



Certified Experts in Automation Engineering to Design, Control, Test & Adapt

Data Acquisition System for HVAC Cooling Tower

Authors:

Thomas Garvey, Senior Automation Systems Consultant, Data Science Automation, McMurray PA
Quintin Stotts, Senior Automation Systems Consultant, Data Science Automation, McMurray PA

NI Products Used:

LabVIEW 2012
Report Generation Toolkit
PXI-1033 Chassis
NI-4070 DMM
NI-2630 Switch

Category:

Structural and Physical Test and Monitoring
Automated Test
Energy

The Challenge

A legacy GE Intellution and PLC based test system was lacking features and functionality for a leading industrial HVAC Cooling Tower manufacturer's R&D test lab.

The Solution

A LabVIEW & PXI based system was implemented to modernize the data acquisition, visualization and data storage capabilities of the test system that provided a deeper understanding of the product performance.

Introduction

Data Science Automation (DSA) is a premier National Instruments (NI) Alliance Partner that specializes in automating and educating the world leading companies. Clients choose DSA because of DSA's deep knowledge of National Instruments products, disciplined process of developing adaptive project solutions, staff of skilled Certified LabVIEW Architects and Certified Professional Instructors, and unique focus on empowerment through education and co-development.

A leading manufacturer of HVAC Cooling Tower systems sought the assistance of DSA to develop a full-featured, adaptable LabVIEW application after their initial attempt using internal resources became time consuming and cumbersome to the point of jeopardizing their project deadlines. In order to keep up with the ever increasing demand to make systems more energy efficient, cost effective and environmentally friendly, designers of the cooling towers needed the ability to immediately visualize performance data and understand how new designs and components were affecting the operation and performance of the cooling tower systems.

The Implementation

Cooling towers use evaporation of water to remove excess heat from the chiller in a building's HVAC system. The primary performance parameters to be monitored in the testing of the cooling towers were temperatures, pressures and flows. Engineers and designers of the systems would use these key parameters to gain deeper understanding of system performance. For example, the comparison of the temperature of the process water entering and leaving the system could be used to determine certain performance aspects of the tower. The system possessed the capability to monitor dozens of each type of measurements for a given test and provide an aesthetic, user friendly interface to visualize the test data.

Why LabVIEW?

The customer considered upgrading the GE Intellution system as an alternative to migrating to NI, but LabVIEW and the NI Platform was deemed to be much better supported in the industry and the GE

To acquire the data, a PXI chassis was implemented that contained a NI-4070 DMM card and a NI-2630 switch card. This hardware setup was selected to allow for more scalability of the system. Implementing the switch card provided a higher ceiling for the number of channels that could be measured at a lower cost than implementing multiple DMM or DAQ cards. The software would control the hardware to scan through the configured sensor signals to be passed to the DMM card to make the measurement. The configuration of a test in the LabVIEW application's GUI (Figure 1) contained logic to pair a configured channel to a particular measurement type. This configured the DMM to take the measurement and the software would then apply scaling factors to convert the raw voltage, current or resistance measurement to real-world engineering units.

There was also a requirement to store all the acquired data to file for historical review and post processing. The client already had Excel macros developed, based on their legacy GE Intellution data files, and it would have been an arduous effort to modify or replace those existing macros. Fortunately, with the LabVIEW Report Generation Toolkit, it was not a huge effort to generate data files from LabVIEW to match the exact format of the legacy data files so the same macros could be used by the engineers.

Conclusion

Implementing the system with LabVIEW and PXI allowed for future expandability to adapt to evolving test requirements. LabVIEW contained the capability to easily and effectively interface with the test hardware, organize and process the acquired data and visualize the data on an intuitive graphical user interface to make faster decisions and led to a better understanding of the designs being tested. The implementation used an approach that enabled the reuse of prior Excel macros.

Contact Information

Thomas Garvey, trg@DSAutomation.com
Quintin Stotts, qrs@DSAutomation.com