CHAPTER 3

SCOPE, OBJECTIVES AND OVERALL EXPERIMENTAL PLAN

3.1 SCOPE FOR THE PRESENT RESEARCH

Remote monitoring and control with fault diagnosis has been a challenging task for the engineers and researchers. Especially in industrial applications it requires much more research and development to realize efficient operation. Information reporting system from a remote location, secured architecture for monitoring, development of fault diagnosis for Distributed Control System (DCS) and experimental investigations are core areas that need attention.

Detailed analysis of various web-based remote monitoring and control systems shows that most of the difficulties exist in architecture, data transfer, Web-based Graphical User Interface, multiple user access, security and safety. Also, development of a better framework of fault diagnosis system for Distributed Control System becomes essential for industrial applications since very few efforts have been made in this direction.

The non availability of proper experimental facilities regarding remote monitoring, control and fault diagnosis systems for DCS has made it necessary to develop such systems for verifying the performance without the risk of handling the actual industrial processors. This research work tries to address these issues and proposes methods and procedures to advance the real time web enabled remote information monitoring and fault diagnosis in DCS research to the next level.
3.2 OBJECTIVES OF THE STUDY

The focus of this research work is to develop a remote monitoring, controlling and fault diagnosis system which is based on Supervisory Control and Data Acquisition (SCADA) and Virtual Private Network (VPN).

The following objectives have been adopted:

(i) Studying the various Web-based remote monitoring and control systems and different web related features such as network communication architecture, web-based user interface, communication latency and security aspects.

(ii) Developing experimental setup for remote monitoring and control which mainly focuses on reliable security, multiple user accessibility and easy data transfer so as to make effective and efficient monitoring.

(iii) Developing a framework and fault diagnosis system for DCS for better plant operation.

(iv) Implementing and testing the above framework in DCS and validation of the effectiveness of the system.

However scope of the experimental work is limited to remote monitoring, control and fault diagnosis using the experimental setup developed for this purpose.

3.3 OVERALL EXPERIMENTAL PLAN

Based on the detailed literature review and observations from industrial practice the experimental methodology consisting of three stages is framed as shown in Figure 3.1. In the first stage typical two dissimilar process control experimental setups with two controllers are tested with the developed Web-based remote monitoring, control with alarm and report function over secured network architecture.
In the second stage, design and implementation of Web-based remote supervisory control and information system is tested with proposed architecture and flexible Web-Based Graphical User Interface (WBGUI), Multiple-User access level and web-based report. In the final stage, a real-time Web-enabled platform for information monitoring and fault diagnosis in a Distributed Control System is proposed and tested.

3.3.1 Experimental study – I

In the first stage, study and implementation of Web-based supervisory Control and Information System (WBSCIS) in Multi Process Experimental Setup is focused. The objective of this work is to understand the design and implementation factors such as remote monitoring architecture, Web-based Graphical User Interfaces, multiple-user access level and security accepts that impact Web-based remote monitoring, control and report function.

The experimental setup consists of two different processes, Level process experimental setup and Flow - Pressure experiment with an independent Programmable Logic Controller (PLC) with common Supervisory Control Data Acquisition (SCADA).

3.3.2 Experimental study – II

In the second stage, in order to show the applicability and effectiveness of the design and implementation of web - based remote supervisory control, the information system is tested with a typical industrial process temperature control experiment setup. The implementation of industrial process control is made possible by the use of Internet, PLC controlled by PC and SCADA.
Figure 3.1 Overall Experimental Plan
3.3.3 Experimental study –III

A novel real-time web-enabled platform for information monitoring and fault diagnosis in a Distributed Control System with expert decision support is proposed. The on-line monitoring and maintenance system is a vital tool for the operator and for the plant engineer to know the status of the distributed control system. This novel web-based expert service support maintenance has the system of integrating hardware and software which reduces the distributed control system's service maintenance. Real-time on-line diagnosis helps plant engineer to maximize the plant operation.