

User Solution

SCXI and LabVIEW Test Traulsen Refrigerators and Freezers



Traulsen uses LabVIEW, an AT-MIO-16F-5, and SCXI to monitor and control eight refrigerator test stands simultaneously.

Traulsen sells more reach-in refrigerators and freezers to the restaurant market than any other company in the world. Their customers include McDonald's, Outback Steakhouse, Denny's, Marriott, and K-Mart. To make the "preferred vendor" lists for these customers, Traulsen must ensure that every refrigerator and freezer they ship meets standards set forth by the National Sanitation Foundation (NSF). These guidelines require that cabinet air temperature not exceed 40°F for refrigerators with a maximum compressor operating time of 70 percent. Freezers have a maximum allowed temperature of 0°F with a maximum compressor operating time of 80 percent.

To test units for guideline adherence, Traulsen needed a PC-based instrumentation system to monitor and control four rooms containing eight test stands at their site in Grand Prairie, TX. These test stands are where refrigeration design engineers test Traulsen refrigerators and freezers. The most difficult part of building a PC-based test system to ensure compliance with NSF standards was finding a combination of hardware and software to acquire, analyze, and present the data. "Our first data acquisition system, installed in August 1992,

had a parallel port interface and DOS-based, menu-driven software," said Tom Yingst, Vice President of Engineering. "The system had a plug-in board and software that interfaced to a box on the wall. The whole system was ancient and unworkable, and we started looking for something better."

Consultants Build Custom Turnkey Systems

After an extensive vendor evaluation, Traulsen selected National Instruments in January 1993. When Traulsen indicated they needed a system installed "yesterday" and had no programming experience, National Instruments recommended LabVIEW and three nearby National Instruments Alliance Program members. Traulsen selected Lynda Gruggett of G Systems, who set out to build a custom test and measurement system based on LabVIEW for testing Traulsen products.

"Lynda originally developed a LabVIEW system to run on our older data acquisition system," said Yingst. "So we set up two test rooms to run the LabVIEW systems. When it came time to expand the system to include the two remaining rooms, we reached a fork in the road. We could finish the system

using the old hardware, or we could convert the entire system to National Instruments. We decided to go with National Instruments because their hardware was more accurate. Plus, the modular, open architecture gives us the flexibility to adapt the system to our changing needs."

New System Controls Testing at Eight Stations Simultaneously

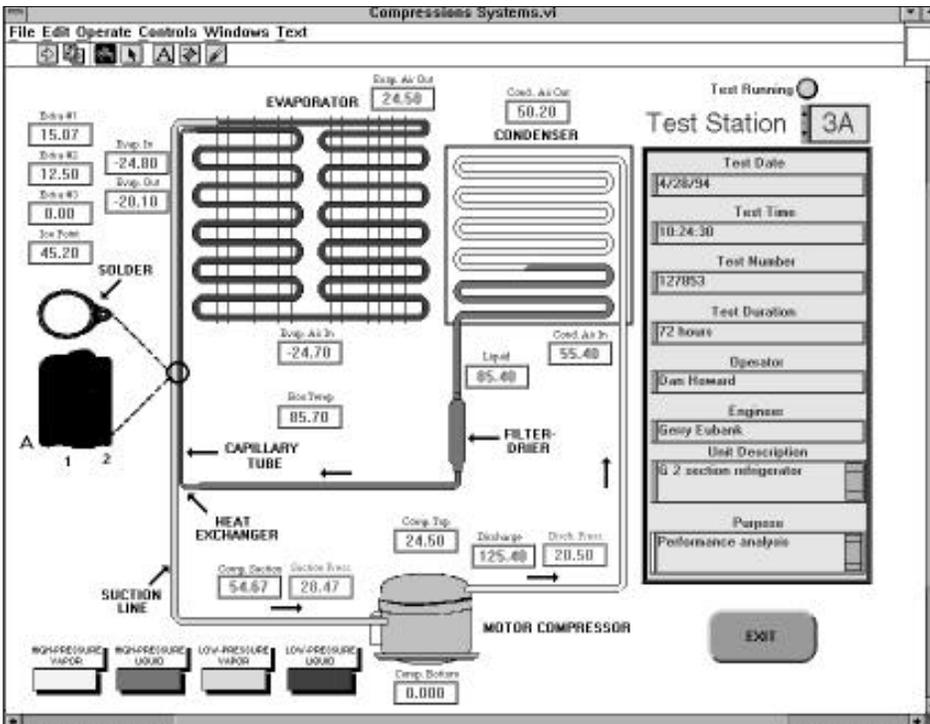
When converting the entire application to National Instruments products, Gruggett chose the AT-MIO-16F-5 plug-in data acquisition (DAQ) board and SCXI signal conditioning equipment, along with a Gateway computer running LabVIEW for Windows. She used SCXI to connect the AT-MIO-16F-5 to the eight test stands in the four rooms. The system features an SCXI-1001 12-slot chassis with an SCXI-1160 relay module and SCXI-1100 multiplexer amplifiers that route sensor signals to LabVIEW for analysis.

"Completely replacing the hardware that a data acquisition and control system is based on may seem like a big undertaking, but LabVIEW made it easy," says Gruggett. "I created a new set of virtual instruments (VIs) that were identical in functionality, and wired connections to

LabVIEW can acquire data and analyze it, or can output the data using DDE or file I/O, so other general-purpose software programs can be used for analysis.

the VIs controlling the old hardware. Converting to the National Instruments hardware was just a matter of replacing the old hardware driver icons with the new set of icons, which call the NI-DAQ® Library. The majority of the VIs in the system – approximately 100 – required no modification to switch to the new hardware."

Each test stand has 21 signals. Pressure transducers monitor the refrigerant suction and discharge pressure. Two transducers monitor the total current



The LabVIEW-based system monitors and controls refrigerant suction and discharge as well as voltage, temperature, and humidity.

and the compressor current of the unit under test. Another transducer monitors the voltage of the unit under test. SCXI also multiplexes signals from 16 thermocouples that monitor temperatures of the condenser, evaporator lines, discharge, refrigerator section, and freezer section. LabVIEW controls the temperature and humidity in each test room using the SCXI-1160 relay module. When all eight stations are running simultaneously, SCXI controls 12 relays, multiplexes 160 pressure, temperature, and voltage

signals, and sends them to LabVIEW for analysis.

Traulsen laboratory technicians who use the system every day are finding additional benefits to converting to SCXI. "SCXI is versatile and easily expandable, and the shielded aluminum is just great," says Dan Howard, laboratory technician at Traulsen. "With the old hardware, we'd have to replace the back of the board because the pins kept breaking—plus, they didn't have any fans to cool the board."

Traulsen Shelves Stand-Alone Hardware

"Without SCXI, we would have used paper data loggers," explained Yingst. "Now we're eliminating data loggers that are less than three years old."

"Once we get the data flowing on this system, it is just fabulous," said Yingst. "We've started buying Gateway computers, because you get one general-purpose application software package for free and can buy more at a reduced rate. So, every machine in the place comes with Microsoft Excel loaded on it. One

SCXI is versatile and easily expandable, and the shielded aluminum is just great.

*— Dan Howard
Traulsen*

of the strong points of LabVIEW is that it can acquire data and analyze it, or can output the data using DDE or file I/O so other, general-purpose software programs can be used for analysis. Test reports now consist of data acquired with LabVIEW, copied onto a disk, and routed to the project engineer. He can manipulate it with Excel to his heart's content."

Project engineers can view the test data in Excel as the tests are running. Engineers can also start and stop test stations without interrupting other tests in progress.

And what of the older DAQ system?

"It's sitting on a shelf," said Yingst, "and will be used for very simple production test line auditing." 🐦



Tel: (512) 794-0100
 Fax: (512) 794-8411
 E-mail: info@natinst.com
 WWW: http://www.natinst.com

Branch Offices: Australia 03 879 9422 • Austria 0662 45 79 90 0 • Belgium 02 757 00 20 • Canada 519 622 9310 • Denmark 45 76 26 00 • Finland 90 527 2321
 France 1 48 14 24 24 • Germany 089 741 31 30 • Hong Kong 2645 3186 • Italy 02 48301892 • Japan 03 3788 1921 • Korea 02 596 7456
 Mexico 95 800 010 0793 • Netherlands 03480 33466 • Norway 32 84 84 00 • Singapore 2265886 • Spain 91 640 0085 • Sweden 08 730 49 70
 Switzerland 056 20 51 51 • Taiwan 02 377 1200 • U.K. 01635 523545

© Copyright 1995 National Instruments Corporation. All rights reserved. Product and company names listed are trademarks or trade names of their respective companies. 360433A-01 050595