

Early Detection Shaves Testing Costs and Time in Brugge

When it comes to testing Spicer® transmissions, the stakes are high. If the smallest problem isn't detected quickly, more damage occurs, the root cause of the problem becomes obscure, and the costly process must be repeated.

A single endurance test for the big off-highway transmissions – which weigh as much as two tons – developed at Dana's technical center in Brugge, West Flanders, Belgium, can run 24 hours a day, seven days a week for several months. With several test runs required to validate a new model, test costs can approach \$500,000.

With eight transmission test rigs and dozens of new models being tested each year in Brugge, a team led by Claude Dieleman knew the company needed a better way to handle this process. His team analyzed several "watchdog" parameters, including pressure, temperature, torque, speed, sound, and vibration. Coupling these with mathematical analysis tools wasn't enough to provide the early detection needed on the transmissions which, by their nature, have complex duty cycles for their myriad of end

uses – forklifts, front-end loaders, and backhoes, for example – for a variety of customers such as CNH, CVS, Kalmar, Liebherr, Manitou, NMHG, Taylor, and Terex.

"After a year and a half, we had to admit that neither home-brewed nor off-the-shelf solutions were sophisticated enough for the transmissions," Dieleman said.

Eventually, the Dana team tried Shock Pulse Method (SPM), a patented technique developed in Sweden

that uses signals from rotating rolling bearings as the basis for efficient condition-monitoring of machines.

"During the first trials, we proved SPM was the solution to our safeguard problem. The needed equipment was purchased

A failed gear of the TE-15 endurance test, which triggered the need for a better safeguard system, shows the results of inefficient testing. Such a dramatic failure can occur in just a few minutes. The Shock Pulse Method looks at very high frequency signals and detects microscopic cracks in gears and bearings by creating tiny shock pulses. This method allows engineers to stop the test before visible damage can occur – far earlier than complete destruction of a gear.



soon thereafter, and the investment has already been recouped by avoiding only one severe failure and rerunning that test," he said.

The SPM system for a single test rig is a \$15,000 investment, while rerunning an endurance test costs between approximately \$25,000 and \$85,000.

The Brugge center plans to eventually install the SPM system on all test rigs. ♦

Dana engineers at the Off-Highway technical center in Brugge, West Flanders, Belgium, found a less costly way to test off-highway transmissions. Their new method will save the company several hundred thousand dollars each year. The Brugge test lab engineers in front of the test bench are, from left: Kris Callier, Geert Ricquier, Claude Dieleman, Tommy Van Acker, and Kurt Goethals.

