Troubleshooting a Two-Throw Compressor with the Model 333D01 Digiducer

An industrial facility recently started using the Reciprocating Machinery Protector (RMP) sensor to monitor compression. There are two impact detectors on a two-throw reciprocating compressor (the only compressor at this site). One reads as expected (~7 mA) and the other reads ~20 mA consistently, triggering an alarm. Nothing was believed to be wrong with the compressor and there was speculation that the alarms were false. The user had already sent the unit back twice to be inspected by the manufacturer. Each time the manufacturer determined it fully operational. It's an impact detector and the company had no confidence in the impact detector's output.

After checking the wiring and scaling of the PLC, the test engineer confirmed that the RMP was indeed outputting 20 mA (full scale). There was a substantial amount of noise coming from the compressor but it was difficult discern where it was originating. Placing a hand on the outside of the compressor for each throw was not helping to distinguish between the vibration levels. The RMP's were programmed identically, yet one was triggering alarms and the other was not. It became necessary to see what the vibration signal looked like on each throw, so a laptop and the Digiducer™ were used. Below are the vibration plots:

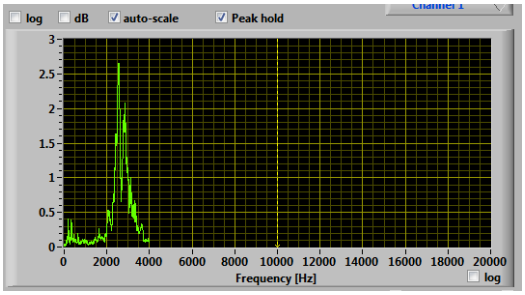
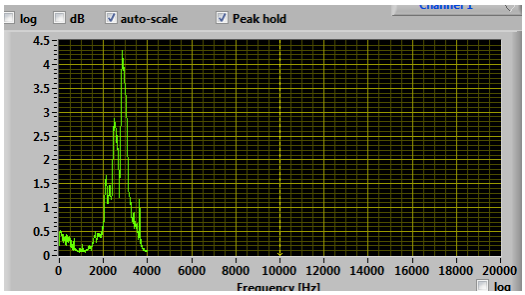


Figure 1: Good Data, No Alarms $\left(\frac{m}{s^2}\right)$



Throw 2: Supposed "Bad Data" $\left(\frac{m}{s^2}\right)$

The test was completed twice, each time resulting in the same data. The plot for Throw #1 shows the worst output, where it was approximately 1.8 m/s^2 vibration on Throw #1 when in live mode. The supposed "bad" RMP was indeed reporting almost twice as much impact vibration as the "good" RMP. This data was taken over several minutes using the peak/hold function in shareware

software called Soundcard Oscilloscope (other software options can be found at http://digiducer.com/pages/software.)

The RMP counts the number of impacts during its sample window (determined by the compressor running speed) and adds mA to the signal output depending upon the severity of the impact. There are two thresholds. Throw #1's RMP was operating below the coupling current, thus no impacts were being counted and it was operating like a normal 4-20 mA linear sensor. As the data shows, Throw #2 was experiencing greater high frequency impacts, likely caused by a loose wrist pin and the impact of the piston against the side wall of the chamber.

The monitoring system was operating correctly and warnings were being issued as impact events were occurring. A simple measurement using the Digiducer validated the effectiveness of the monitoring system in place.

The Digiducer team looks forward to hearing of other problems solved by the 333D01 USB Digital Accelerometer.