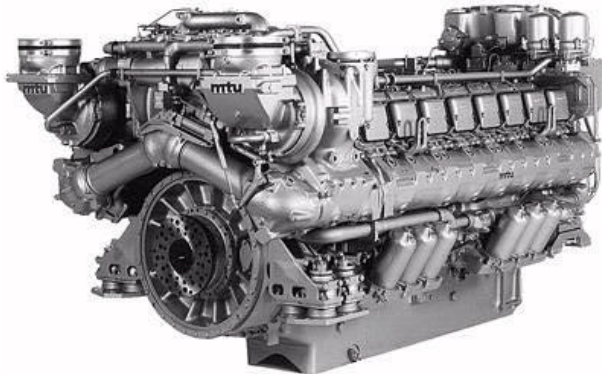


The aim of the newly developed Bombardier diesel engine test rig was to construct a modern, flexible and decentralized measurement system for diesel motors in a test cell. The system should be able to measure a series of standard signals such as temperature, pressure, force, torque, RPM etc.



*Diesel engine for locomotives*

In addition to all the standard functions of a state-of-the-art measurement system, a precisely synchronized CAN-Interface was required. It is used to receive data from the engine control unit as well as from certain external devices such as a Pierburg fuel measurement station.

Online results such as the mechanical power of the diesel engine or the electrical power of the loading machine have to be calculated and evaluated. In the case of threshold crossings, real-time reaction is one of the vital functions with which the system has to provide the user.

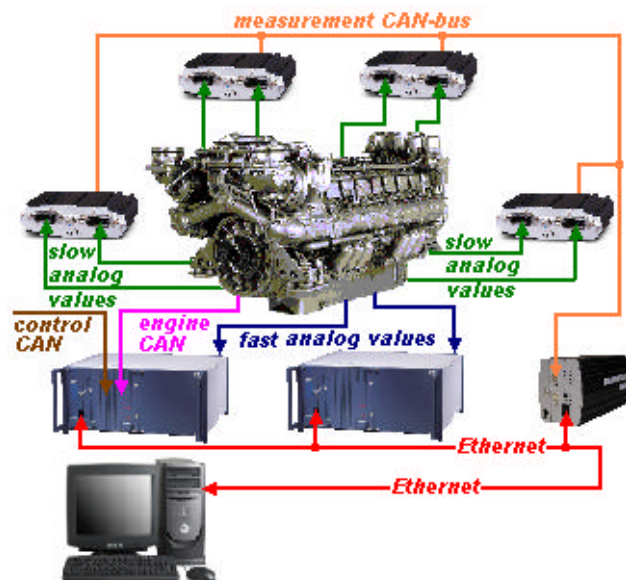
Together with Bombardier Transportation in Hennigsdorf (near Berlin), imc installed a 160 channel measurement system in a newly renovated facility. The entire solution consists of:

- 2  $\mu$ -MUSYCS; 64 analog / digital channel system
- 1 busDAQ-2
- 12 CANSAS ISO-8.

With the help of 'Online FAMOS', a powerful DSP array inside the  $\mu$ -MUSYCS and busDAQ systems, Bombardier engineers can perform a host of online calculations during the measurement. Therefore, some results can even be displayed while the data stream into the system. This saves the user some of the time-consuming subsequent off-line evaluation.

To measure slow signals such as temperature, pressure or airflow, the new CANSAS modules exploit their advantages – decentralized, sensor-near, flexible and easily to configure. By their very concept, CANSAS modules measure very near the sensors and therefore long wires are no longer necessary. A dramatic reduction of signal interference, cable length, and effort in configuring are the result. CANSAS systems can be used very flexibly. They can easily be reconfigured, removed from or added to the measurement chain.

Faster signals such as RPM, vibration, high frequency current or voltage signals can be acquired by the  $\mu$ -MUSYCS systems. With a sampling rate of 160.000 Hz in aggregate, even sound measurements can be taken. Thus, microphones and microphone amplifiers also are included in the measurement system.



*Signal flow drawing of the Bombardier test rig*

From a central measurement and control stand, Bombardier development engineers can configure the entire system. A measurement can be started and its results can be displayed online and offline.

A network of computers belonging to the diesel engine department has access to a data server which receives the data from the measurement systems. FAMOS, the off-line data analysis and evaluation tool, allows display of the data from all different parts of the entire test rig. In addition, extensive calculations and data evaluations can be performed, and, finally, reports composed.

