Pyrex Glass Press Instrumentation System

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Category:
Discrete Manufacturing/Process Control

Products Used:
LabVIEW 6.1
Database Connectivity Toolset 1.0.1
PXI-1010 Chassis
PXI-8175 Controller
PXI-6040E Multifunction Card
PXI-6713 Analog Output Card
SCXI-1540 LVDT Amplifier
SCXI-1315 Connector Block
TB-2705 PXI Connector Block

The Challenge
A Pyrex® glassware manufacturer desired to upgrade their 24x7 process monitoring on high-temperature production glass presses. The original, proprietary, C-based system was built on obsolete technology and was difficult to maintain and modify. Equipment deterioration and obsolescence dictated a change from the present system with enhanced features.

The Solution:

Data Science Automation (DSA) developed a contemporary system based on National Instruments (NI) LabVIEW, PXI and DAQ to acquire digital and analog signals from displacement sensors, pyrometers, etc. for event and process monitoring, and to replicate the original GUI to simplify the end user's transition. An industrial PXI solution was suitable to sustain the harsh, high-temperature environment and 24-hour operation. In addition to real-time analysis and display of process characteristics, the data is being collected for archival to a networked Oracle database.

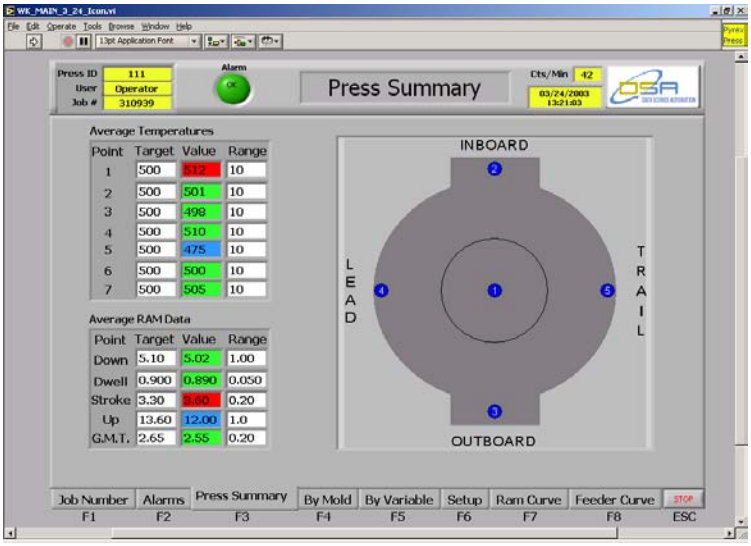

Figure 1

The PXI solution utilizes a mixture of analog and digital inputs to monitor the glass press process and compare the analyzed values to stored parameters for several types of glassware. It is critical to the quality of the glass for the operator to have immediate access to the analyzed data for adjustment of the process if necessary (Figure 1). This is especially true during change of production runs. Running outside of these specified parameters will lead to possible loss of product and delays in the production cycle.

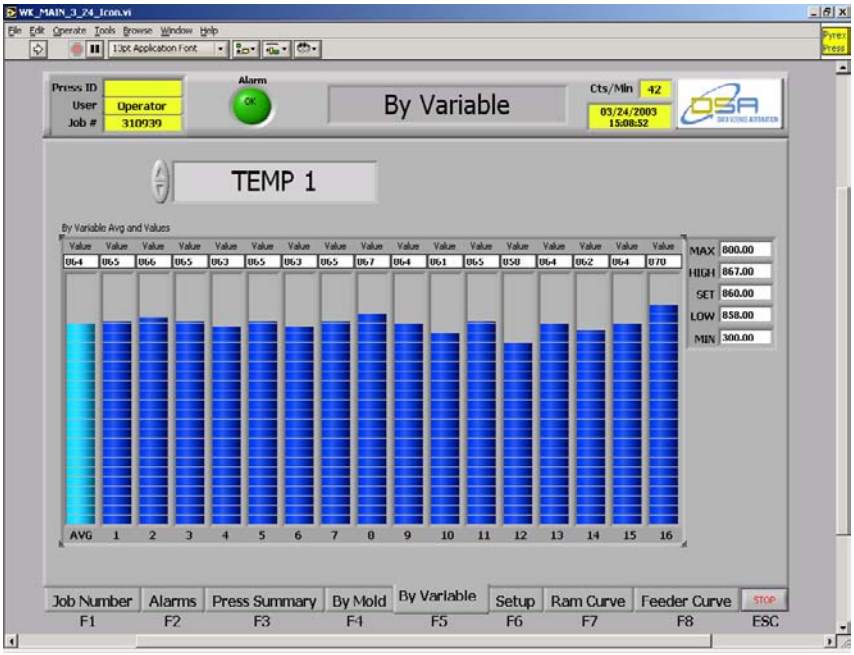

Figure 2

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Since the operators are accustomed to viewing the results with the current system the new solution would have to present the data in a similar manner. LabVIEW allowed DSA to develop front panel controls and indicators that closely resembled the old systems but have all the built in features to design a useful user interface.

The system permits selection from several existing job files (recipes) which specify target values, ranges, etc. for various pieces of glassware. These recipes have been well established from the years of production of several different types of glassware. Production rates will range from 20 to 50 parts per minute. Manufacturing new designs and storage of the new recipes is easily accomplished through a spreadsheet recipe interface.

Several signals from the press are being acquired from sensors and event timing signals are exchanged with the PLC which is controlling a hydraulic ram for pressing the molten glass into the glass molds. In addition to the parameters being displayed to the operator in the control room, critical values such as mold temperatures, ram velocity and event timing need to be displayed for the operators directly by the glass press. This is accomplished by the analyzed data being output to easy to see panel meters which are located directly next to the press. During the change over to another piece of glassware the operator will monitor this critical subset of parameters at the press for adjustment of the process. Once the operators are satisfied with the quality of the glassware being made they can better monitor the production from the local control room and select more detailed displays of the press activity (Figure 3) by way of selectable front panel screens.

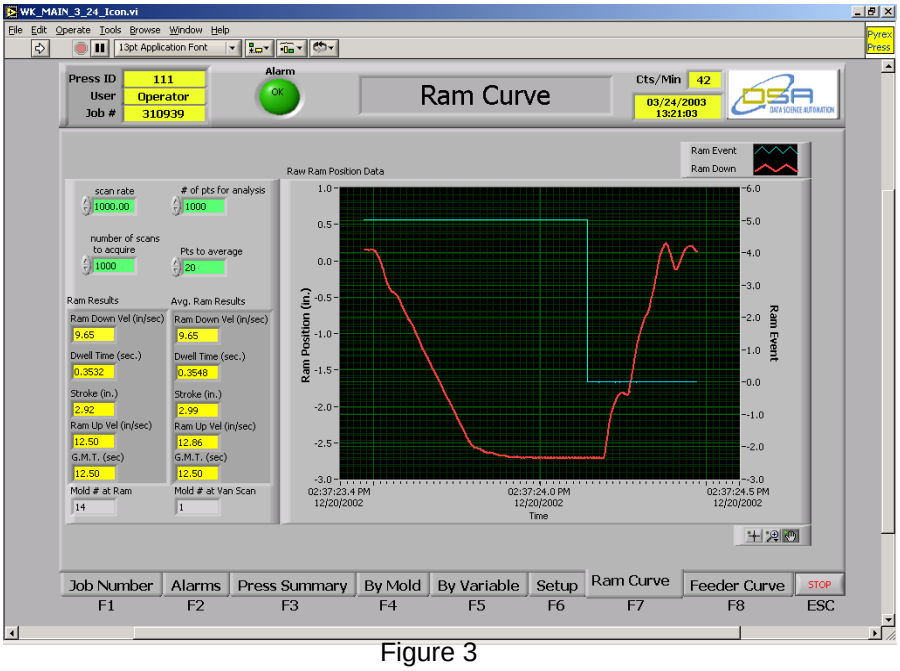

Figure 3

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The production line is located in a different area of the facility than the engineering and administrative offices. Leveraging off of the built in features of LV, supervisors can view and even control the application with the built in Web Server. If a supervisor's support is required on the off shift they can remotely access the same control with a web browser. (Figure 4).

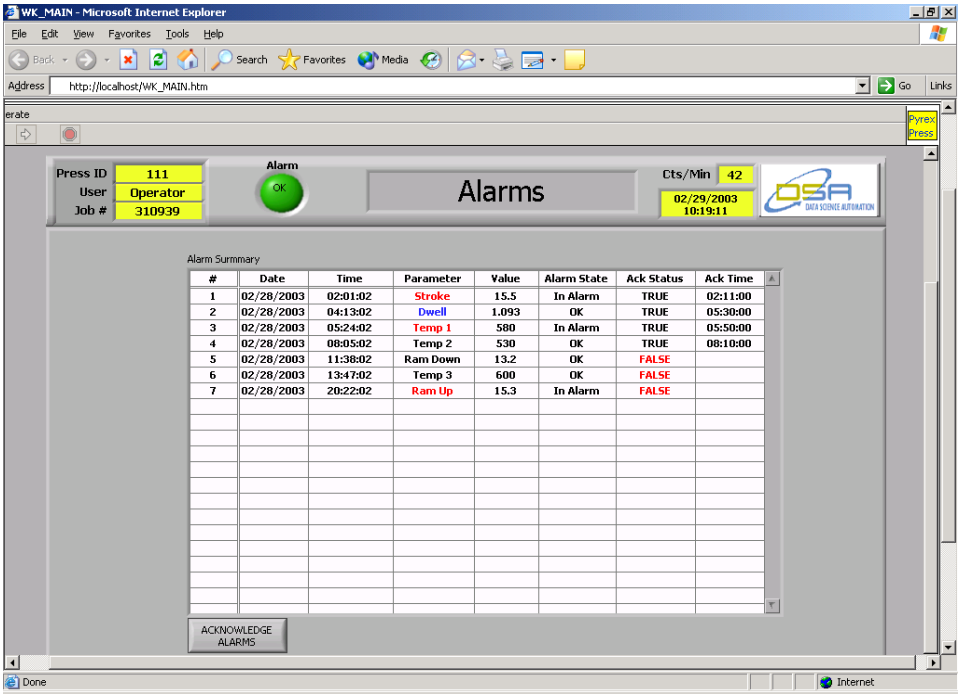

Figure 4

The data is acquired, analyzed and presented to the operator and additionally logged to the local hard drive.

At scheduled intervals the data is then inserted to a networked Oracle database utilizing the LabVIEW database connectivity toolset. Once it has been archived in the company's enterprise system, all personnel with access to the database can utilize it for reporting, production analysis, report generation, etc.

This is the first phase of the project. The next will be to instrument the other four glass presses with the same type of solution. All the stations will be networked so data and recipes can be shared between them if necessary. In addition to all presses having their own DAQ system one spare unit will also be used as a replacement should the need arise. The spare unit will be on the shelf and powered up so it will be up to date with the information stored on the production presses. Should the customer desire to include additional channels (i.e. pressure, temperature, etc) the PXI/SCXI chassis can easily accommodate several modules for expandability.

In Conclusion

Data Science Automation, Inc. was able to use the modularity of the National Instruments PXI chassis to deliver an industrial solution with the functionality needed by the customer. The ability of the NI product line to seamlessly connect to the customer's service proven sensors was critical to this solution. By selecting the LabVIEW development environment we were easily able to reproduce the capability of the existing system and introduce the needed new functionality that the customer required. The application is now structured in a modular type architecture which will allow for easier future enhancement. The customer also benefits from the easy to follow application code as compared to the proprietary C based code which was a challenge to understand and modify. Equally as valuable is the knowledge that the components are industry standard and available, off the shelf, for replacement if necessary.

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