**A**

**INDUSTRIAL TRAINING REPORT**

**ON**

# LAXMI ORGANICS INDUSTRIES LTD, MAHAD


Submitted by

**Diksha Pundlik Kharvilkar**

**(2130331372505)**



**Department of Electronics & Telecommunication Engineering**

**Dr. Babasaheb Ambedkar Technological University, Lonere**

**Lonere-402103**


**2021-2022**

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# ACKNOWLEDGEMENT

Words are inadequate to express the overwhelming senses of gratitude and humble regards to head of department of electronics and telecommunication engineering for constant motivation, support, expert guidance constant supervision and engineering suggestion for the submission of my progress report of training work "**LAXMI ORGANICS INDUSTRIES LTD, MAHAD**".

I express my gratitude to department of electronics and telecommunication engineering for in valuable suggestion and constant encouragement all through the training work. I would like to thank Mr. Yogesh Patil sir for providing all the facilities and support during my training work.

**Diksha Pundlik Kharvilkar**

**(2130331372505)**

**Third Year ExTC**

# CERTIFICATE

This is to certify that the Industrial training done in company entitled "**LAXMI ORGANICS LIMITED M.I.D.C. MAHAD"** submitted by **DIKSHA PUNDLIK KHARVILKAR (Roll no. 2130331372505)** is record of bonafide work carried out by him under my guidance in the partial fulfilment the requirement for the award of Degree of B.Tech. in Electronics and Telecommunication Engineering course of Dr. Babasaheb Ambedkar Technological University, Lonere (Dist. Raigad) in the academic year 2022-2023.

**Prof. S. L. Nalbalwar**
(Prof. & Head of Department)

Electronics and Telecommunication
Engineering
Dr. Babasaheb Ambedkar Technological
University
Lonere-Raigad 402103

**Examiner**

**Prof. Prashant P. Mahajan**

Date:

Place:

# INTERNSHIP CERTIFICATE

**LAXMI ORGANIC INDUSTRIES LTD**
Chandermukhi, ThirdFloor, Nariman Point, Mumbai 400021, India
+91 22 49104444 info@laxmiorganic.co.in www.laxmiorganic.co.in

LOIL/MHD/
07.11.2022

**TO WHOMSOEVER IT MAY CONCERNED**

This is to certify that **Diksha Pundlik Kharvilkar** a student of Dr. Babasaheb Ambedkar Technological University (BATU) institute who is pursuing Third Year of Bachelor in Engineering (Electronic & Telecommunication Branch).

She has successfully completed Industrial Training in our organization for the period from 21st October 2022 to 7th November 2022 in Instrumentation department.

We wish her all the best for her future endeavors.

**For Laxmi Organic Industries Limited,**

LAXMI ORGANIC INDUSTRIES LTD MAHAD

**Yogesh Patil**
**Sr. Manager - HR**

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# LIST OF FIGURES

# 1. INTRODUCTION TO COMPANY

Laxmi Organic Industries is a specialty chemical manufacturer, focused on two key business segments: Acetyl Intermediates and Specialty Intermediates Since its inception, the company has maintained a constant focus on innovation, creativity and speed, which has enabled it to meet with new challenges and service new opportunities across the world.

The Company primarily manufactures Ethyl Acetate Acetic Acid and Diketene Derivative Products (DDP). DDP is a specialty chemical group the technology and business of which has been acquired by LOIL from Clariant Chemicals India Limited. Laxmi Organic Industries Limited was incorporated as a Public Limited Company on May 15 1989.

**Company: -** Laxmi Organic Industries, Mahad.


**Fig no. 1 Board of Laxmi organics ltd, Mahad**

# 2. THE INDUCTION PROGRAM


**Fig.2 Entrance of industry, Unit 2**

Introductory presentation was delivered by training in-charge where aim and objectives of Laxmi organic industries were conveyed. Laxmi organic is leading manufacturer and raw material supplier of Agrochemical, Synthetic chemicals, Dyes, and Pharmaceuticals.

The overgrowing demand of vital chemicals in this industry are monitored and controlled by powerful industrial grade hardware and software like Distributed Control System (DCS), Programmable Logic Controllers (PLC) and SCADA Software. This all work together in precise controlling and monitoring of vessels, power generators, backup management, data handling, real-time value measurement and controllers, boilers and distillers.

Safety is responsibility of every individual as emergency situation may occur at any moment, such drastic change in moment may lead to serious accidents, so importance to safety is mandatory.

# 3. SAFETY INSTRUCTION

**1)** In-case of fire, crawl down and try to find exit or open window


**Fig no. 3.1 Exit Door**

**2)** In-case of gas leak, cover your face with wet cloth or clothes you wearing and evacuate as soon as possible.

**Fig no. 3.2 how to cover face**

**3)** In-case of emergency, listen to instruction given on public addressing system and gather at recommend gathering point are nearest to you, example open space, admin office, reception gate, front gate, etc.


**Fig no. 3.3 Emergency evacuation**

**4)** Many other instructions were given like always wear helmet while touring plant, use glove before touching any instruments and put hard toe safety shoes before entering plant or manufacturing plant.


**Fig no. 3.4 Mandatory safety rules**

**5)** Never tour inside plant without supervision of plant in-charge or worker working in same plant.

**Fig no. 3.5 Plant tour under supervision**

After introductory session, H.R Mr. Yogesh Patil Sir conducted basic interview to ensure we had knowledge of chemicals and working of control systems. Because while entering in active production plant there are many safety measures that are to be considered to ensure safe and comfortable working and monitoring environment. Having basic knowledge of chemical reactions, hazards and electrical safety measures like static charge and flames are crucial while touring running plant , hence we all were ask to wear anti-static shoes and full body covered cotton clothes and hard-type helmet to avoid accidents and maintain safety. As safety is priority in each factory.

# 4. PLANT SURVEY AND TOUR

We were guided by plant head Mr. Sandeep Ranaware Sir, who firstly told us importance of safety equipment and how to properly put safety gears. Then he took us to main manufacturing plant that was Plant Alpha. In this plant we studied the pressure gauges and real time digital and analog monitoring system. Sir showed us the wiring engaged in distributed control system (DCS) and its importance. The connections looked very complicated but sir explained each and every part of process in easy-to-understand language with practical application like, chemical reactors equipped with automatic pressure control and monitoring hardware are just like pressure cooker at home and whistle which is like automatic control and monitor. Then sir showed us presentation on distributed control system , in which various types of gauges and meters were shown, where we saw precise monitoring of fluids and exact delivery of chemicals at specified time and temperature, mostly all chemicals are temperature sensitive used in boilers and vessels, auto-misation in such processes is crucial, because manually controlling such quantity in milligrams and very delicate temperature retention is practically not possible hence use to powerful software and hardware is very vital in such industries, which is time efficient and very accurate. Then we were asked some question regarding chemicals and their reaction phases, it was to ensure we were aware about reactions and how to deal with acids and strong bases in-case of contact with them.

# 5. THE ALPHA PLANT

This is main plant or Laxmi organic limited, where initial raw material is brought and prepared for further treatment, alpha plant is initial and main treatment phase which involves preparation of raw materials into useable chemicals for various further processes. The process that is employed at a chemical process plant normally involves steps known as unit operations. Each unit operation is usually carried out in a separate unit, or area, of the chemical process plant. The units are usually connected to one another in a way that allows materials that be transported to the next unit when each operation is complete. Chemicals and chemical-based products need to originate from other things. The first unit operation in a chemical process plant is usually the input of raw materials, also known as feedstocks. A feedstock not only refers to the first raw materials introduced into the process, but can also refer to material that is entering a certain unit. Output in a chemical process plant can refer to matter that has completed a unit operation and is leaving a specific unit. It can also refer to matter that has completed the entire chemical process and is ready to leave the plant. A product or chemical completed at one chemical process plant may still be only in its first stages. Output from one plant is often feedstock for another. The facilities where these chemical processes are employed are usually designed by chemical engineers. Building a chemical process plant is not as simple as employing people to erect the structure and connect pipes and electricity. Unlike other structures, such as stores or office buildings, there is a lot more consideration that needs to be taken with chemical process plants. The feedstocks and output from these industrial facilities may be hazardous or toxic. Serious damage to the environment or human and animal health could occur if the chemical process is not properly contained. To ensure safety, chemical engineers must assess how certain chemical processes will affect the materials they interact with. Chemical engineers must also assess the configuration that will allow the chemical process to achieve its goals.

# 6. THE REMOTE MONITORING SYSTEM

Communication in today’s world is fast, reliable, and has found its way into many manufacturing fields. One advantage of instantaneous communication is remote monitoring. Remote monitoring can monitor numerous processes such as leaks, maintenance, vibration, emissions, data, pressure, voltage, and other preventable issues. Many industrial manufacturers focus on network-compatible devices to allow easy remote monitoring with other components and monitoring systems.

Remote monitoring tracks a machine's real-time data and performance without the user being physically present at the equipment's site. Remote monitoring helps technical personnel in many ways because industrial and manufacturing units are not limited to single-located facilities; they often comprise more than one site. Remote monitoring also enables the manufacturer to maintain the necessary record of different processes more efficiently. Examples include record safety and retention, which can be difficult in traditional paper-based systems.

## 6.1 Types of Remote monitoring

Remote monitoring is implemented in various industrial applications and monitors several process parameters. These are fed to algorithms and analytics, yielding information contributing to the facility’s overall performance improvement.

**Fig no. 6.1 remote monitoring systems**

Some areas where remote monitoring best benefits manufacturers are the manufacturing process, maintenance monitoring, emissions monitoring, SCADA configuration, and data recovery.

Remote monitoring enables technical persons to visualize a real-time manufacturing process by reading data from sensors throughout the facility. These sensors give information about process variables and can be combined to have detailed manufacturing insight. It also includes alarm management that activates an alarm if the process faces an abnormal condition. In a filling machine, remote monitoring can track the remaining containers, the machine's actual speed, and how much liquid is remaining. The alarm system can be set up for problems related to the motor or a filling pump.

### 6.1.1 Maintenance Monitoring

Maintenance monitoring determines the machine or component's expected operation life and can predict the machine's subsequent breakdown.

Remote monitoring can successfully implement maintenance strategies such as preventive and predictive maintenance. It can record the performance output of a component combined with other parameters such as installation date. Rated output can yield meaningful data regarding lifespan, output efficiency, and breakdown status**.**

### 6.1.2 Emissions Monitoring

Emissions sources are commonly at hard-to-access locations. Concerned technicians may not be able to access the emissions sources during operations due to high temperatures, such as in boilers and power sources. This affects the quality of data monitoring and limits the frequency of data collection.

**Fig no. 6.1.2 control room**

Dedicated sensors collect the emissions data installed at the emissions site. With its analytics, technicians can analyze emissions data for early warnings, such as in a boiler’s fuel combustion system

### 6.1.3 SCADA Configuration and Data Recovery

Remotely monitor SCADA components such as human-machine interfaces (HMIs) and programmable logic controllers (PLCs). HMIs and PLCs often need troubleshooting; for example, during a software upgrade or program re-installation.

Traditionally, the engineer or technician manually approaches the machine and component's compartment with a computer or laptop with software and communication cable to interface with the component. This consumes time for the arrangements of resources, and production faces breakdown.

With remote monitoring, the relevant persons can easily access SCADA components by performing the activity from their workstations.

## 6.2 Different Industrial Remote Monitoring Processes

Remote monitoring is not limited to a single technology, field, or industry. A single machine or process contains different monitoring devices and can be successfully monitored to deliver the results. A few examples include pressure, vibration, voltage and current, and other variables.

### 6.2.1 Pressure

Pressure monitoring is essential for HVAC-related functions such as clean room and air handling units (AHU). The pressure in these systems primarily monitors airflow across purified and contaminated areas and checks on filters' integrity. Pressure remote monitoring allows continuous monitoring, as the system's location can be in hard-to-access areas such as the technical floor for AHUs. The pressure status of any room is a critical value and should not deviate from the standard values. Otherwise, these shifted values indicate disturbance in the airflow pattern, contaminating the controlled area.

These devices' pressure values can be fed to analytics, which presents the pressure profile for easy monitoring and generates an alarm when deviated from the set values. This, in turn, activates maintenance procedures to troubleshoot the problem.

### 6.2.2 Vibration

Remote monitoring of Vibration indicates the health of mechanical and rotating components such as motors and Compressors. The vibration monitoring is implemented as a Maintenance strategy predicting the breakdown before it happens. An effective maintenance strategy is known as Predictive Maintenance.

**Fig no. 6.2.2 banner vibration sensor system**

Vibration measurements are often required frequently or continuously. The vibration measurement systems are usually located at hard-to-access locations and are difficult to implement continuously during operation.

The data from the vibration sensor are collected remotely and then fed to analytics. The analytics then keeps historical trend, which is readily available for the analysis.

Analytics also contains alarms that generate whenever the value exceeds the normal limits.

## 6.2.3 Voltage and Current

Voltage and current measurements are crucial parameters in an industrial environment and represent electric power's condition. Nowadays, manufacturers are moving toward self-generating electric power.

Electricity measurements indicate variables critical for power generation equipment such as health, connected load condition, transmission line, and wiring. This also helps detect any problems with the associated components such as the transformer, switchgear systems, or electrical panels.

**Fig no. 6.2.3 remote monitoring system**

Analytics uses these values to calculate and measure the performance and activates alarms when an abnormality occurs.

### 6.2.4 Process Variables

Manufacturing process variables monitor a machine's essential operation and explain how it behaves according to different production steps. Some parameters useful for implementing remote monitoring include pulse counts, run times, and alarms.

The pulse-count function refers to measuring output. These are particularly essential where the output is countable, such as in a filling machine where the filled containers are calculated, or in blister packing machines where the blister is counted. Pulse counts are monitored remotely for output tracking and product planning in response to demand by the supply chain department. It also prevents mistakes in data, such as human error in traditional paper-based systems.

Run times record total machine running hours with the production process. These production hours are needed for various purposes, such as comparing part failure frequency with machine run hours; output with total run hours daily, weekly, or monthly; and planning preventive maintenance after specific hours of machine operation hours.

These parameters are also monitored remotely and automatically fed to analytics for automatic algorithm processing.

# 7. THE PRODUCT STUDIED DURING TRAINING

## 7.1 Distributed Control System

In recent years, the use of smart devices and field buses makes distributed control system (DCS) to be prominent in large and complex industrial processes as compared to the former centralized control system. This distribution of control system architecture around the plant has led to produce more efficient ways to improve reliability of control, process quality and plant efficiency.

Nowadays, distributed control system has been found in many industrial fields such as chemical plants, oil and gas industries, food processing units, nuclear power plants, water management systems, automobile industries, etc.

A distributed control system (DCS) is a specially designed automated control system that consists of geographically distributed control elements over the plant or control area.

It differs from the centralized control system wherein a single controller at central location handles the control function, but in DCS each process element or machine or group of machines is controlled by a dedicated controller. DCS consists of a large number of local controllers in various sections of plant control area and are connected via a high-speed communication network.

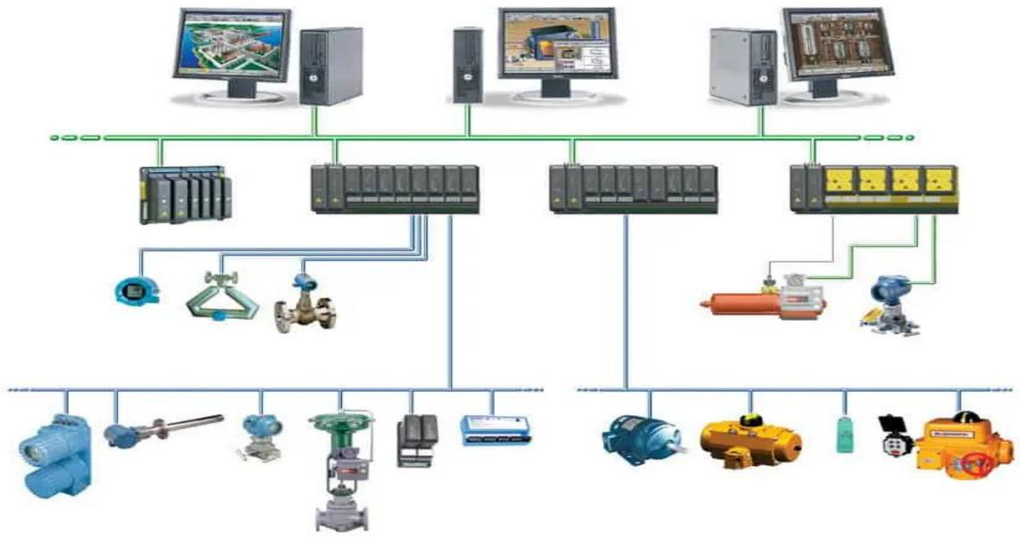

**Fig no. 7.1 Distributed Control System**

In DCS control system, data acquisition and control functions are carried through a number of DCS controllers which are microprocessor-based units distributed functionally and geographically over the plant and are situated near area where control or data gathering functions being performed as shown in the figure above. These controllers able to communicate among themselves and also with other controllers like supervisory terminals, operator terminals, historians, etc.

Distributed individual automatic controllers are connected to field devices such as sensors and actuators. These controllers ensure the sharing of gathered data to other hierarchal controllers via different field buses. Different field buses or standard communication protocols are used for establishing the communication between the controllers. Some of these include Profibus, HART, arc net, Modbus, etc.

### 7.1.1 Architecture of Distributed Control System

As the name suggests, DCS has three main qualities. The first one is the distribution of various control functions into relatively small sets of subsystems, which are of semiautonomous, and are interconnected through a high-speed communication bus. Some of these functions include data acquisition, data presentation, process control, process supervision, reporting information, storing and retrieval of information.

The second attribute of DCS is the automation of manufacturing process by integrating advanced control strategies. And the third characteristic is the arranging the things as a system. DCS organizes the entire control structure as a single automation system where various subsystems are unified through a proper command structure and information flow.These attributes of DCS can be observed in its architecture shown in the diagram below. The basic elements comprised in a DCS include engineering workstation, operating station or HMI, process control unit or local control unit, smart devices, and communication system.

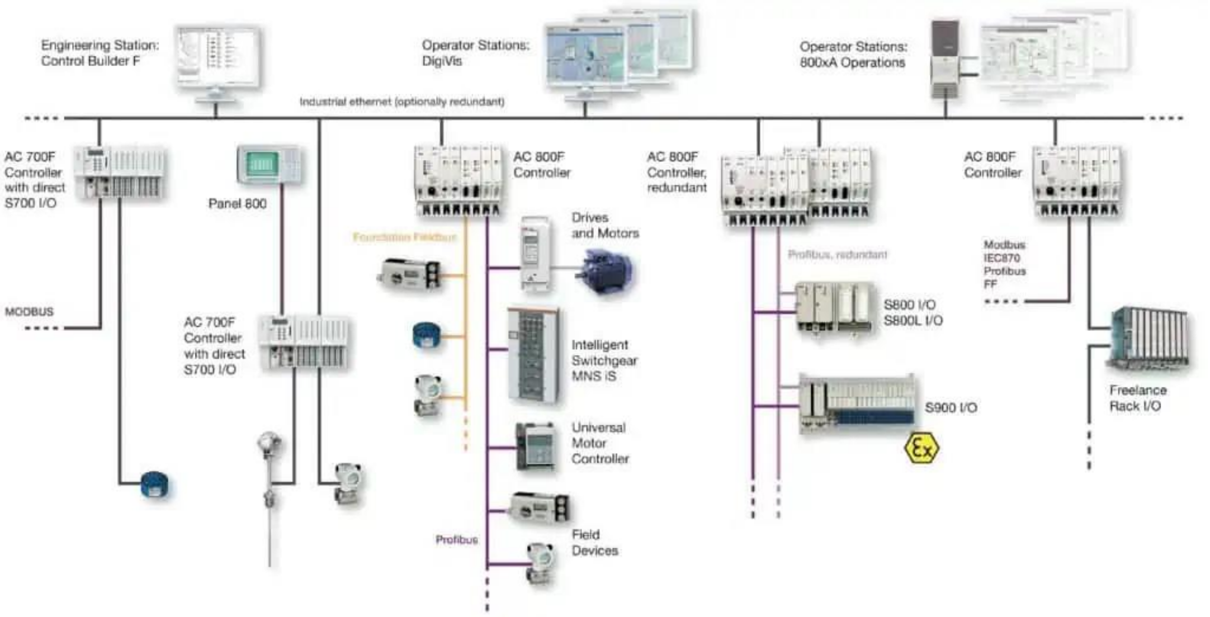


**Fig No. 7.1.1 Architecture Of DCS**

### 7.1.2 Engineering Workstation

It is the supervisory controller over the entire distributed control system. It can be a PC or any other computer that has dedicated engineering software (for example, control builder F engineering station in case of ABB freelance distributed control system).

This engineering station offers powerful configuration tools that allow the user to perform engineering functions such as creating new loops, creating various input and output points, modifying sequential and continuous control logic, configuring various distributed devices, preparing documentation for each input/output device, etc.

## 7.2 Operating Station or MMI

This is used to operate, monitor and control plant parameters. It can be a PC or any other monitoring device that has a separate software tool on which operator can view process parameter values and accordingly to take control action. For instance, it is a DigiVis software tool that can run on a simple PC-environment in case ABB DCS.

Operating stations can be a single unit or multiple units where a single unit performs functions like parameter value display, trend display, alarming, etc. while multiple units or PCs performs individual functions such as some PCs display parameters, some for-trend archives, some for-data logging and acquiring, etc.

### 7.3 Process Control Unit of DCS

It is also called as a local control unit, distribution controller, or process station. A distributed control system can consist of one or more process stations that can be extended with different types of I/O units. These controllers consist of a powerful CPU module, field bus or communication module with extended field bus capability and either direct or remote connected I/Os.

The field devices like sensors and actuators are connected to I/O modules of this unit. Some field devices can be directly connected to field bus (such as Profibus) without any I/O module, which can be termed as smart field devices.


**Fig no. 7.3 Analog I/O Module**

## 7.4 Communication System

The communication medium plays a major role in the entire distributed control system. It interconnects the engineering station, operating station, process station and smart devices with one another. It carries the information from one station to another. The common communication protocols used in DCS include Ethernet, Profibus, Foundation Field Bus, Device Net, Modbus, etc.

It is not mandatory to use one protocol for entire DCS, some levels can use one network whereas some levels use different network. For instance, consider that field devices, distributed I/Os and process station are interconnected with Profibus while the communication among engineering station, HMI and process station carried though Ethernet as shown in the figure below.

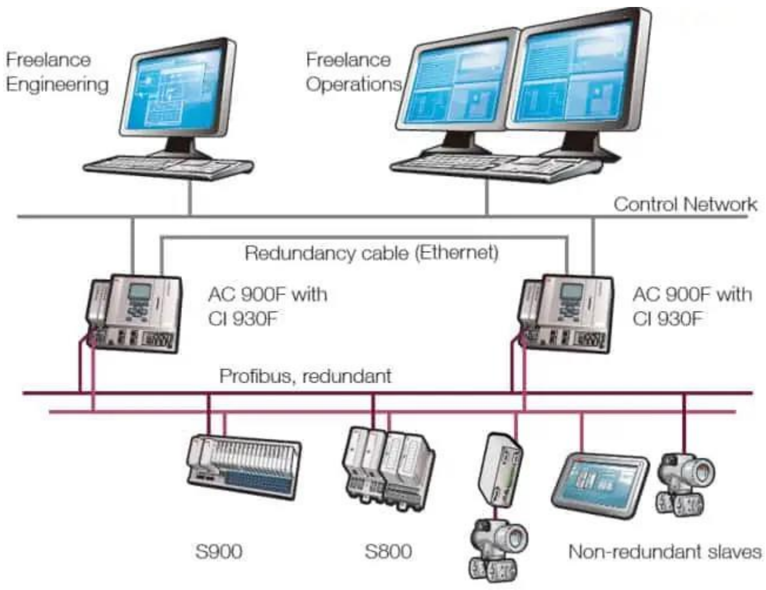


**Fig no. 7.4 Functions and components of DCS**

The major advantage of DCS is the redundancy of some or all levels of the control area. Most of the cases critical processes are installed with redundant controllers and redundant communication networks such that problem in main processing line should not affect the monitoring and control functions because of the redundant processing section.

## 7.5 Smart or Intelligent Devices

The intelligent field devices and field bus technology are advanced features of DCS technology that replaces traditional I/O subsystems (I/O modules). These smart devices embed the intelligence required for simple sensing and control techniques into the primary sensing and actuating devices. And hence it replaces the need for a DCS controller to perform routine sensing and control process. These field devices can be directly connected to field bus so that sourcing of multiple measurements to the next higher level control station is possible via digital transmission line by eliminating extraneous hardware such as local I/O modules and controllers.


**Fig no. 7.5 Smart Transmitter**

## 7.6 Working & Operation of DCS System

The operation of DCS goes like this; Sensors senses the process information and send it to the local I/O modules, to which actuators are also connected so as to control the process parameters. The information or data from these remote modules is gathered to the process control unit via field bus. If smart field devices are used, the sensed information directly transferred to process control unit via field bus.

# 8. DIFFERENCE BETWEEN SCADA AND DCS

Although both DCS and SCADA are monitoring and control mechanisms in industrial installations, they have different goals. There exists some commonality between DCS and SCADA in terms of hardware and its components, however, there are certain requirements by the end applications that separates a robust and cost-effective DCS from the viable SCADA system. Some of the differences between DCS and SCADA are listed below.

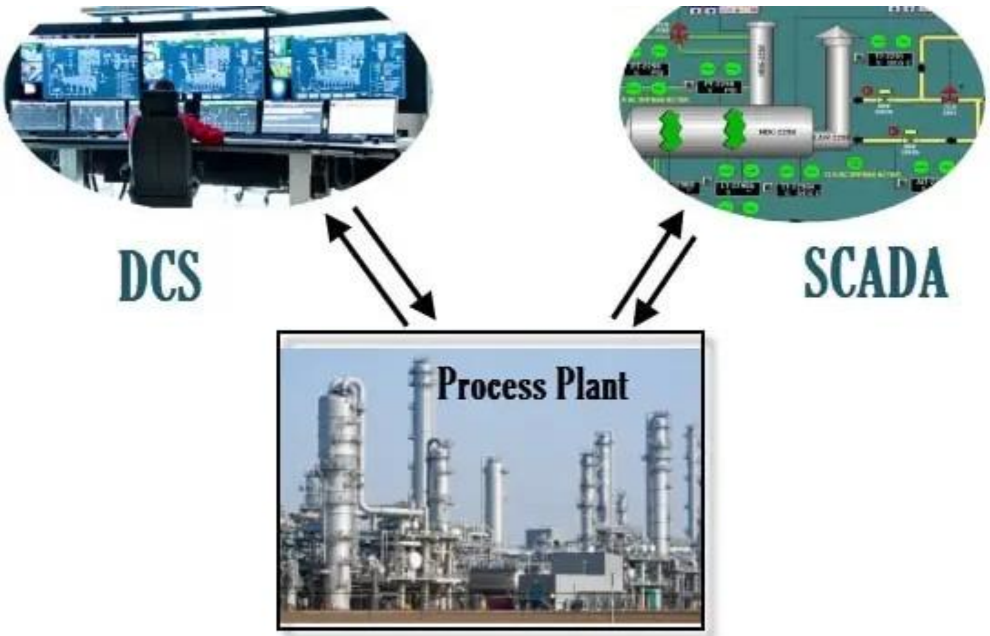


**Fig no. 8.1 Difference DCS and SCADA**

DCS is process oriented, whereas SCADA is data-gathering oriented. DCS emphasizes more on control of the process and it also consists of supervisory control level. And as a part of doing so, it presents the information to the operator. On the other hand, SCADA concentrates more on acquisition process data and presenting it to the operators and control center.

In DCS, data acquisition and control modules or controllers are usually located within a more confined area and the communication between various distributed control units carried via a local area network. SCADA generally covers larger geographical areas that use different communication systems which are generally less reliable than a local area network.

DCS employs a closed loop control at process control station and at remote terminal units. But in case of SCADA there is no such closed loop control.

DCS is process state driven where it scans the process in regular basis and displays the results to the operator, even on demand. On the other hand, SCADA is event driven where it does not scan the process sequentially, but it waits for an event that cause process parameter to trigger certain actions. Hence, DCS does not keep a database of process parameter values as it always in connection with its data source, whereas SCADA maintains a database to log the parameter values which can be further retrieved for operator display and this makes the SCADA to present the last recorded values if the base station unable to get the new values from a remote location.

In terms of applications, DCS is used for installations within a confined area, like a single plant or factory and for a complex control process. Some of the application areas of DCS include chemical plants, power generating stations, pharmaceutical manufacturing, oil and gas industries, etc. On the other hand, SCADA is used for much larger geographical locations such as water management systems, power transmission and distribution control, transport applications and small manufacturing and process industries.

# DCS SYSTEMS FROM DIFFERENT VENDORS

- ABB- Freelance 800F and 800 xA
- Yokogawa- Centum CS 3000 and 1000
- Honeywell-TDC 3000
- Emerson- Delta V Digital Automation
- Siemens- Simatic PCS 7

# CONCLUSION

Industrial training is a crucial component of the engineering curriculum, offering a deeper insight and familiarizing students with contemporary technologies. It provides exposure to the practical facets of the field, which often differ greatly from theoretical concepts. Throughout my training, I acquired substantial practical knowledge that would have been difficult to attain solely through academic study. This hands-on experience will be immensely beneficial as I embark on my engineering career.

My training at **Laxmi Organic Industries Ltd.** in Mahad was a remarkable experience. The exceptional work culture and the spirit of collaboration among the staff created an excellent environment for learning and growth.