

Facilities Monitoring System

by

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Category: Biotechnology

Products Used:

3 Fieldpoint FP-1600 Ethernet Controllers
5 Fieldpoint FP-AI-111 Analog Input Modules
1 Fieldpoint FP-RLY-420 Relay Module
LabVIEW DSC 6.02 Runtime Engine
Fieldpoint 3.0 OPC Server

The Challenge: The United States Department of Health and Human Services needed to monitor and log the temperature and humidity at approximately 50 locations throughout their warehouse and repackaging facilities for pharmaceuticals in Perryville, MD to satisfy FDA requirements.

The Solution: We used approximately 3000 ft of 4 conductor wire to connect Omega Temperature and Humidity transducers in 4-20 mA circuits to the Fieldpoint modules distributed throughout the buildings. LabVIEW DSC was used to log and monitor the sensors and to produce web pages for easy remote access to the system.

Abstract: The purpose of the Facilities Monitoring System for Health and Human Services is to monitor and log 50 temperatures and humidities of sensors that are distributed throughout a building complex. The application uses Fieldpoint Ethernet modules for distributed I/O. The built-in logging and security capabilities of LabVIEW DSC are used in the server application. Users can check the status of the system remotely using a web-browser. Alarms can also be suspended remotely from a web-browser.

24 hour monitoring of Temperature and Humidity

Monitoring consists on verifying at a regular interval that the measured value is still within the programmable range. An alarm state is generated if the measure value is out of range. Monitored devices that are missing a sensor (from disconnection, short-, or open-circuit conditions) will also generate an alarm. Programmable delays prevent outgoing alarms for temporary disruptions. Each alarm-status has an associated color and symbol:

-  The signal is good.
-  The signal is below the acceptable range, but the delay time has not yet expired. An Alarm status has been logged.
-  The signal is above the acceptable range, but the delay time has not yet expired. An Alarm status has been logged.
-  The signal is below the acceptable range past the delay time. An Outgoing Alarm is generated and logged.
-  The signal is above the acceptable range past the delay time. An Outgoing Alarm is generated and logged.
-  An operator has temporarily suspended the alarm, presumably to analyze and fix the problem that occurred.
-  Alarm checking on this signal has been disabled, presumably because the monitored device is not in use.
-  The system has detected a bad-status condition, such as a network outage.

Fig 1. Main web page of the facilities monitoring system, indicating the at-a-glance status of the system.

Remote Monitoring using a Web-Browser

Using a web-browser, two types of views are available. The main view represents the physical layout of the system, modeled on the building floor plans. This facilitates assessing the global state of the system, and provides an intuitive means of navigating through the facility to access the configuration and state details for individual devices & sensors. Yellow indicates and alarm condition that did not cause an outgoing alarm, while red indicates and alarm condition that did notify the alarm monitoring company. Clicking on a particular location in the floor-plan view will “zoom” to a more detailed floor-plan, indicating the locations of each of the devices that are being monitored, and their status

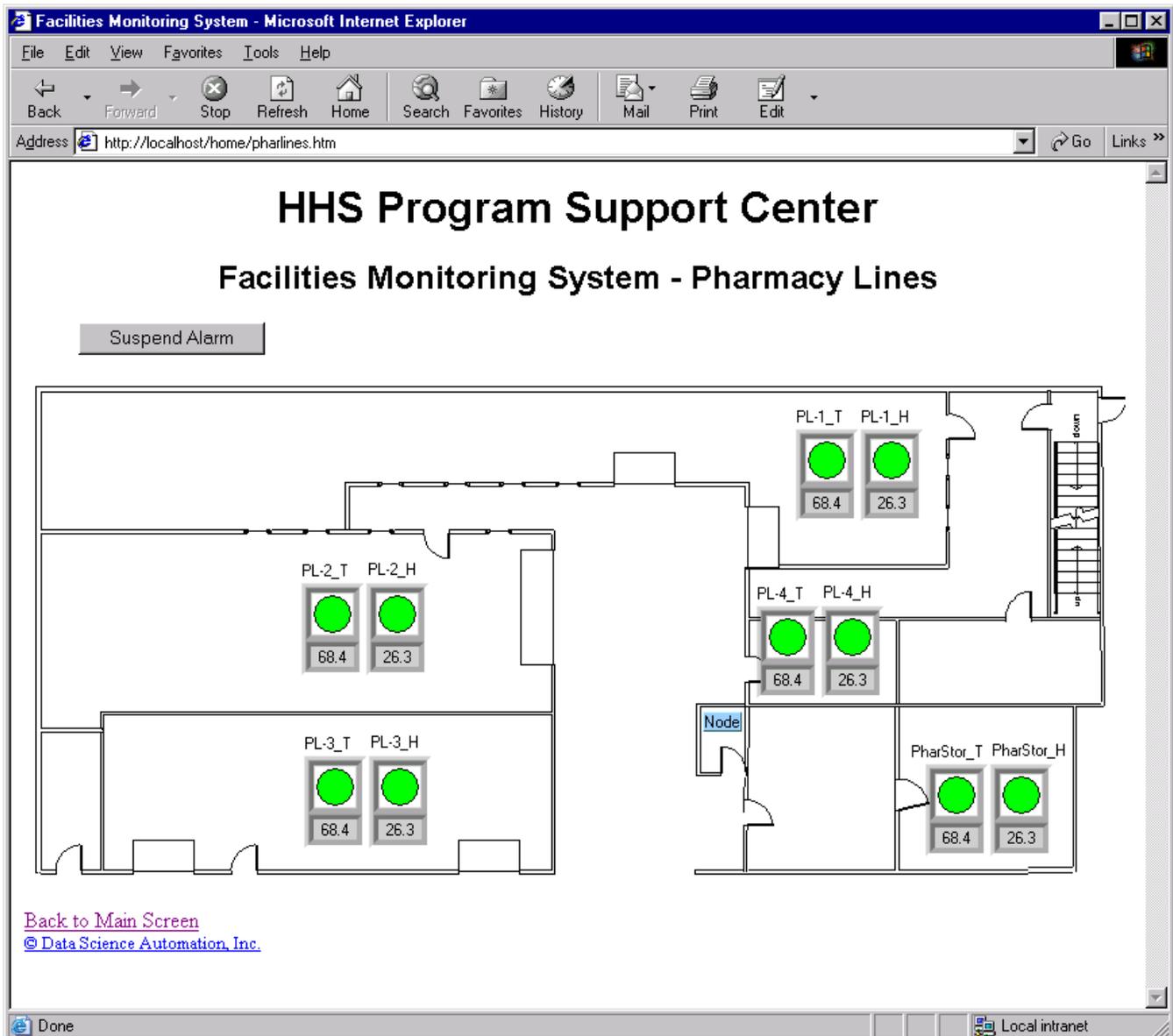


Fig 2. Detailed web-pages showing individual temperature and humidity monitoring devices , and the Fieldpoint node they are connected to.

Several of these views are available, one for each section of building complex. Anyone with access to the intra-net can immediately see if a particular location is operating under normal conditions or if a temperature or humidity is out of range.

Remote Alarms

When a particular sensor is out of range past the delay time, a relay that is connected to the building alarms system is opened. This causes the building alarm system to go off, and the alarm company to be notified. The alarm company will then notify a designated employee who can log in from home and verify the status of the system. The alarm can then be suspended remotely through the web-interface for a set duration, for example one hour. The employee can then enter the building, determine what caused the alarm, and remedy the situation.



Fig 3. Device View for a particular sensor.

User Configurable Alarm Parameters

On the server machine, the web-pages are also available as individual windows. But additional views are also available. Clicking on a device/sensor in the location view “zooms” to the corresponding Device view, (assuming the user is logged in as either an Operator or an Administrator) which will display information about the monitored device. Here the administrator can change such parameters as the alarm limits and the delay times. One can also suspend the alarming on the device, for maintenance reasons for example.

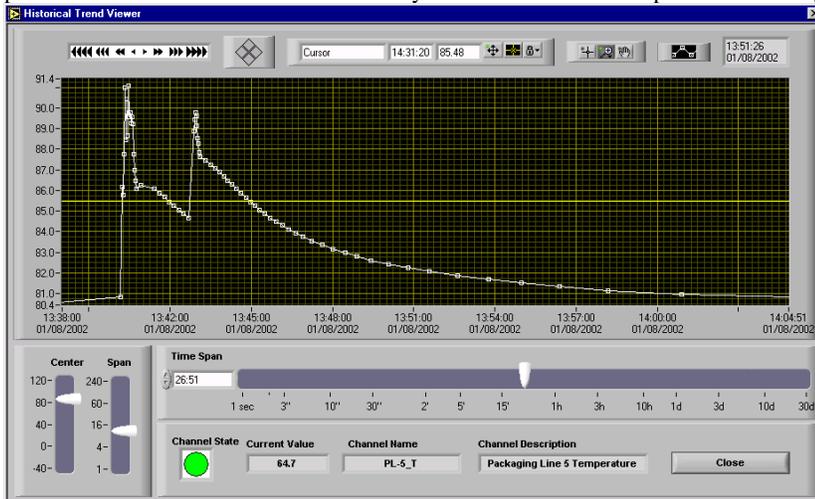


Fig 4. Trend View for a particular device.

Clicking on the ‘Open Trend Panel’ button opens the trend view, which displays an interactive chart that plots past data retrieved from the Citadel historical database. These views can be customized to show data for a given time span, and range. In addition, the system allows viewing of the current alarms and the alarm log. The standard alarm logging for LabVIEW DSC was modified to require the operator to enter a comment with each alarm acknowledgement. These comments are also shown when viewing the historical alarm and event log.

Data can also be exported to a comma delimited file. After the user selects which channels to export, and a time span and resolution, a standard file dialog box allows the user to save the file to any desired location.

In conclusion, LabVIEW DSC in combination with the Fieldpoint Modules and the Fieldpoint OPC server allowed us to develop a reliable and user friendly 24/7 monitoring and logging system that can easily be adapted to future changes such as additional input channels, other OPC clients, PID control of output channels etc.