A LabVIEW-based Test and LIMS Database System

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NI Products Used:
LabVIEW 2012
NI GPIB
NI VISA

Category:
Automated Test

The Challenge

Replace a series of disconnected legacy systems and laboratory test utilities with a single, integrated LIMS (Laboratory Information Management System) for tracking anode test specimens throughout their lifetime at a large test/R&D facility.

The Solution

LabVIEW was paired with Microsoft SQL Server and existing customer multimeters/data collection hardware to create a facility-wide test data management system usable across multiple test labs and accessible from anywhere in the company.

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.

Testing Laboratory Mayhem

A leading manufacturer of anodes for electrolytic processes and systems needed to modernize their test article tracking and life testing process. New designs for electrolytic anodes are given rigorous life testing before the design is approved and produced in quantity. Test "specimens" of the anode are cut, and sent through various test and laboratory analysis processes, including a life test. For the manufacturer in question, analysis of these specimens was becoming difficult due to the fact that each test lab had a different system for collecting data and recording results. In addition, there was no single, coherent system to "track" a given specimen through the various testing and laboratory processes during the life of the specimen. Some manual laboratory tests had their results recorded only in hard copy paper files, other tests used a simple MS Access database, still other tests recorded to a spreadsheet format. When trying to analyze data for a particular specimen, it was nearly impossible to collect and view all the relevant information at once due to all the disparate systems being used. A more comprehensive, networked solution was needed that could be used for all test specimens throughout the facility.

DSA Arrives with a Networked, SQL Based Data Collection Solution

The manufacturer initially hired DSA to upgrade the data acquisition system used in two of their life test labs. One lab used in-house software developed many years ago under MS-DOS to collect data and store it in local files. The other lab utilized Agilent 34970A multimeter/scanning units with off-the-shelf Agilent software that collected data directly to a spreadsheet. Although the two systems collected similar data, they were drastically different from one another. DSA designed a flexible, adaptive LabVIEW-based front end compatible with both labs that could utilize the customer's initial investment in Agilent hardware, but introduce a much more flexible, configurable data collection and recording system. In addition, the LabVIEW software application could easily be adapted to perform some control actions on the test units as well.

New NI USB-GPIB interfaces were purchased for the Agilent 34970 units, and the software allowed dynamic configuration of the 34970 units to pair with a given test bay or "cell". Once data channels were assigned to a cell, a test specimen could be assigned to that same cell and tracked. The system monitored cumulative runtime of a specimen as well as voltage and temperature, and allowed the lab operator to temporarily remove a specimen for other types of laboratory testing (known as taking the specimen "offline") while allowing the specimen to be replaced later and resume testing, without losing track of the cumulative run hours a specimen had previously been online. (Figure 1)

A Comprehensive Specimen Tracking Solution

Voltage and temperature history as well as cumulative runtime hours for a given lab specimen needed to be logged to a storage location that was accessible by many departments and individuals within the company, not all of whom would be in the test lab environment and have easy access to the DSA logging software. A company-wide database solution using MS SQL Server was proposed by DSA, along with an additional LabVIEW-based front end executable called the "Specimen Offline Tool" that could be easily installed by anyone with a Windows PC at the facility. This front end application would act as a simple, straightforward way to access basic information about specimens that were currently undergoing testing. After some additional research, along with Q&A sessions with lab and R&D personnel, DSA and the customer concluded that the front end application should also be used as a single, comprehensive solution to tracking all specimens across all test labs at the facility. These could be specimens in test, specimens scheduled for future testing, or specimens that had already been through the test cycle and terminated. This would eliminate the many disparate systems used not just in the labs where data acquisition hardware was being utilized, but all R&D and test areas in the company, thus turning it into a complete LIMS (Laboratory Information Management System) solution. The Specimen Offline Tool would be a central place to set up specimens for testing in any lab, track specimens as they moved from one lab to another and let personnel know which specimens were scheduled for what kinds of tests. In addition, the Specimen Offline Tool would be able to inform personnel in the facility if a specimen under test was in imminent danger of failure. (Figure 2)

An additional benefit of using a database approach was that other front end analysis applications could be written to mine data from the LIMS database in the future if the customer needed something beyond what the Specimen Offline Tool could provide. In addition, given the ease of database connectivity and making SQL queries from the LabVIEW environment, the Specimen Offline Tool itself could be expanded as the LIMS system evolved. (Figure 3)

A Successful System that Continues to Evolve

Since its inception one year ago, the LabVIEW and database-based LIMS solution has improved tracking and testing of anode specimens immensely at this leading industry producer and has allowed them to discard the hodgepodge of test and tracking systems that in the past left lab and site R&D employees pulling their hair in frustration. Currently the customer is drawing up plans to upgrade the LIMS to also provide lab alarming inside the Lab Logger application as well as more advanced specimen tracking features in the Specimen Offline Tool.

Contact Information

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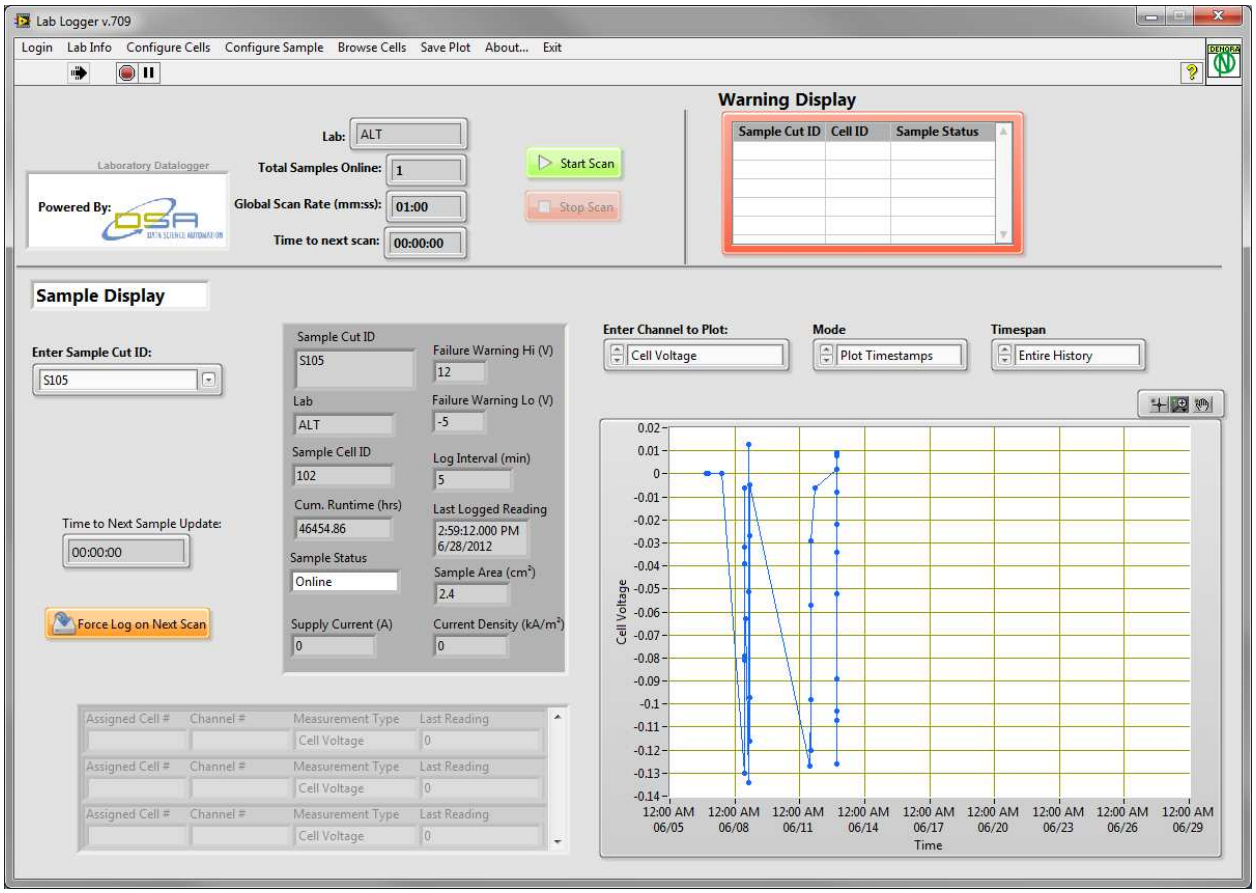

Figure 1: Lab Logger User Interface

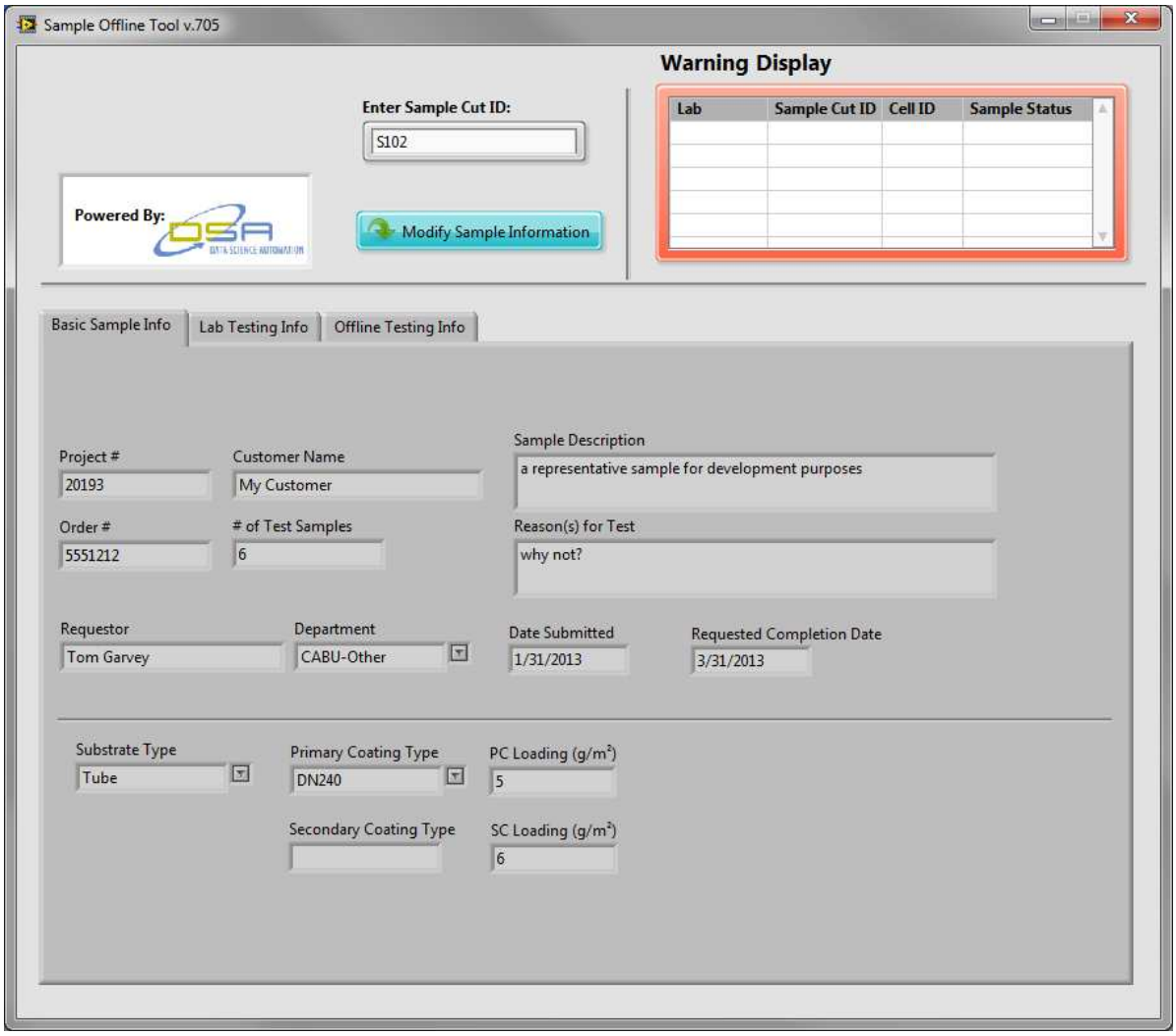

Figure 2: Specimen Offline Tool

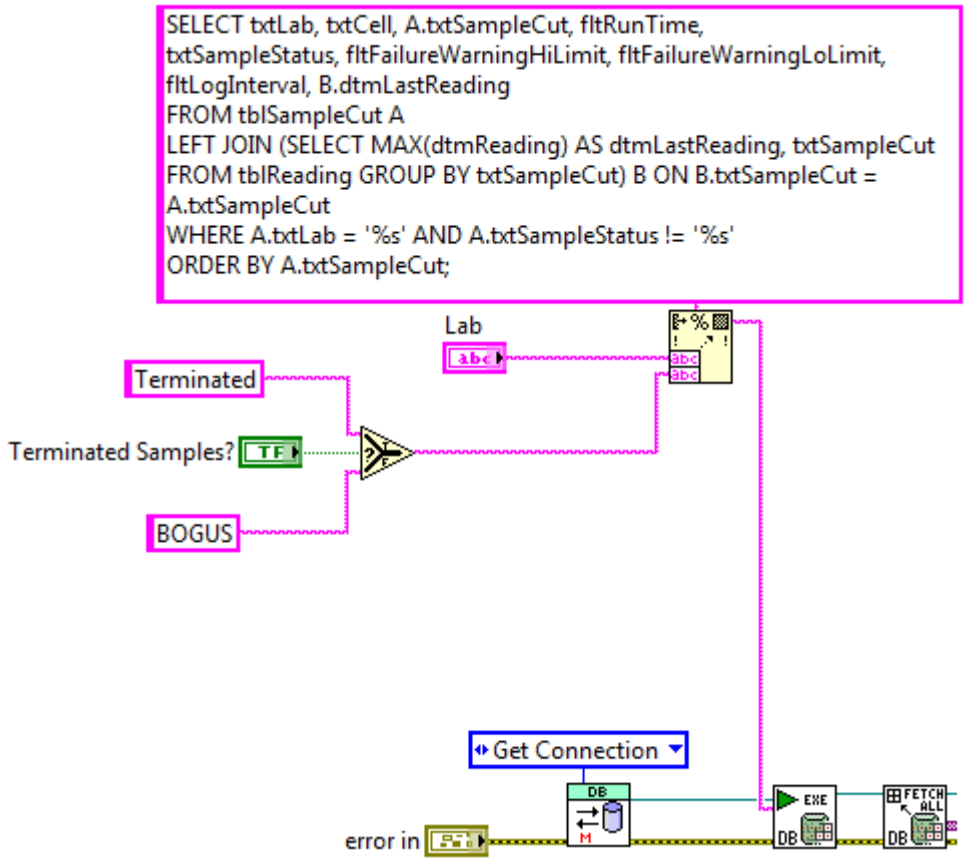

Figure 3: Database Query Block Diagram