Pre Development of Automation Based Alarm Management System

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Abstract: The architecture of today’s automation based distributed control and data acquisition systems allows integration, control and monitoring of various plant control systems from a centralized operator interface. This paper describes the approach used in establishing the design of DCS implementation in several Power Plants. Key aspects associated with the control system architecture, integration with plant control systems, and graphical operator interface are investigated. In addition, the role of the plant control system has been expanded from just process visualization and control to include process optimization, plant asset management, energy management, and inventory control. Cement plants can now use the process control systems to improve operational and energy efficiency.

Abnormal Situation is a disturbance or series of disturbances in a process that cause plant operations to deviate from their normal operating state. They happen when the automated control system can not cope and consequently, the operations team must intervene to supplement the control system. These disturbances may cause a reduction in production; in more serious cases it may endanger human life. They extend, develop, and change over time in the dynamic process control environments increasing the complexity of the intervention requirements. Hence there is a need to develop advanced alarm management system.

Keywords—Triconex, DCS, SCADA, EEMUA, PAM.

1. Introduction

Alarm management system is one of the most important and underutilized aspects of process automation in today’s automation world. In various cases, alarm systems do not receive the attention and resources that are warranted on the plant. This is understandable because alarming is a deceptively very easy and simple activity. Many plant operators in industry till uses the philosophy of alarm management developed by the engineering firm when the plant was built.

Alarm management is a supervisory application that users can choose to merge into the collaborative process automation infrastructure. Its most important function is as a tool to enhance the performance of the heritage alarm systems and the process. Justifying the cost of DCS based advanced alarm management system for a plant is a demanding task for the designers and Operators.

When executing an alarm management programmed, the goals and objectives of that programmed must be clearly communicated to all the staff who is involved, including operations, engineering, and plant management. Dedication from plant operator is especially crucial to a successful alarm strategy execution.

The alarm systems used in today’s industries are a common headache for all industrial operators around the world. Nowadays the alarm system which is using in industries is not highly precise and advanced. We are not able to see the total update of alarm systems. These are totally analog based operating systems. Hence there is a high possibility of data loss.

Hence there is a need to develop perfect alarm management system to handle system functions for better industrial automation control. The alarm management system which provides security in industries at different levels such as engineer level, entrepreneur level, and operator level is urgently required in industries. Hence we are designing an advanced alarm management system which satisfies all these requirements which is based on Distributed Control Systems.
2. Objective
To develop DCS based advanced alarm management system. Also to design the SCAD A screen for the purpose of monitoring as well as controlling some functions of the system.

3. Related Work
Today’s large scale industrial automation projects are costly and require more time. Hence there is a need to develop new advanced technology which is time saving. Hence Distributed Control System based system architecture is developed. This technology reduces the requirement of hardware as well as cost of the system. This is because of virtualization of controllers and the reduction of hardware cost and labor.

According to the increasing number of statutory requirements as well as insurance aspects, nowadays the plant operators are not avoiding to deal with the topic of alarm management systems in industry. A systematically planned and ideally set alarm management system provides a economical benefit and safe as well as stable operation in the plants in all industries. The ideal alarm management system very effectively contributes the increasing the process of safety and the availability of a plant, ensuring the quality of product as well as reduction in costs.

The very ideal way for the improvement of handling of alarm management system is the reliefness of the plant operators and operator’s systematic guidance during plant operation. The useless and unimportant alarms are strictly avoided from the plant. The reduction in the alarm provides the plant operator the necessary freedom to ensure reliable and safe operation control.

4. Flowchart
The step by step explanation of this alarm management philosophy is shown below

5. System Architecture
The system architecture of this project is given below. It includes the operator station for monitoring plant instruments and alarm status, Engineering station for maintenance and design, Automation station for storage of DCS hardware and plant overview where various instruments are installed whose status is to be monitored at the operator station and if any abnormal condition occurs so that operator come to know the error of the process parameter and can take corrective action.
6. Proposed System

This project is based on industrial automation and DCS is the heart of this project. The hardware and software these two are important areas in this project.

6.1 Hardware Description

In this project we used Triconex DCS for operating the whole plant and Triconex PLC for controlling the inputs and outputs. The PLC we used in this project is a compact PLC which has fixed number of inputs and outputs. We have to monitor and control the alarm strategy of six Km plant by using automation system.

6.2 Software Description

In this project mainly we are using two softwares. These are

- Tristation software and
- Wonderware Intouch

There are five important languages which are used for the programming. They are as follows

- Functional block diagram
- Ladder logic
- Structure text
- Instruction list
- Flow chart

Out of these languages, ladder logic is the simple and most widely used language as compared to other languages.

7. Ease of Use

Distributed Control System

Distributed Control System has made the process of monitoring and controlling in industries very effortless and flexible. This is a very easy way to handle a powerful management system. The process and maintenance of industrial process has been simplified because of very wide spread use of architecture of Distributed Control System. In future the process of automatically operated machines will be fully based on artificial intelligence. Artificial intelligence may be the key technology in near future, whereas the entire concept of computer integrated manufacturing will be managed by this DCS based automatically operated technology.

This reduces the need of manpower required in industry. But the reduction of manpower in industry not affects the safe operation of any plant because the processes are being monitored by operator station on field as well as in industry. As a result alarms are issued without any time delay through the provision of horn in alarm management system. Therefore DCS controlled and monitored the function of power plants safely and with the higher efficiency.

Benefits of alarm System

Nowadays almost each and every industry uses alarm management system. There are a lot of advantages as well as disadvantages of this alarm management system. Here we are developing this poor alarm management system and convert this into the advanced alarm management system. By using this DCS based advanced alarm management system we will operate the whole plant automatically. The benefits of this developed system are as follows.

- Compliance with the better practice
- Enhanced safety measures in alarm systems
- Decreases maintenance costs and better plant operation
- Enhanced production and human performance
- Reduces the workload of operator
- Enhanced the shift handovers
- Decreases the rates of insurance

**Well Designed Alarm System**
The purpose of an alarm management system is to attract the operator’s attention towards plant conditions requiring timely assessment or action of alarms.

- To alert, inform and guide the plant operators about alarm management systems
- To prevent unwanted shutdown in the alarm systems
- Only present the industrial operators with beneficial and relevant alarms
- Use prioritization to highlight the typical alarms
- Have a detailed response to each and every alarms
- Allow suitable time for the plant operator to response.

**8. Selection Criteria For PLC**
While selecting a PLC, various factors are considered as per the application. The important factors are

- Number of Inputs and Outputs.
- Scan time
- Communication Protocol
- Memory Size
- Software

Different PLC’s are having different configurations of input and output module. Compact type PLC has fixed inputs and outputs. Expansion modules are also available to increase the number of I/O but they are compatible only with the high end modules.

**9. Operator Station**
SCADA stands for Supervisory Control And Data Acquisition System. Previously without SCADA an industrial process was controlled by PLC, PID and Microcontrollers having programmed in certain languages. These programs were either written in assembly language or relay logic without any true animation that would explain the process running. With the development of SCADA now we can view the graphical animation of the whole plant and also can control limited but important function through the software. Now a days all the control systems are coupled with HMI or SCADA as it gives an animated view by sitting at one place while the plant is at another place.

Various vendors of SCADA are

- Wonderware – Intouch
- Siemens – WinCC
- Movicon – Progea
- Delta – Winlog
- GeFanuc – Cimplicity

In our project we have used Wonderware Intouch as it is easy to interface the PLC with this software.

**10. Interfacing Of Operator Station with DCS**

The very first step is the installment of software of SCADA on the server. Various protocols are used for the interfacing of the DCS and the server. The most widely used protocol is serial protocol i.e. RS-232 for serial communication. The inputs and outputs are connected to the DCS and they work on the ladder logic provided by the user. The main advantage of SCADA system is that we can monitor and control some limited functions through the software without being present near the plant.

**11. Limitations**
The limitation of this system is that this automation system reduces the number of labors in industries because of this the problem of unemployment may increases. Also this is very costly system.

**12. Conclusion**
The purpose of this project is to develop DCS based advanced alarm management system. I gained more knowledge about various processes directly used in industries which are used in automation system in which I specially learnt about PLC, DCS and SCADA.
Implementation of automation in the plant increases productivity which in turn increases the economy. Installing DCS in the system makes it handy to control the entire system. Although the initial investment is high as the DCS and its components are far costlier as compared to other methods. The language used for the programming of the DCS is ladder logic and FBD. These languages are very useful since most of the industrial applications use these languages. One of the most important feature in this system is the implementation of SCADA. This SCADA technology is growing fast and will be very famous in the coming years. Mainly SCADA is used for the monitoring purpose but we can also control some functions by using SCADA system.

13. References


