imc

An Axiometrix Solutions Brand

Saving Time from Test Bench to Road

A Unified DAQ Solution for Motorcycle Prototype Testing

APPLICATION NOTE

Introduction

G.P. vehicle engineering srl, located near Milan, Italy, specialises in developing innovative two- or three-wheeled vehicles. The company's particular focus is on high-performance motorcycle solutions and electric mobility, based on the development of sustainable urban mobility concepts. In this context, it has brought about several patents and innovations for over 20 years. These include an innovative braking system for the Supertwin 1100 bike from Ghezzi & Brian, the RELIS system for tilting three-wheelers, and the HEPU electric powertrain.

G.P. vehicle engineering is renowned for its strong research and development-oriented approach. The company offers a comprehensive range of services, including feasibility studies, vehicle design, prototype construction and laboratory and road testing for chassis and components. Testing and validation activities play a fundamental role in the continuous improvement of prototype performance, reliability and efficiency.
A high-performance data acquisition system is essential for this, supporting the company’s engineering services.

“We greatly appreciated the availability and support of the imc pre-sales team. The demonstrations of both the imc hardware and software helped us gain a clear understanding of the solution and its capabilities for our application.”

Giuseppe Ghezzi, Owner of G. P. vehicle engineering

G.P. vehicle engineering

Application Goals

During the development of motorcycle prototypes, which are manufactured in small series or as one-off items, several testing tasks need to be carried out. To complete these tasks efficiently without compromising data quality or channel availability, a data acquisition was needed that offered the following features

- compact and versatile, to acquire data under real-world operating conditions
- stand-alone operation, portable with mobile data storage options, to analyze the vehicle's dynamic behavior
- simultaneous recording different types of sensors
- ready-to-go to reduce installation time and complexity
- one configuration and operation software

The goal is to obtain a complete and reliable view of the vehicle's performance, both in the laboratory and during road and track testing.

The imc C-Series Data Acquisition System

Testing in the laboratory and on the road with one DAQ System requires a versatile ready-to-go system. G. P. vehicle engineering decided to the imc C-Series platform, because of these aspects:

- robust design suitable for demanding test environments
- high flexibility for different measurement configurations
- sampling rates of up to 100 kS/s per channel,
- 400 kS/s per unit
- stand-alone operation with data storage on internal memory
- integrated DSP for real-time data processing

The system can operate both autonomously and connected to a PC for online monitoring and visualization.

FIGURE 1.
imc C-Series Data Acquisition System

Sensors and Acquired Signals

During the structural and vehicle dynamics testing on the vehicle, the test installation is configured to synchronously capture the following signals:

- temperatures
- accelerations and vibrations
- strain gauges
- analog voltage and current signals
- data from the CAN bus network

This versatility of the imc C-Series DAQ allows to be quickly adapted to the different phases of prototype development.

FIGURE 2 and 3.
Test configuration in the laboratory and in a mobile test setup

The Test Configuration

During the development process, the imc C-Series DAQ was used in both the laboratory and under dynamic road and track conditions. Ensuring the continuity between the different test phases was also the purpose of the measurement software imc STUDIO, which is for configuration and operation of the DAQ.
In the laboratory (Fig. 2), the prototype is instrumented to perform functional checks and optimize the measurement setup.
When the system is used in dynamic tests (Fig. 3), it is configured as a mobile, wearable solution inside a technical backpack.

This solution enables the acquisition of data under real-world operating conditions while ensuring a fast, non-invasive installation process and high operational mobility.

Real-Time Data Analysis and Post-Processing

The imc C-Series enables synchronized acquisition of all relevant quantities, including parameters from the vehicle's CAN bus, providing a complete and coherent view of the prototype's behavior.

Thanks to the integrated DSP and imc Online FAMOS software, real-time processing can be performed, derived parameters can be calculated, and any control logic can be managed directly on board the system. Data can be saved both in raw and already processed form, facilitating subsequent analysis activities. For the road tests, the data can be stored on an onboard-memory.

To examine the measurement data from the lab and the road test in greater depth, the data is available for subsequent post-processing of the measurement data.

Benefits of an Efficient DAQ Solution

The use of the imc C-Series platform enabled G.P. vehicle engineering to achieve:

- high operational flexibility
- reduced installation time
- measurements under real-world operating conditions
- high data quality and synchronization
- advanced analysis integrated into the system

The use of the imc C-Series CL5016 system on the CL/CS platform proved particularly effective in supporting G.P. vehicle engineering's prototype testing development.

Its combination of robustness, flexibility, high performance and embedded processing capabilities enables the acquisition system to be transformed into an intelligent measurement platform that is ideal for dynamic testing processes in mobile setups for testing motorcycle prototypes.