flotek.g 2017- "Innovative Solutions in Flow Measurement and Control - Oil, Water and Gas"
August 28-30, 2017, FCRI, Palakkad, Kerala, India.

Application of SCADA in Valve Testing Automation

Muthukumar. V
McWANE India Private Limited
Coimbatore, INDIA.
v.muthu@mcwaneindia.com

ABSTRACT

The Industrial Control System (ICS) for valve testing includes the use of Programmable Logic Controller (PLC), Distributed Control system (DCS) and Supervisory Control and Data Acquisition (SCADA). The SCADA system plays major role in implementation of automation in industrial automation, distribution network and product testing.

This paper explains the use of a SCADA system in an automated valve testing environment. This environment will be illustrated with data acquired from a SCADA system. The automation is enhanced by constant monitoring of the process using a SCADA screen which is connected to the PLC with communication cables. The SCADA screen monitors the entire process, which is in turn controlled by setting the tag values of various variables in the SCADA system.

Usage of SCADA in the valve testing line has increase the reliability, control and efficiency of the testing operation. By using SCADA we not only automate the valve testing but also record all testing parameters and store them in the system for easy retrieval and analysis.

A case study is presented herein where the SCADA is effectively utilized in a valve testing facility. This study illustrates the automation of the valve testing process with SCADA and the auto recording of the valve test details.

KEY WORDS

SCADA, Automation, Valve Testing, Type Test.

INTRODUCTION

Recently SCADA has arisen as one of the best solutions for industrial automation. The SCADA system plays a vital role in industrial automation, since it helps to maintain efficiency, process data for smarter decisions and communicate system issues to help mitigate downtime.

Implementing the SCADA system enables the user to timely monitor and remotely controls the valve testing operation. The field instruments and devices are linked to the SCADA engine and PLCs allowing us to trigger and control any instruments or devices connected to the system. Monitoring live data and system status via the SCADA screens is also easily accomplished. This system has proven especially for type-test / cyclic-test of the valves. It benefits both the operator and supervisor to run the process automatically, which significantly reducing the labor cost and human errors.

ARCHITECTURE

The basic SCADA architecture begins with a human machine interface (HMI), programmable logic controllers (PLC) and/or remote terminal units (RTU) as well as field instruments and control systems. PLCs are microcomputers that communicate with an array of objects such as factory machines, HMIs, sensors, and end devices, and then route the information from those objects to computers with SCADA software.

The architecture of SCADA system is explained in **Fig.1**

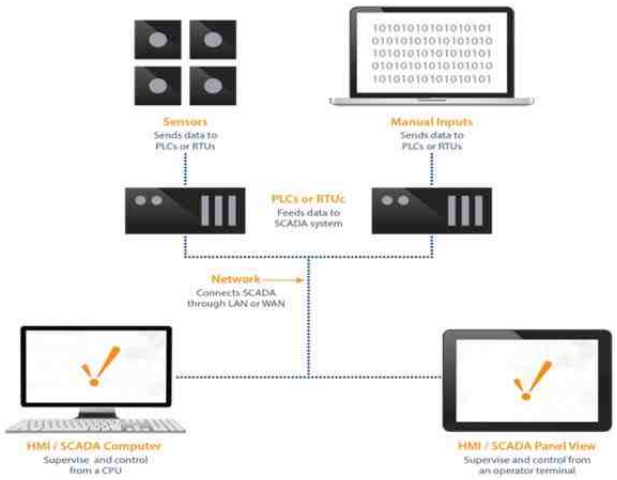

Figure 1 - Architecture of SCADA system.

The HMI processes the data from each tag and sends the information to the SCADA screen, where the operator can monitor and control the system. The supervisory system gathers the data sent from each tag and sending commands or operations to the process. The RTUs connects the sensors and also convert the sensor's signals to digital data. This data are transferred to the supervisory system, where it can be stored in a distributed database. PLCs are used as field devices because they are much more versatile and economical than process-specific RTUs. Finally, the communication infrastructure delivers connectivity to the supervisory system and then to the RTUs and PLCs for the user to command. The communication infrastructure is necessary to relay data from remote RTU/PLCs, which run along electric grids, water supplies and other testing devices.

In the specific terms of using a SCADA system in the valve testing operation, you also get the following functions:

Control and monitor the process remotely:

SCADA software enables remote monitoring and control of process operations in real time and it eliminates the need for site visits by personnel for inspection, adjustments and data collection.

Data logging and reporting:

Required live data can be selected and logged into a database. Based on the requirements this data can be plotted into graphs or charts, and reports generated automatically.

Alarming:

Get alerted instantly by alarm notification from any minor unwanted events to critical incidents. You can monitor these alarms all the time on HMI screens, or configure your SCADA to send you notifications via phone calls or messages.

Scripting / Calculation:

There are times where your process operation requires the calculation of some parameters. This can be easily achieved with a SCADA system. Most of the SCADA engines and software comes with the automatic scripts that enables the operator to configure the system required logics and calculations.

VALVE TESTING

As per EN / ISO / BIS standards guideline, the valve type test requirements are automated by using the SCADA system for the following valve types,

- Gate Valve
- Butterfly Valve
- Check Valve
- Air Release Valve
- Control Valve

The valve type tests are not only limited to the following tests, as it may vary based on the product types,

- Shell Test
- Seat / Leak Test
- Obturator Strength Test
- Torque Test
- Endurance / Cyclic Test

Test Results:

Based on the test requirement and inputs set into the SCADA system, the test progresses and outcomes are monitored through SCADA screen and the entire test

results are stored in the system and can retrieve the test data easily at any time for review and analytical purpose.

THE BENEFITS OF SCADA

When applied properly a SCADA system can help us to save time, cost and reduces the human errors. Some of the major benefits of a SCADA automation system are listed below.

- Safety of workers and equipment are increased through predefined processes managed by a SCADA system.
- Engineering costs, time and risks are reduced through easy integration with all your plant devices.
- Resources, such as people and plant assets, are optimized as SCADA promises high level control over the plant environment.
- Productivity is increased via analysis of processes used to improve plant and production efficiencies.
- Maintenance costs are reduced through centralized control and monitoring, that minimizes downtime.
- Quality is improved because the analysis of process data can result in preventing errors before they occur.
- Operators are more effective using SCADA because it consolidates the various plant processes and provides them with a comprehensive overview of operations.
- Alarms are centrally managed which improves operational effectiveness by not overwhelming operators unnecessarily.
- Integrating SCADA with a historian package and other business systems will connect the plant floor to the boardroom by sharing real-time and historical data.
- Mobility solutions provide operators with the freedom to observe operations first hand, no matter where they are.

CONCLUSION

SCADA systems are designed for web based connectivity eliminating cumbersome cable connection systems.

While SCADA platforms provide a vast number of benefits and reduce the cost and downtime of the system, there are still security threats that need to be addressed.

The goal of SCADA platforms is to provide users with quick access to PLCs/RTUs and provide simplistic integration of this equipment control to user interfaces.

ACKNOWLEDGEMENT

Author extended their gratitude to McWANE India Pvt. Ltd. colleagues and Mr. Saravanan, Manager of Mansco Fluidtek Pvt. Ltd. for their supports provided for this paper presentation.

NOMENCLATURES

SCADA	: Supervisory control and Data Acquisition.
PLC	: Programmable Logic Controllers
ICS	: Industrial Control Systems
RTU	: Remote Terminal Units
HMI	: Human Machine Interface
FI	: Field Instruments, which are includes Actuator, Sensor and other Electronic devices
EN	: European Standard
ISO	: International Organization for Standardization.

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