

Diesel Particulate Filter Testing on Vehicles with GPS Logging Delphin TopMessage Data Acquisition and Control System

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CAS DataLoggers recently provided the 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. Twin-Tec 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 in order to protect the environment and benefit from the reduced vehicle emission taxes. Twin-Tec was therefore developing many different retrofit filters for many different brands. 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. In order to record all the test data, Twin-Tec needed a sophisticated data acquisition device capable of extreme accuracy and fast signal processing and that could capture the wide range of data required in the tests.



Twin-Tec installed a **Delphin TopMessage Data Acquisition and Control System** with ADVT and DIOT modules in combination 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 TopMessage'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 DIOT module. The live data was visualized through a mimic interface using ProfiSignal Basic software.

The TopMessage featured 2 slots for analog, digital input, or output cards, as well as an Ethernet interface and CANbus for expansion modules. The analog inputs could be attached to RTD sensors, thermocouples, volt or 20 mA signals, enabling any physical value to be acquired. The measurement data was saved as scaled and linearized to the device, and scaling was pre-configured for all current thermocouple and RTD sensor types. The high measurement accuracy, up to a 24-bit resolution, enabled high-precision measurements without need for any signal amplification. Additionally, the device processed any signal quickly and reliably from just a few thermocouples right up to thousands of measurement points spread over several plant areas. The data acquisition device also featured screw

terminal connections and up to 1 GB of local memory. The TopMessage also offered powerful alarm and programming capabilities to allow the device to process measurements and initiate actions on its own. The TopMessage could be used for local data acquisition and logging when connected to a PC; for remote unattended data collection connected to the internet; or as a stand-alone device.

In order to record the vehicle speed and direction, a special NEMA driver for a GPS sensor was developed. This driver was interfaced to the TopMessage 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 1 GB TopMessage data logger memory. After the test drive was finished, all the data was analysed with the ProfiSignal software included free with the TopMessage. This user-friendly software provided for the acquisition of measurement, control and test data as well as functions for archiving, analysis, operation and monitoring. It was also possible to convert the GPS data into a KLM file which could be loaded by Google Earth to plot various measurement channels like vehicle speed, filter temperature or pressure of position or engine speed.

Twin-Tec benefitted immediately from installing the Delphin TopMessage data acquisition system in its diesel particulate filter testing program. Filter temperature, pressure, engine speed, idle times, vehicle position and speed were all measured in the test drives using one powerful device. Twin-Tec subsequently used 5 TopMessage systems to more smoothly run the testing. The universal analog inputs made it easy to connect all the temperature and pressure sensors, and engineers found it easy to configure the TopMessage's ProfiSignal software to show live reading during the test drives. The data acquisition system's 1 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 TopMessage (200x73x118 mm) made it an ideal fit for installation in the small enclosure. Additionally, internal calculation and logic channels were used to trigger data logging when test conditions were reached.

In the event that Twin-Tec needed to expand the number of channels used, Delphin slave module expansion chassis were also available to expand the TopMessage 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 further information on the Delphin TopMessage, additional data acquisition and control systems, or to find the ideal solution for your application-specific needs, contact a CAS Data Logger Applications Analyst at (800) 956-4437 or visit the website at www.DataLoggerInc.com.

Contact Information:

CAS DataLoggers, Inc.
12628 Chillicothe Road

CAS DATALOGGERS

Chesterland, Ohio 44026
(440) 729-2570
(800) 956-4437
sales@dataloggerinc.com
<http://www.dataloggerinc.com>