

## Tier 1 Automotive Supplier Standardizes on MTII's Capacitance Systems for In-Process Inspection of Shafts and Spindles

### Introduction

Precision shafts and spindles are generally finished utilizing a centerless grinding process. This machining technique is cost effective and typically produces a quality cylindrical surface in which ball and roller bearings ride. The surface finish is important because any imperfection can be transferred through the bearing system creating unwanted noise, vibration and premature failure.

### Problem

Unfortunately, tool wear, improper feed rates and grinding wheel runout can lead to a poor surface finish. One commonly found defect in the grinding process is called chatter. It is a series of microscopic "waves" in the machined surface, which must be minimized to avoid adverse effects. As the height of these waves increase, so does the noise and vibration.

A Major Tier 1 supplier to the automotive industry approached MTII looking for a method to measure and classify these imperfections. The application was critical enough to demand 100% in-process inspection. They required a production environment sensor that had small spatial resolution, high frequency response and ultra-high resolution. For proper defect classification the measurement accuracy had to be less than 4 micro-inches (0.1 microns) with a resolution of 1 micro-inch (0.025 microns).

### Solution

MTII worked closely with the manufacturer and developed a unique capacitance sensor to fulfill the project requirements. The sensor design incorporated a rectangular sensing element with an area of 0.020" x 0.10" (0.5mm x 2.5mm) and a corresponding measurement range of 0.01" (0.25mm). Several different tip options were provided with either a radius or chamfered face to accommodate a number of spindle configurations and sizes. The sensors were used in conjunction with MTII's Accumeasure 9000, an ultra-high resolution capacitance amplifier. Built in digital displays were incorporated offering the customer "at-a glance" visual indication of the sensor gap to facilitate setup.

### Results

The system was able to quickly measure, sort and therefore pass or reject any spindle that exceeded a preset limit. The incorporation of this early process check not only improved throughput, but it also eliminated poor quality parts from being further machined, saving thousands of dollars in the first month of operation. By working closely with the supplier, MTII identified and solved additional applications suited for capacitance technology.