



EFFECTIVE SOLUTIONS FOR CONTROL SYSTEMS AND AUTOMATED TEST EQUIPMENT

LabVIEW™ Software Based “Roll-Around” Data Acquisition Test Stand

Category:
Automotive

Products Used:

LabVIEW™ Software
AT-MIO-16E-10 data acquisition board
SCXI-1102 thirty-two channel thermocouple card
SCXI-1121 four-channel isolation amplifier with excitation modules
SCXI-1120 eight channel isolation amplifiers

The Challenge: Provide a mobile data acquisition system capable of monitoring several different tests of power steering pumps.

The Solution: Using LabVIEW™ software, a SCXI chassis, data acquisition (DAQ) hardware, and a Rittal PC enclosure a “Roll Around” data acquisition test stand was built.

Abstract

Engineers at a major automotive components manufacturing site were looking for a flexible tool that would streamline their testing procedure. Power steering pumps are tested under different types of conditions for extended periods of time for functionality and durability. Technicians were using chart recorders to monitor their tests and then writing down test results by hand, leaving room for error. Enhanced data acquisition capabilities and a more accurate method of recording data were required. LabVIEW™ software and SCXI signal conditioning were selected to work in conjunction with a single data acquisition board. This cost effective software and hardware solution provided the flexibility to monitor the different types of signals and provide room for future expansion.

Introduction

Engineers at a major automotive components manufacturing site were looking for a flexible tool that would streamline their testing procedure. Power steering pumps are tested under different types of conditions for extended periods of time for functionality and durability. The customer monitors parameters such as pump pressure, pump flow, and the temperature for the fluid.

Design Considerations

Technicians were using chart recorders to monitor their tests and then writing down test results by hand, leaving room for error. Enhanced data acquisition capabilities and a more accurate method of recording data were required. The challenge was to design and construct a new PC based system that was general enough that it could be used to monitor several of the different tests they were performing. This new system also had to be capable of being moved from station to station easily. This would allow the technicians to generate reports right at the stand. The acquired data would be stored to the hard drive in a Microsoft Excel format that could be used at a later date. Due to the environment in which the system was to be used, the computer and data acquisition hardware would have to be protected from dirt and oil.

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System Architecture

The system had to be PC based, easy to use, powerful and flexible enough to monitor different types of tests. National Instruments' LabVIEW™ software was a natural choice for this application with its wide range of hardware options and graphical interface capabilities. SCXI signal conditioning was selected to work in conjunction with a single data acquisition board. This cost effective hardware solution provided the flexibility to monitor the different types of signals and provide room for future expansion. A Rittal PC enclosure was chosen to house the PC and data acquisition hardware. This enclosure has a NEMA 12 rating, which allowed us to reduce the cost by using a desktop computer instead of an industrial grade computer. Figure 1 illustrates a typical "Roll-around" test stand.



Figure 1: "Roll-around" Test Stand

System Design

A cost effective and versatile data acquisition system was developed which provided general utility interface screens for the operator that are totally integrated with their standard testing procedures. The system utilizes standard 120VAC 20-amp service that is provided through a retractable power cord. Soft rubber casters are used for easy mobility on different types of floor surfaces, and an oversized fan and filter are used to maintain positive air pressure within the enclosure. A convenience outlet and printer connection is located on the outside of the enclosure. The enclosure housed the PC; a National Instruments' AT-MIO16E-10 data acquisition board connected to one National Instruments' SCXI-1102 thirty-two channel thermocouple card, four National Instruments' SCXI-1120 eight channel isolation amplifiers. This variety of signal conditioning allows for the monitoring of parameters such as pressure, flow, current, voltage, temperature, and speed. Shunt calibration of pressure transducers is achieved through the SCXI-1121 modules, which simplifies their calibration procedures.

Software Design

The LabVIEW™ software application allows the operator to configure which channels will be used for each application and when data is to be stored to the hard drive. This can be based on time duration, channel threshold, or commanded by the operator. The operator is also able to enter the sample rate at which to acquire the data. These configurations may be saved to the hard drive to be used again at a later date. Multiple channels may be viewed on a single plot or viewed as separate plots (Figure 2). Data is displayed continually to the screen regardless of whether or not data is being stored to the hard drive.

Collected data may be viewed graphically on the system. The operator has the capability to plot any channel versus any other channel or versus time for any given data file. These plots may also be printed directly from the system.

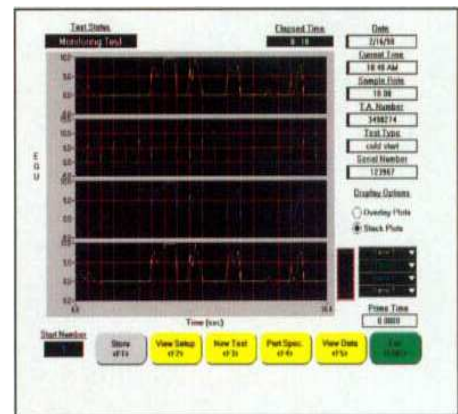


Figure 2: Data Screen

Results

The LabVIEW™ software based roll-around data acquisition test stand provides the means to monitor tests in an accurate and efficient manner. The test stand is trusted to monitor the test and collect data at a timed interval or if something should go wrong. The data is stored on the hard drive to be viewed at a later date or printed out and added to a report. The system can monitor tests continually without the worry of running out of paper or ink. This system reduced the error induced by the existing procedures and provided an efficient method of producing a concise report. The power and flexibility of LabVIEW™ software allowed for the development of an open-ended and cost-effective solution to a plaguing problem.