*Quest Journals*
*Journal of Software Engineering and Simulation*
*Volume 9 ~ Issue 5 (2023) pp: 37-40*
*ISSN(Online) :2321-3795 ISSN (Print):2321-3809*
www.questjournals.org

**Research Paper**

# Water for Injection SCADA Application

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***Abstract:***
*SCADA(Supervisory control and Data Acquisition) is a category of software applications for controlling Industrial Processes, which is the gathering of data in real time from remote locations in order to control equipment and conditions. SCADA provides organizations with the tools needed to make and deploy data-driven decisions regarding their industrial processes.*
*SCADA systems include hardware and software components. The hardware gathers and feeds data into field controller systems, which forward the data to other systems that process and present it to a human-machine interface (HMI) in a timely manner. SCADA systems also record and log all events for reporting process status and issues. SCADA applications warn when conditions become hazardous by sounding alarms.*
*Typically, these are supported on Microsoft Operating system and hence easy to install and maintain. The scada applications also support Server-Client architecture and hence monitoring/control same plant from various locations is also possible.*
*Now a days scada applications are also visible over internet and on Mobile phones, which helps the managers to keep eye of key process parameters regularly without any manual intervention.*

***R**eceived 01 May, 2023; **R**evised 08 May, 2023; **A**ccepted 11 May, 2023 © The author(s) 2023.*
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## I. Introduction:

For this project the process which our group identified is 'Water for Injection'. The scada application was designed for this process. For Pharmaceutical production, purified water is a very important raw material. As the normal water is not 100% purified, need to process it to purify the same.

We have designed scada to monitor and control the Water Purification plant. The project contains various process screens, real time parameters from process. The critical alarms are displayed in standard scada Alarm Summary object, where operators can view alarms and take proper action. For process History, Historical Trends are configured to monitor important process parameters History.

Process Batch Reports were designed to understand the quality of the water to be used for further production purpose. Scada Security was configured to avoid unauthorized access to application.

## II. Literature Survey:

Water for Injections is used to dissolve and dilute other drugs that require mixing with water before they can be given as an injection or an infusion (a drip) into your veins, muscles, or other tissues in the body.

**(1) The article published by Interpharm/CRC This edition published in 2011 by Informa Healthcase, London.**
**Pharmaceutical Water, second edition** has a good information about various types of water needs in pharmaceutical industries, water impurities and various methods of water purification.

**(2) As per article of ScienceDirect for Training Program Lessons for Teaching Programming of SCADA System,** GE iFixscada programming concepts were learnt. It helped to develop the various screens, Parameters, Logics in iFixscada while working on this project.

**(3) Kevin Collins's book PLC Programming for Industrial Automation:** This book was referred to understand PLC logic and ladder programming. With the help of this book, a logic was developed for this Project.

**(4) Tracy Syrstad's boof VBA and Micros**. This book helped to understand the VBA scripting. iFixscada support VBA programming and with the help of this book, we could be able to develop the scrips for this project. Various VB functions and variable were clearly mentioned in this book in a simple way to understand those quickly.

## III. Block Diagram:

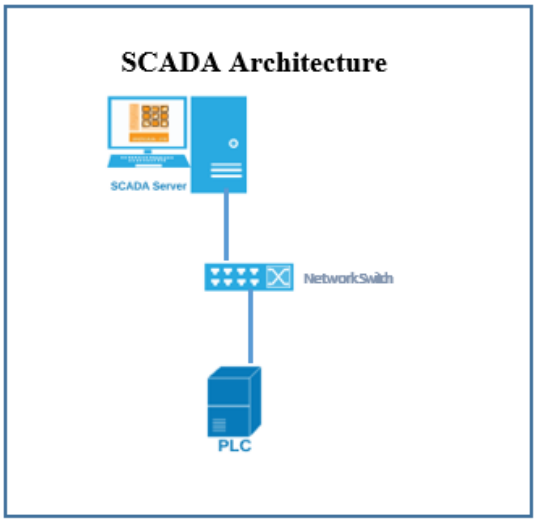


**Fig 1:** Block Diagram

## IV. Hardware Components:

### 4.1 Desktop/Laptop System

Since GE iFix SCADA is a Windows based software, need a Laptop/Desktop with Windows Operating system. We have selected a Laptop with Windows 11 Operating System for this project. Microsoft Office and other supporting softwares too preinstalled on the system. The Desktop should be having a good resolution to develop the HD screens for the SCADA.

### 4.2 Programmable Logic Controller:

PLC is the main control unit where the Process is mapped in PLC Ladder Logic. Various plan sensors to be connected to the PLC to read the various parameters from field and also to control the output devices. A PLC programming software is also required to program the PLC as per the process need. Once the logic was developed, it was tested with the help of programming software and modified as per need of the process. A Power supply is also required to power on the PLC. The communication port of the PLC to be configured to establish communication with SCADA over standard communication protocol.

## V. Software Used:

### 5.1 Kepware Communication Driver

The Kepware communication driver is used to establish communication with PLC over standard communication protocol. The driver has built in any communication drivers available for Siemens, Mitsubishi, Rockwell, GE PLCs etc. and hence has plug and play capability to establish communication with PLCs or controllers.

**5.2 GE Digital SCADA IFix**

iFix is the standard SCADA software used to develop a HMI program for various process controls. It has bult in Graphics developer, alarms, Historical Displays etc. A bult in scripting environment allows to write various logics within scada application. Proficy iFIX collects industry data and delivers the information directly to operators, managers and others in the company who need data. The result is better control and monitoring. With this information, managers and staff can make the right decisions faster.

## VI. Process Block Diagram:

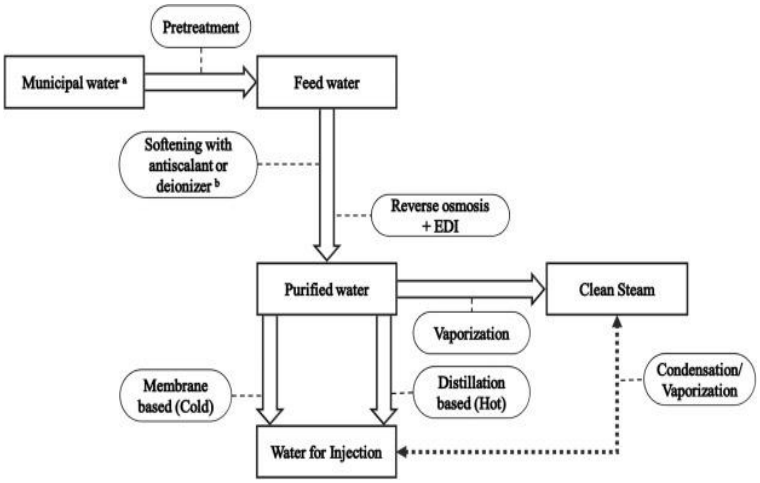


**Fig 2: Process Block Diagram**

## VII. Methodology:

The SCADA application was designed for Water for Injection process. This is typically a need at pharmaceuticals plants where a pure water is needed to producing injections and medicines.

A overall process was understood with the help of various literatures available. A control logic was developed to control the various processes through the purification cycle. PLC is used to write a control logic for controlling various processes for the process parameter read by the PLC modules.

A SCADA application was developed as per the P&ID drawings selected for the Water for Injection Process. Communication was established with the PLC with the help of Kepwae communication driver and all critical parameters were mapped in communication driver to read real time values from the plant.

The SCADA has various features with respect to the process application and hence configured various features like alarms, Historical Display, standard scada objects for Water for Injection scada application.

The application was tested by opening various process graphics and by operating the various output devices from the graphics. Alarms and events were monitored at application level based on the process. Historical Display was checked with various pens selectin for the process duration.

## VIII. Experimental Setup:

The Hardware setup of the overall system is shown in the fig.3

Fig. 3. Application Setup

## IX. Conclusion:

Thus,this application will help various pharma end users to produce pure water for producing injections as well as medicines in regulated environment. The system also records the system information for further analysis.

The application is purely operated from system without any manual intervention on plant and has also alarms to take preventive actions before any incident occurs in plant.

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