Engine Monitoring and Testing with the DT9836

Application Summary

Engines are the driving force behind many forms of transportation and/or agricultural machinery. They are designed to run at high speeds and at high temperatures. They are stringently tested to perform under the harshest of conditions in order to satisfy very high quality standards. The various components are all tested individually at the manufacturing plants. Once they are combined to create the engine then mounted into a chassis, the harshest of tests are done. Readings from a variety of sensors often need to be recorded at the exact same instant in time to see if they meet the requirements and specifications of the supplier. This testing process needs to be accurate, precise, repeatable, and most of all correct.

An engine manufacturing company has been using a data acquisition system for the last 10 years in a DOS environment. They use these "portable" systems around the entire facility to test a variety of engines ranging from a car engine all the way to a large tractor or combine harvester. The units they are presently using are quite large and use components which are no longer available for replacement if the system goes down. The units include multiple channels (up to 24) and a GUI which is user-friendly and which can display all 24 channels and record the data. The company presently has over 75 of these portable units and needs to replace them.

Potential Solution

There were a number of aspects to be considered when looking to replace these units:

1. Portable – The system will need to be moved throughout the factory.
2. High Speed – Due to pistons and moving parts running at extremely high speeds.
3. Size – The unit will need to be smaller than the previous data acquisition system yet still provide all, if not, functionality.
4. Cost effective – With 75+ units to replace, cost is a major factor.
5. Ease-of-use Software – A user-friendly GUI with minimal interaction from the user is required.

The company decided on the DT9836 (12 Channel, 225 KHz per Channel Simultaneous) High Speed module as their first choice. This is a portable USB module with a BNC box enclosure. This makes it a perfect solution for mobility and ruggedness. An executable program was created in Measure Foundry, tailored with the option to show multiple channels and record all data to files and was deployed with the distribution wizard on all of the 75 systems. The customer decided to use multiple DT9836s so that they could have 24 sensors plugged into the laptop to get simultaneous readings. The result of using the USB module and Measure Foundry software with the Distribution Wizard provided the customer with a portable, cost effective, high-speed unit which can be

tailored to a variety of applications and testing scenarios. The cost saving on these 75 units with this new configuration was approximately $2M.

Additionally, the flexibility of the DT9836 now allows a variety of applications to be addressed with this single module:

- The DT9836 will measure the time between shifts in the tractors “automatic” transmission. The transmissions are actually a series of hydraulically operated clutches that are connected to the transmission gears. When shifting the clutch for the next transmission gear is engaged approximately 10ms before the clutch for the current gear is released. This results in a smooth shift. The parameters that are monitored are hydraulic pressures, shaft speed or rpms, programmed shift time and the actual shift time. The High Speed DT9836 allows for very accurate readings.
- Engine colds start testing. The tractor is placed in a cold chamber and current draw from the battery is measured.
- The portable unit can also be used for vibration testing where the tractor is placed on a giant shaker table. The DT9836 provides specific levels of voltage excitation for the vibration test.

Click here for full information on the DT9836 series.