New Control System for the Testing Laboratory: Innovation and Standardization

Category: Case Study,Insights
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The project to renovate the test cells is part of the laboratory at Bonfiglioli Riduttori – EVO Plant in Forlì. This facility is a center of excellence for the research, development, and testing of power transmission systems and advanced mechatronic solutions.In the laboratory, critical and rigorous tests are performed on gearboxes, geared motors, and other mechanical and electronic equipment, with the goal of ensuring maximum reliability and performance of Bonfiglioli products.

The renovation of the test cells, which includes the installation of 10 test benches and 20 stations, represents a significant enhancement of the laboratory's operational and testing capabilities, aligning with the high standards of quality and innovation that define the brand.In this context, the solution based on National Instruments' cRIO 9045 provides an advanced technological infrastructure that meets the specific control and automation needs of the laboratory, further improving the quality of the tests and the level of innovation at the plant.

Request

The requests and objectives of the test cell renovation project include:

1. A significant improvement in the creation of test profiles, making it faster and more intuitive, with data acquisition and saving times in the order of 5 ms.
2. The implementation of a buffer to ensure continuous recording of pre-

and post-fault data, guaranteeing comprehensive collection of critical information.
3. Implementation of an alarm system, both cyclical and global, to monitor operating conditions in real-time and signal any anomalies.
4. An increase in operational efficiency through the optimization of testing processes, allowing for the simultaneous execution of multiple tests.
5. Greater reliability and accuracy in test results, in line with the quality standards required in the industry.

Solution

The solution for the renovation of the test cells involves the use of National Instruments' CompactRIO 9045 technology, designed to meet the control and automation needs of laboratory testing.

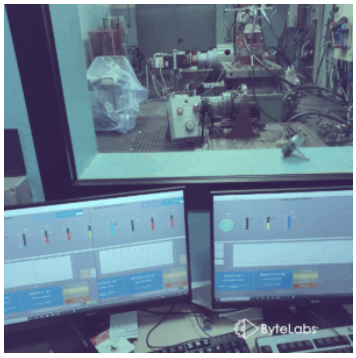


Thanks to the integration of FPGA and Real-Time (RT), the system achieves data acquisition and saving times in the range of 5 ms, ensuring high performance and accuracy in the results.

The configuration includes 10 test benches, each capable of simultaneously managing two stations, for a total of 20 operational stations.Another key element of the solution is the creation of a buffer that allows continuous recording of pre- and post-fault data, facilitating the analysis of critical events. Additionally, a system of alarms, both cyclical and global, will be implemented to monitor operational conditions in real-time and signal any anomalies.

Our experience in designing LabVIEW-based systems, combined with the integration of ByteQX for cloud-based data and report management, will

contribute to a datadriven approach.



The implementation of Python for the development of APIs and OPC-UA services will ensure flexibility and interoperability between the various system components.In summary, this solution provides a comprehensive approach to the laboratory’s needs, improving the efficiency and reliability of tests while aligning with opppthe quality standards required in the industry.

Results

The results and objectives achieved with the new solution for the refurbishment of the test cells represent a significant step forward in terms of efficiency and quality, with a targeted integration of Industry 4.0 needs.

1. **Reduction in data acquisition and saving times**: Thanks to the integration of FPGA and Real-Time technology, data acquisition and saving times have been reduced to 5 ms, allowing for faster and more accurate testing.
2. **Improvement in monitoring quality**: The creation of a buffer for continuous data recording before and after faults has increased the ability to analyze critical events, ensuring a more complete and reliable data collection.
3. **Implementation of an efficient alarm system**: The integration of cyclic and global alarms allows for real-time monitoring of operational conditions, improving the timeliness of responses in case of anomalies or malfunctions.
4. **Innovation in the context of Industry 4.0**: The system provides **data availability and process standardization**, ensuring continuous access to test reports via a web application. Additionally, communication via the **OPC-UA** protocol allows for the visualization of energy consumption and operational data on a monitoring dashboard, offering a centralized dashboard for test management and analysis.
5. **Advanced automation and management**: The integration of Python and ByteQX has facilitated cloud management of data and reports, standardizing processes and improving information accessibility for a fully data-driven management approach.

These results ensure greater operational efficiency, reduced test execution times, and a significant improvement in data quality and availability,

enabling a smarter and more interconnected management system that aligns with Industry 4.0 requirements.

