

Diesel Particulate Filter Testing with Vehicle Data Acquisition

Delphin Expert Logger Data Acquisition and Control System

CAS DataLoggers recently provided the vehicle data acquisition solution for Twin-Tec, a German developer and manufacturer of environmentally friendly products and technologies for reducing exhaust emissions, including a wide range of [diesel particulate filters](#) and catalytic converters for automotive applications. TwinTec was heavily involved in producing products for retrofitting and upgrading already approved vehicles as well as corresponding replacement products. In Germany, the government encouraged all owners through financial incentives to retrofit their filters since many old vehicles had no diesel particulate filtration. Many German automobile owners became interested in adding a particulate filter to their exhaust system to protect the environment and benefit from the reduced vehicle emission taxes.



Twin-Tec was therefore developing many different retrofit filters for many different automobile models. Each filter required testing on the road under typical driving conditions to determine filter efficiency—however, virtually every new filter also required a new design due to the wide variety of exhaust systems and their varying temperature and pressure operating levels. During test drives, the filter temperature, pressure, engine speed, idle times, vehicle position and speed all needed to be measured accurately and reliably to ensure that the filter met all required standards. To record all the test data, Twin-Tec needed a sophisticated data acquisition device capable of extreme accuracy and fast signal processing that could capture the wide range of data required in the tests.

Installation

Twin-Tec installed a [Delphin Expert Logger 200](#) together with a **GPS sensor** to record measurement data from the filters in tandem with vehicle position information. The whole system was installed in a small weatherproof enclosure and its sensors were interfaced to the enclosure through special connectors. During the test drive, all test data was recorded on the Expert Logger's internal memory. Engine RPM was recorded through a separate speed meter (DAB 500 from AVL) which was providing TTL pulse output. The pulses were then recorded by the counter and inputs of the Expert Logger. The live data was visualized through a mimic interface using [ProfiSignal Basic](#) software.

The Expert Logger 200 featured 21 analog inputs and 8 digital inputs/outputs as well as an Ethernet interface and CANbus for expansion modules. The analog inputs could be attached to RTD sensors, thermocouples, voltage or 4-20 mA signals, enabling any physical measurement to be recorded. The measurement data was saved as scaled engineering units and linearized to the device. The high measurement accuracy, up to a 24-bit resolution, enabled precision measurements without need for signal amplification.

Usage

The Expert Logger can process each input signal quickly and reliably from just a few thermocouples right up to thousands of measurement points spread over several areas. The vehicle data acquisition device also features screw terminal connections and up to 16 GB of local memory. The Expert Logger offers powerful alarm and programming capabilities to allow the device to process measurements and initiate actions on its own. The Expert Logger can be used for local data acquisition and logging when connected to a PC; for remote unattended data collection connected to the internet or LAN; or as a stand-alone device.



To record the vehicle speed and direction, a special NMEA driver for a GPS sensor was developed. This driver was interfaced to the Expert Logger through serial RS232 port. A separate COM channel was created for the GPS information like speed, direction, altitude, etc, and all the data was stored directly on the 16 GB Expert Logger memory. After the test drive was finished, all the data was analysed with the ProfiSignal software. This user-friendly software was used for configuration of the input channels, processing and analysis of the data and export to .csv form for reporting. It was also possible to convert the GPS data into a KLM file which could be loaded by Google Earth to plot the data against map position.

Benefits

Twin-Tec benefitted immediately from installing the [Delphin Expert Logger 200](#) data acquisition system in its diesel particulate filter testing program. Filter temperature, pressure, engine speed, idle times, vehicle position and speed were all measured during the test drives using one powerful device. Twin-Tec subsequently used five Expert Logger systems ensure smooth operation of their diesel emissions testing. The universal analog inputs made it easy to connect all the temperature and pressure sensors, and engineers found it easy to configure the ProfiSignal software to show live

reading during the test drives. The vehicle data acquisition system's 61 GB internal memory provided storage capacity for several thousand test drive kilometres, and the interface of the GPS sensor also gave Twin-Tec valuable additional information about vehicle speed in combination with engine RPM and particle emission. Additionally, the small and compact size of the Expert Logger (200x73x118 mm) made it an ideal fit for installation in the small enclosure.

If Twin-Tec needed to expand the number of channels used, Delphin slave module chassis were also available to expand the Expert Logger to a maximum of 1000 hardware/software channels. Up to ten slave devices, each with identical housings and each equipped with two I/O modules, could be attached to a master, with any combination of I/O modules being possible.

For more information on the [Delphin Expert Logger](#), vehicle data acquisition systems, or to find the ideal solution for your application-specific needs, contact a CAS Data Logger Applications Specialist at **(800) 956-4437** or visit the website at www.DataLoggerInc.com.