage commenced amounted to multiple hundreds of thousands of dollars in parts and labor alone, without including the costs of operational downtime, thereby demonstrating the value of Power-Max DCA.

This successful trial once again demonstrates good correlation between ET Products' field experience and laboratory engine dynamometer testing, both for the causes of these internal deposit problems and the solution through use of ET Product's highly effective detergent chemistry. Furthermore, studies like this and normal customer experience consistently demonstrate that the cost to use ET Products detergents far outweighs costs that can occur as a result of issues.

Power-Max deposit control additive is available formulated into a range of products designed specifically for bulk fuel treatment and specialized aftermarket applications.



After

Choose Power-Max:

- Powerful prevention control of nozzle coking and internal injector deposits
 - Powerful deposit removal capability
 - Proven performance against biodiesel induced deposits
 - Deposit control demonstrated in real world conditions
- Comprehensive no-harms credentials and global market experience
- Wide range of flexible formulated products designed specifically for bulk fuel dosing or aftermarket applications