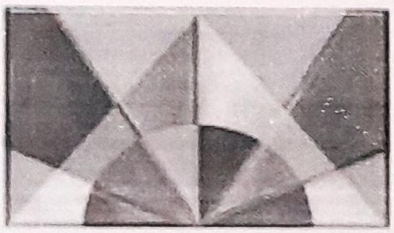
Babu Banarasi Das University

BBD UNIVERSITY

VOCATIONAL TRAINING REPORT
ON

Hindalco Industries Limited
(Renusagar Power Division)



Submitted To:
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PREFACE

With day-to-day advent of new technology the older machinery are being replaced by new machinery. Now it has not been the work of semi skilled person. It has opened a new horizon for degree holder engineers. But to do the job properly a suitable training is needed.

The knowledge of entire system is must for an engineer to do the trouble shooting in the quickest possible way so that the production does not get effected.

So for an engineer the industrial training is playing a vital role in developing the practical knowledge. The Industrial training is not merely an academic requirement but a professional necessity too.

I feel great pleasure to get training at Hindalco Industries (Renusagar power division) during the course of which I got the opportunity to develop my expertise and define my technical and professional interests.

In this practical training report I have tried my best to introduce about all the important topics of DCS in a very short span of four weeks.

ACKNOWLEDGEMENT

It is my pleasure to be indebted to various people, who directly or indirectly contributed in the development of this work and who influenced my thinking, behavior, and acts during the course of study. I express my sincere gratitude to **Mr. Hem Raj**(Head TTMDC) for providing me an opportunity to undergo summer training at Hindalco Ind. Ltd.- Renusagar Power Division.

I am thankful to **Mr. R.C. Chaurasia**(Head – Electrical Dept.) for his support, cooperation, and motivation provided to me during the training for constant inspiration, presence and blessings Lastly, I would like to thank the almighty and my parents for their moral support and my friends with whom I shared my day-to-day experience and received lots of suggestions that improved my quality of work.

I also like to extend my thanks for Head Electrical Department-EE **Mr. V.K. Maurya** and **Mr Sankalp Paliwal** (Industrial Training Coordinator) for providing me a chance to explore the industry of Hindalco.

Nilesh Kumar Srivastava

Electrical 4th year

BBD University

DECLARATION

I NILESH KUMAR SRIVASTAVA declare that I have done this work to the best of my ability and hard work on part in successfully complete this report entitled.

"A VOCATIONAL TRAINING REPORT

ON

Renusagar Thermal Power Plant"

I hereby declare that my report on the above topic is complete in all respect & this project is a result of my study and effort for this project.

NILESH KUMAR SRIVASTAVA
B-TECH (EE-4th YEAR)
BBD UNIVERSITY

Introduction to **Hindalco Industries limited.**

Hindalco is a flagship company of ADITYA VIKRAM BIRLA group. It is engaged in the production of aluminium and other related products of its cycle. It was set up in collaboration with Keizer aluminium and chemical corporation, USA in record time of 18 months. The plant started production in the year 1962 with a capacity of 20000 TPA (tones per annum). In 1994 the company has received the European quality certification ISO-9002 and certified with ISO-140001 recently.

The company undertakes Bauxite mining, aluminium production, aluminium smelting and manufacture of semi-fabricated material. Hindalco has captive bauxite reserves of about seven lacks tons. Aluminium is a power intensive industry and needs nearly 16000-17000 kWh of power for the production of one tons of aluminium. Hindalco has a captive power plant of 741 MW.

After the recent expansion and modernization program, Hindalco has capacity to produce 4,50,000 TPA of alumina, 2,42,000 TPA of aluminium, 80,000 tons of rolled items, 16,000 tons of items and 45,000 tons of redraw rolls and it has further expansion plan in the smelter capacity by 100,000 TPA. In addition, alumina refining capacity will be increased by 2, 10,000 TPA with a matching increase in captive power generation facilities. The company's aluminium smelter and refinery are located at Renukoot and captive power plant at Renusagar in UP.

The company is one of the leading producers of aluminium worldwide. The company is highly cost competitive due to availability of good quality bauxite, low labour cost and capacitive power plant. In the domestic market too, Hindalco forces better than its peers belonging to public as well as private sector.
The company has followed policy of consistent improvement in its

process and technology. By improving its technology in aluminium smelter it has been able to improve the raw material utilization and hence efficiency. The company has shown concern towards environment policy. The company has installed dry scrubber system in alumina production facility which has reduced the company's aluminium fluoride consumption from 40 kg/ton to 24.6 kg/ton. It has earned ISO-14001 certification also.

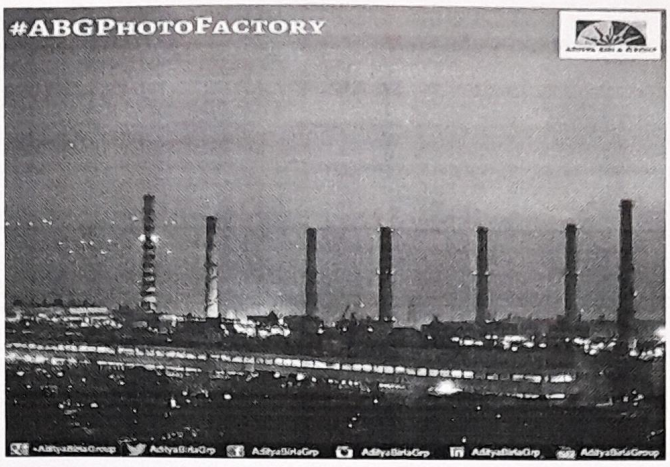
The company has shown consistently good result with average growth in profit nearing 20% over than last three years. In the financial year 2000, Hindalco recorded an increase in exports by 89% to Rs.2642 million. With growing demand for aluminium the company has embarked upon extension plan.

The company is one of the leading produces of aluminium worldwide. The company is highly cost competitive due to availability of good quality bauxite, with increasing use of automobile sector and other area, the future of aluminium industry is bright; Hindalco being one of the major aluminium producers in the country stands to gain a lot in the present scenario.

Hindalco forces better than its peers belonging to public as well as private sector. This is evident from its recently declared results. The company has shown profit of nearly 2, 56.37 corers on a turnover of 72,077.87 crores in a financial year 2010-2011 the company enjoys large reserves which is useful in getting soft loans.

Hindalco is the sixth most profitable private sector in India. Hindalco was honoured **with Aditya Vikram Birla award** for an excellence for an outstanding technological innovation.

RENUSAGAR POWER DIVISION

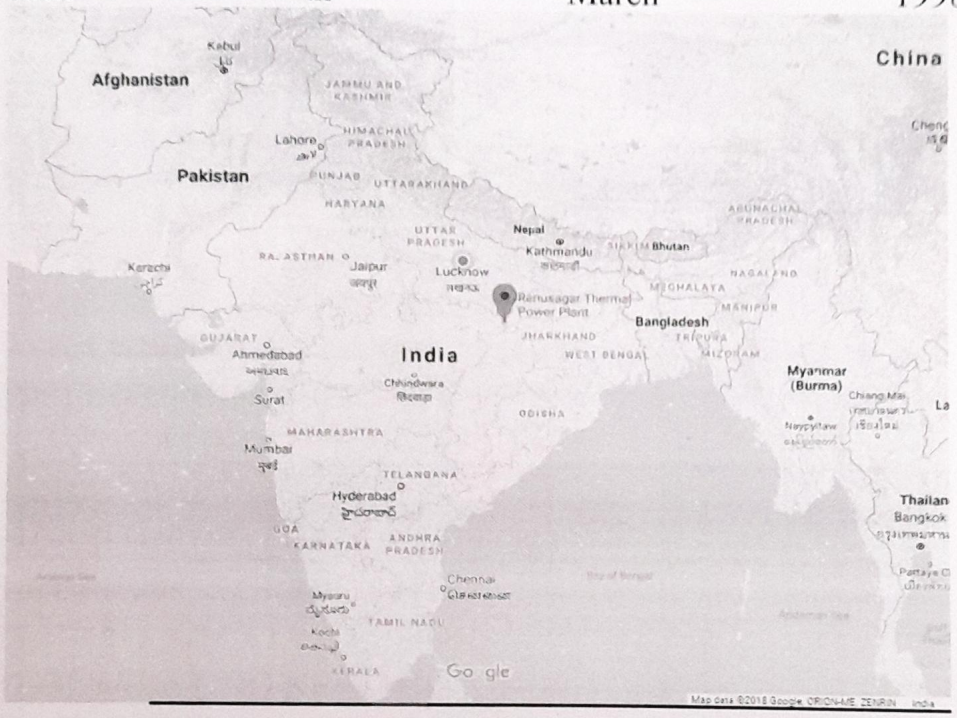


HINDALCO is among the most efficient power user per ton of aluminium produced; their electricity consumption is 14300 kWh. Innovations and constant up gradation have led to these energy efficient plant operations.

Hindalco has been the recipient of the energy conservation award instituted by the ministry of power in 1991, 1995, and 1996 and the race of the quality, the organization has achieved ISO-14001 for the preservation of environment. Out of various contributions the result in the significant low cost aluminium production, one of the major contribution is made by the captive power plant HINDALCO-RENUPOWER established at Renusagar.

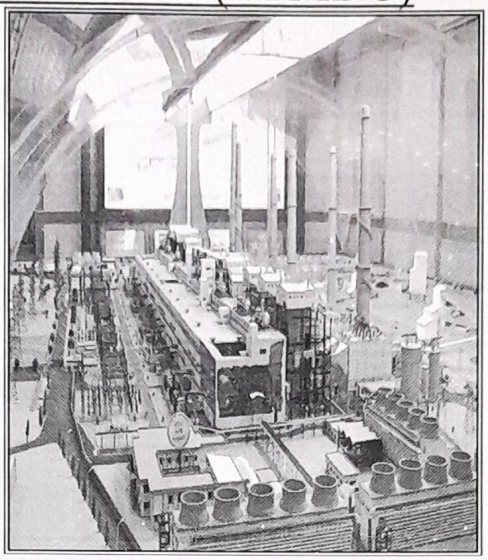
RENUSAGAR POWER DIVISION is the brain child of the great visionary the Late Shri G.D.Birla who foresaw the power storage in the country long before the other could visualize about it and established a captive thermal power plant at Renusagar, merely 40 km from Hindalco Renukoot utilizing low grade coal of Singrauli coal belt, in the vicinity of Rihand lake in Sonebhadra district of U.P. Power is the most cost driver for the aluminium industry. In the Indian context, self sufficiency in the power is most important achievement.

Hindalco Renusagar is rapidly moving towards self sufficiency on this critical front. The recent capacity of power plant is 741 MW consisting of ten units and meets the entire power requirement of HINDALCO. The first turbo generator of 67 MW was commissioned and on full load in September 1967 in the record time of 23 months from the excavation of foundation. The second unit was commissioned in 1968. The power plant was subsequently expanded by adding two TG sets of 77 MW each in 1981-83 and the fifth unit of 68 MW in 1989 with the commissioning of an additional power generator turbine of 74 MW in March 1997 and two more units of 74 MW and 76 MW each in March 1998.



In 2002 unit 9 was commissioned with a capacity of 80 MW and the tenth unit also has been commissioned with the capacity of 80 MW. The installed capacity of Renusagar power plant has increased to 741 MW. This renders Hindalco not only self-sufficient in power but also provides them with surplus power that they can supply to grid.

TECHNICAL TRAINING AND MANAGEMENT DEVELOPMENT CENTRE (TTMDC)



T-TECHNOLOGY
R-REINFORCING
A-ACTIVATING
I-INDUCING
N-NURTURING / GROUP / EFFORT
I-INSPIRING FOR INITIATION
N-NO TO 'ON' CONVERSION
G-GENERATING NEW THINKING

The centre has developed learning culture in the organization. It is the first of its kind India recognized by central electricity authority, minority of energy and government if India. The centre is equipped with the latest training aids and facilities for theoretical, practical and on job training like lecture halls, library, laboratories, workshops and well trained facilities to provide technical, managerial and supervisory training.

Plant Overview

Sr.No.	Unit	Capacity(MW)	Make	
			Turbo Generator	Boiler
1.	TG# 1	67.5	GE()	CE()
2.	TG# 2	67.5	GE()	CE()
3.	TG# 3	77	SIEMENS/ BHEL (Consortium)	CE()
4.	TG# 4	77	SIEMENS/ BHEL (Consortium)	CE()
5.	TG# 5	68	BERGMANN BORSIG	BHEL
6.	TG# 6	74	ABB()	BHEL
7.	TG# 7	74	ABB()	BHEL
8.	TG# 8	77	GE ()	BHEL
9.	TG# 9	80	SIEMENS ()	BHEL
10.	TG# 10	80	SIEMENS ()	BHEL

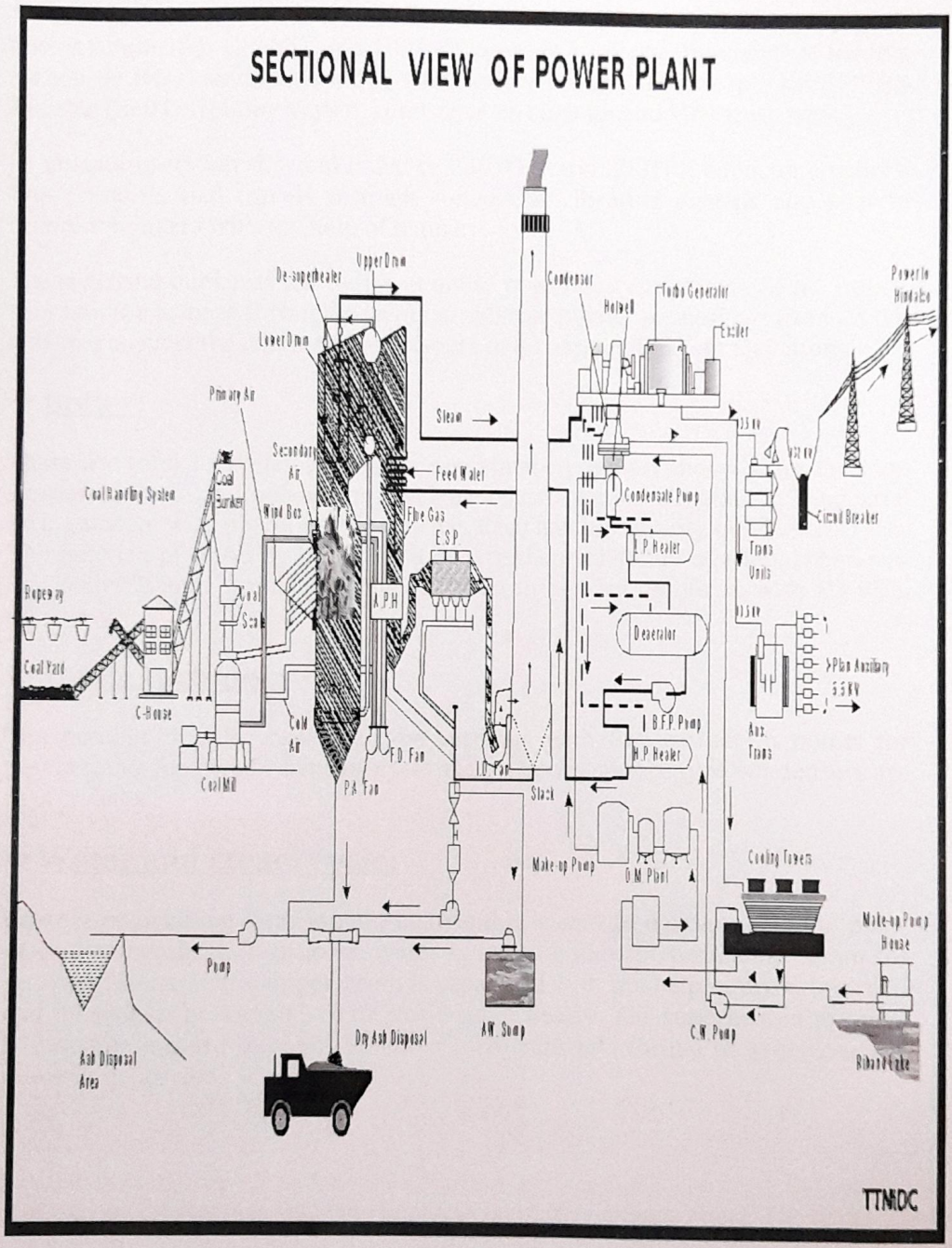
PROCESS OF THERMAL POWER PLANT.

Thermal power plant uses coal, air and water as raw material. The coal is brought to the coal handling plant (CHP) by Arial ropeways. From CHP it is brought to the coalbunkers by conveyor belts. Here it is fed to the pulverizing mill, which grinds it as fine as face powder. The finally powered coal mixed with preheated air is then blown to the boiler by the PA fan. In furnace where the coal burns, an additional amount of air called secondary air is supplied by FD fan. The resultant is also a fine powder, ash. Some of the binds together to form lumps, which fall in to ash pit the bottom of the furnace. Most of the ash is carried out of the boiler to ESP as whereby the water to his disposal areas where the clean gases with the help of ID fans are discharged in the atmosphere to stack.

Meanwhile the heat released from the coal is absorbed by KMS of tubing, which makes the boiler feed water, which s transformed to steam at high temperature and pressure. The steam in the super heater is further pass to the tubes to the turbines where it is discharged through nozzles on the turbine blades. Energy of the steam striking these blades make the turbine rotates couple to the end of turbine is the rotor of the generator, a large cylindrical magnet that rotates with rotation of the turbine. The stator has heavy coils of copper bars in the slots. The electricity is produced by the relative motion between stator and rotor due to faraday's law of electro-magnetic induction. The EMF induced in the stator winding is transmitted to the transformer which increases the voltage to that it can be transmitted over long distance efficiently with less loss in the power line of the grid. The steam, which has given its heat energy, is changed back to water in the condenser so that it is ready for circulation. The condenser contains many tubes in which cold water is circulating. The steam around the tubes losses heat and rapidly change back to water. The boiler feed must be dematerialized and absolutely pure so as to avoid any damage to the tubes that feed the turbine.

The boilers are natural circulation, top supported, bi drum, tangential tilted corner fire system and balanced shaft. The steam

turbines are of the high pressure nominal considering type. The generator is three phase, two pole and cylindrical rotor type alternators. The coal is carried to boilers by primary air. FD fan helps in burning the fuel and ID fans in removing the gases. To start the unit's power is taken from 132KV grid through station service transformer.



PROCESS OF EACH UNIT

❖ Coal handling system:

Coal is supplied to 1200MT and 1500MT capacity bunker at jhingurda at loading station by NCL conveyors-load is transferred through moon cable (300TPH)& Bi-cable (250TPH) Ropeways to renusagar through up and MP forest area.

At unloading station the coal is fed to 250 TPH and 300TPH capacity crushers. The crusher's coal travels through conveyors, vibrating screens and sent to different bunkers with the help of tripper.

The coal from bunker is fed to bowel mills/ pulverized coal of size 74 microns is sent into the furnace through coal pipes and coal burner primary air from PA fan aids to transport the coal into four comers of furnace at different elevations.

❖ Boiler:

There are total 11 boiler (including one stand by boiler) these boiler are "top supported Bi-drum, Radiant type, Balanced draft, Natural circulation, Tangential Firing system with pulverized coal firing. Each having capacity of 275-320 T/Hr. The function of stand by boiler is to ensure the availability of units. Whenever any boiler is out, stand by boiler is given in service. Boiler is with 83-85% efficiency.

❖ Steam turbines:

Ten number impulse reaction type turbines with five extraction points for regenerative feed water heating cycle and two pass surface type condensers are in each units.

❖ Water and steam cycle:

Raw water is taking form Rihand Lake and it is sent to demineralization plant. After demineralization process, water is fed to boiler for producing steam the saturated steam in the upper drum is separated with the help of drum internals and then super heated to 510 degree c super heater. The superheated steam at 510 degree c is fed to rotor, which in turn transmits torque to generator and power is generated.

The extraction steam is sent into heaters where it ex-changes heat. The drip

from heaters flow back to condenser in a cascading in a cascading process.
The non- soluble gases are vented to the atmosphere through deaerator.

❖ Ash Handling systems:

Ash handling system consists of Bottom ash system, fly ash system and electrostatic precipitators(ESP). Around 15-20% ash is taken out through bottom ash system and rest of through fly ash system. The whole system consists of pumps, Hydro ejector, Hydro vector clinker, grinder etc. Apart from furnace bottom in ash is removed from economisers, air pre heater and electronics precipitator hoppers.

All the eleven boilers are provided with electrostatic precipitator (ESP). The efficiency of ESP is about 99% with the result that chimneys are almost smokeless and area is pollution free. The bottom ash and fly ash is collected into ash slurry pump from where is transported with the help of pumps to ash disposal area.

❖ Electricity generation:

Steam turbine coupled generators run at 3000 rpm and delivers 10.5 KV (#3 to #10) & 13.8 KV is stepped up to 132KV with the help of generator transfer and sent to Hindalco through ten transmission lines for its pot lines. Approximately 10% of the generated power is used as auxiliaries' consumption to run the auxiliary equipment at Renusagar.

All the eleven boilers and ten turbines are connected with the common feed water heater and the steam header. The advantage of connecting them with common header is that in case of failure of any availability of the unit is 100% assured.

CONTROL SYSTEM

A **control system** is a device or set of devices to manage, command, direct or regulate the behaviour of other devices or systems. A process-control system monitors a manufacturing environment and electronically controls the process or manufacturing flow based on limits set by the user. The measured quantity such as pressure, temperature, flow, level, etc. of the specific gas or liquid with the help of field instrument is sent to the receiver where it is converted to a digital signal and then identified by the processor. This identification is used by the host controller and automation system for system tasks.

Process Control methods are roughly classified in to two categories.

➢ Loop Control

➢ Sequential Control

- ✓ **Loop control** handles analog measured values (including Feedback control and Feed forward control)
- ✓ **Sequential Control** handles operating sequences and process status signals.

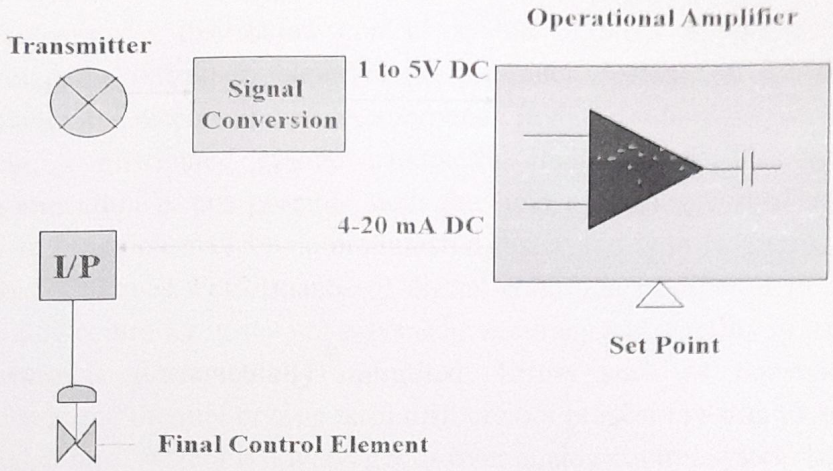
➢ **Feedback control** is a control in which the controller continuously checks the deviation between the input and the set point and always corrects the input to match the set point.

➢ **Feed forward Control** is a control in which corrective action is taken by measuring the disturbance and directly driving the final control element before it affects the process.

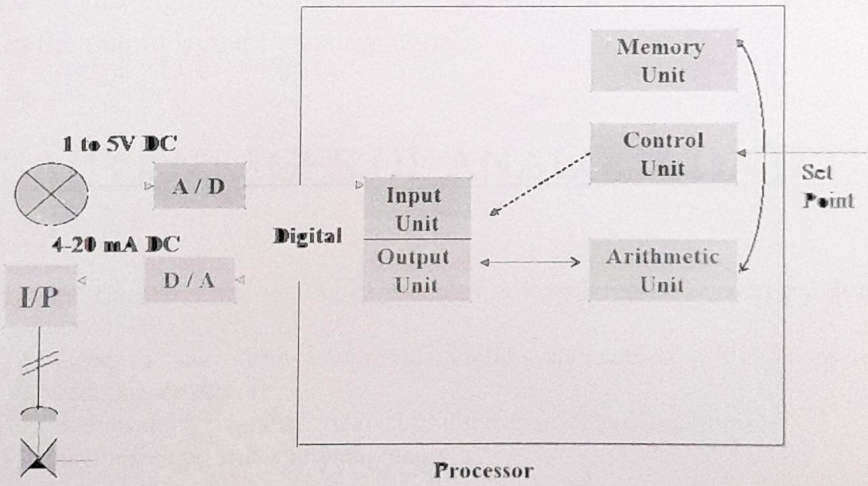
➢ **Sequential Control** is a control which successively advances each control step in accordance with a predefined sequence.

Types of Control System –

1) Analog Control System



2) Digital Control System



ADVANTAGE AND DISADVANTAGE OF DIGITAL CONTROL SYSTEM

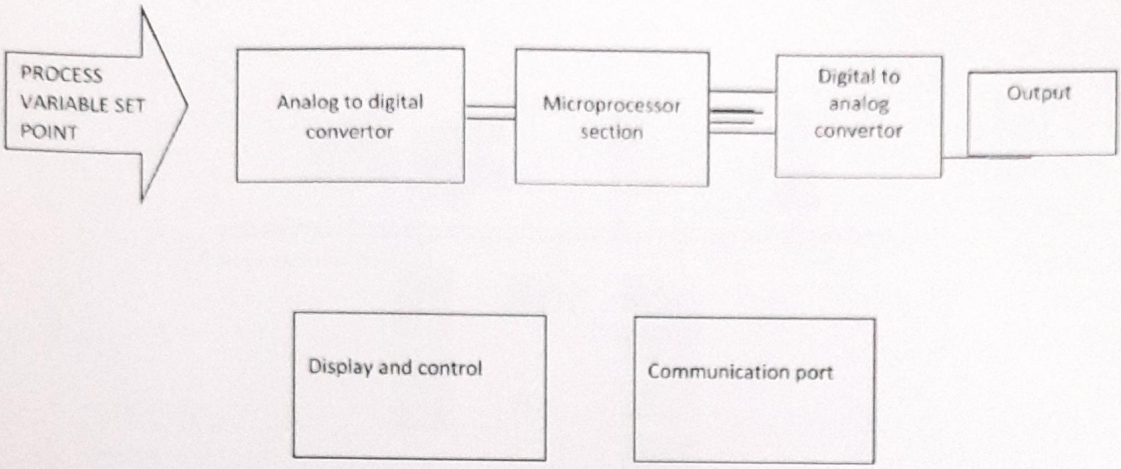
A controller which can communicate with a computer is a prerequisite in implementing a distributed control system. Unless a controller can conveniently inform a supervisory computer system of its process parameter and receive operating commands from the supervisory computer system, a distributed system cannot be implemented. This type of communication is not possible with the help of analog control system. Thus information may be communicated faster and with less error using digital techniques. Performance of digital controller is superior to that of an analog controller in several ways. The accuracy and stability of a digital hardware is fundamentally unlimited. Errors such as non-linearity, hysteresis and thermal or long term drift are not present in a digital system. Digital control system is advantageous over analog control system because of the complexity of the control function it can provide.

Digital controllers are more complex, hence more expensive than analog controller. Much of the complexity results from the need to convert input signal to the digital signals before they may be processed and then to return the output signal to analog signal.

DISADVANTAGES OF ANALOG CONTROL SYSTEM

1) Numbers, types and variety of modules is very large, associated problems of inventory spares, etc.
2) Complex wiring, large amount of cabinets and cabling which leads to the greater chance of faults.
3) Low transmission quality: suspect to interferences and line drops.
4) Time consuming and costly engineering.

TYPICAL HARDWARE BLOCK DIAGRAM OF A DIGITAL CONTROLLER

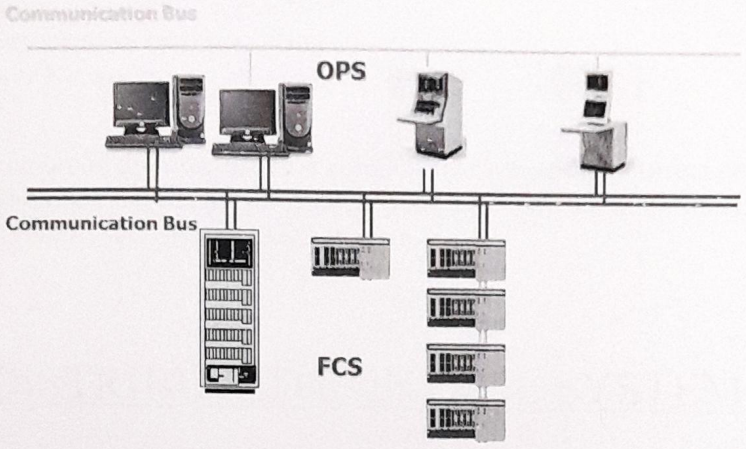


Distributed Control System

❖ INTRODUCTION:

Distributed Control System is a type of automated control system that is distributed throughout a machine to provide instructions to different parts of the machine. Instead of having a centrally located device controlling all machines, each section of a machine has its own computer that controls the operation. For instance, there may be one machine with a section that controls dry elements of cake frosting and another section controlling the liquid elements, but each section is individually managed by a DCS. A DCS is commonly used in manufacturing equipment and utilizes input and output protocols to control the machine. A DCS typically uses custom designed processors as controllers and uses both proprietary interconnections and communications protocol for communication. Input and output modules form component parts of the DCS. The processor receives information from input modules and sends information to output modules. The input modules receive information from input instruments in the process (Field instruments) and transmit instructions to the output instruments in the field. Computer buses or electrical buses connect the processor and modules through multiplexer or demultiplexers. Buses also

connect the distributed controllers with the central controller and finally to the Human-Machine Interface (HMI) or control consoles. Distributed control system also provides redundancy which makes it advantageous over centralized control system.



DCS: - OVERVIEW

A Distributed control system (DCS) refers to a control system usually of a manufacturing system, process of any kind of dynamic system, in which the controller elements are not central in location but are distributed throughout the system with each component subsystem controlled by one or more controllers. The entire system may be networked for communication and monitoring.

A DCS typically uses computers (usually custom designed processors) as controllers and use both proprietary interconnections and protocols for communication Input & Output modules from component parts of the DCS. The processor receives information from input modules and sends information to output modules. The input modules receive information from input instruments in the process (aka field) and output modules transmit instructions to the output instruments in the field. Computer buses or electrical buses connect the processor and modules through multiplexers / demultiplexers. Buses also connect the distributed controllers with the central controller and finally to the Human Machine interface (HMI) or control consoles.

Distributed control systems (DCSs) are used in industrial, electrical, computer and civil engineering applications to monitor and control distributed equipment with or without remote human intervention; the nomenclature for the former 'manual control' and the latter 'automated control'. DCS is very broad term that describes solutions across a large variety of industries, including.

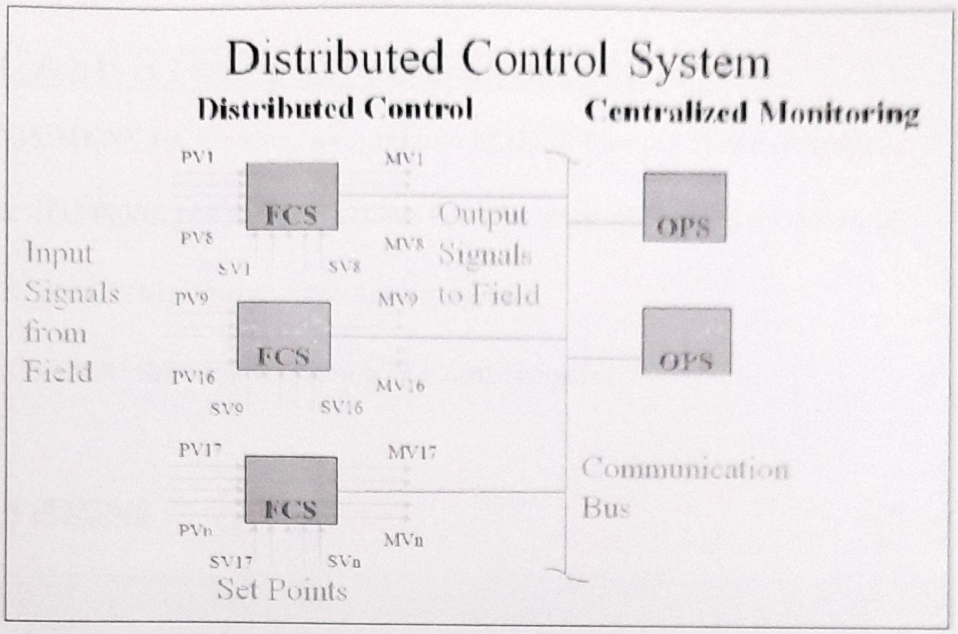
- Electrical power grids and electrical generation plants.
- Environmental control systems
- Traffic signal
- Water management systems
- Refining and chemical plants
- Pharmaceutical manufacturing
- Sensor Networks

The broad architecture of a solution involves either a direct connection to physical equipment such as switches, pumps and valves or connection via a secondary system such as a SCADA system.

DISTRIBUTED CONTROL SYSTEM

- A Distributed Control System is a system which controls the plant process. It is composed of a set of processors, input modules, output modules, printers and workstations that are interconnected by a communication network.
- A Processor consists of a microprocessor-based CPU and a memory unit. In the memory unit, EPROM or ROM is typically used to store programs that are closely related to the operation of the processor; RAM is used to store application programs and I/O data.

The input and output modules provide the necessary interface between the DCS and the field Instrumentation and control devices.



SPECIAL FEATURES OF DISTRIBUTED CONTROL SYSTEM

- Ability to handle complex automation tasks.
- Combination of all automation function in one system resulting in reduced hardware uniform documentation.
- High availability achieved by functional distribution and redundancy.
- Reliable communication with digital signal.
- Serial data transmission over bus thereby reducing cabling.
- Flexibility to easily accommodate late engineering changes.
- Better optimization possible by experimenting with different control structure and algorithm.
- Process observation and operation by VDU's keyboard, pointing device, etc.
- Self diagnostic and fault location facilities.

CASE STUDY ON DCS (SIEMENS)

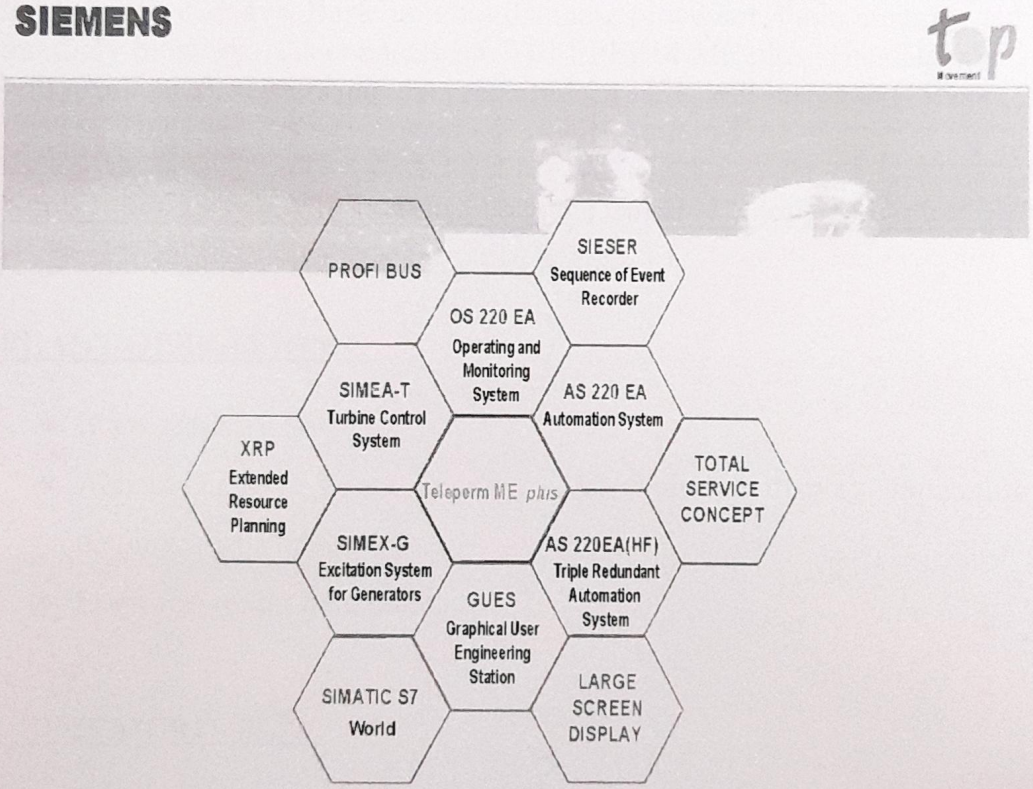
SIEMENS DCS comes as package of the following three systems:

1. TELEPERM ME PLUS: Turbine & boiler controlling and monitoring.

2. SIMADYND: Turbine governing system.

3. SIESER: Siemens sequence of event recorder.

SIEMENS



TELEPERM ME plus system: OS220EA (combined operation, Monitoring and information system)

System comprises of three redundant OS basic units

- **BU 01, BU01R for Turbine operations**
- **BU02, BU02R for boiler operations**
- **PU01, PU01Rfor historical storage and retrievals.**

Servers are connected to 7 MMI's (MAN MACHINE INTERFACE) and 2 large screen displays. Basic unit has database processor, main memory and auxiliary memory. It is connected to TELEPERM ME plus. The database will reside in all servers and data required for HSR will reside in HSR servers. These servers are also provided with built in DAT drives for backup purpose.
Application software is modular package suitably adopted to meet the functional requirements of the plant as follows:

PLANT OPERATIONS:

- Plant graphics Displays
- Alarm Display/ Event Display/ C&I fault list display/ Operation display.
- Logs and report generated.

OPERATOR DISPLAY:

- Area display & Group display
- Alarm summary display
- Status display.

THE OS PROCESSES THE FOLLOWING INPUTS:

- Binary, analog signals of process.

- Signal for open loop & closed loop controls.
- Inputs from keyboard and mouse

BESIDES THESE, THE OS SYSTEM ALSO INDICATES AND OPERATES THE FOLLOWING:

- Operation of open loop drives.
- Operation of controllers.
- Set point changing.
- Auto / Manual changeover.

SYSTEM SUMMARY

The OS220EA operator process communication, monitoring and information system is an important component of the Teleperm Me plus- AS220 EA process control automation system, which is used in power plants and other process engineering systems. The system which is connected to the AS220EA automation system over a redundant bus System. The OS220EA system organizes the data being handled by the Teleperm Me plus automation system for efficient and ergonomic NOBIs and freely configurable plant mimics. An intuitive and user friendly front end based on the X windows system provides a convenient interface to the system. The NOBI blocks are similar to the miniaturized desk components. Mouse is used for operation. The hierarchical information structure is the special feature of this system. The operator can select various hierarchy levels with plant overview, continuing down to a detailed representation. Along with the NOBI blocks and mimics, the operator is given information about various alarms, events operation sequence and faults etc occurring during operation. These signals can be logged for detailed analysis. The system also guarantees certain specific reports, either cyclically or upon operator requests. The system provides the facility to represent various predefined measured values in the form of trend curves and bar charts. Operating point display of signal groups is also provided.

CONTROL AND INSTRUMENTATION

Process industry:

Continuous running plants are known as process industries.

Process variable:

1.Pressure

2.Temperature

3.Level

4.Flow

We maintain the process as per demand.

Roll of control and instrumentation is to maintain these demands.

Teleprem ME PLUS DCS (SIEMENS)	Unit #1,2,9,10
ABB DCS(SYMPHONY-HARMONY)	Unit#3,4
URSAMARS-4000 SERIES ELECTRONIC MODULAR INSTRUMENT BY G.D.R.(DCS IS NOT USED)	Unit#5
Centum XL DCS (Yokogawa)	Unit#6,7
GE fanuc DCS	Unit#8

SOME ABBREVIATION USED

Automation system	AS220EA	1
Automation System (triple redundant)	AS220EA	2
Operating and monitoring info. System	OS220EA	3
Turbine control system	SIMEA-T	4
Static excitation system for generation	SIMEX-G	5
Graphical user Engineering system	GUES	6
Field bus interface	FBI	7
Sequence of event recorder	SEISER	8
Remote distributed I/O module	ET200 MT	9
Man Machine Interface	MMI	10

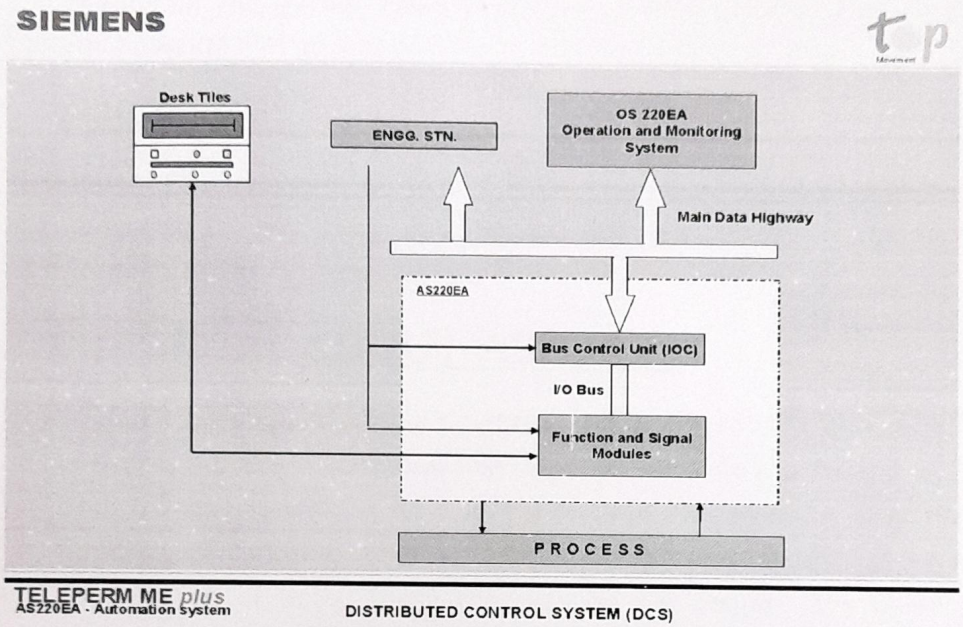
INTRODUCTION- AS200EA

The AS200EA automation system is the most powerful distributed control system ever designed for automation function.

The unique innovation feature of AS200EA is that the central unit has been eliminated between an I/O controller and I/O module. Each I/O module is provided with its own dedicated microprocessor and extensively self- diagnostics. It is capable of standalone autonomous operations. Process orientation task are no longer performed in a central unit but at the I/O level itself. This decentralization and a "true"

distributed structure has improved the availability, making AS200EA the upper end DCS with the highest performance.

The protection integrated in the automation system autonomously initiated protective measure in the event of faults. The protective measure is used to avert hazards, protect the plant and to return the plant to a safe status.



DISTRIBUTED CONTROL SYSTEM (DCS)

AS220EA-AUTOMATION SYSTEM

As220EA automation system working together with an OS220EA operation, monitoring and information system and an engineering station, and if applicable with hardwired control Station.

As200EA has a significant advantage of allowing a panned degree of redundancy from 0-100% with the following silent features.

AUTOMATIC: -

All redundant changeovers are automatic without requiring any manual intervention.

BUMPLESS: -

The process, the system or the operator do not perceive any Step or bomb in case of a redundant changeover is however annunciated to the operator and maintained personnel.

CYCLIC :-

The redundant changeover takes place in less than a processing cycle, thereby ensuring that no loss of data or information takes place.

DIRECTIONAL: -

Redundant changeover is initiated in both directions. The master ship is not assigned to any fixed module or slot any of the redundant counterparts can assume master ship.

ABOUT AS200EA

AS200EA is equipped with a powerful and intelligent I/O level which performs process automation task. Each I/O module is provided with both I/O bus as well as hardware interface. This provides user the flexibility of choosing either of two communication modes or even combination of both. These modules do not require any battery backup for retaining their memory content upon failure of power supply. Each module is equipped with FEPROM EEPROM which is non volatile and retains their content indefinitely.

Besides these structure I/O modules, auxiliary modules (e.g. voltage to current converter, level converter etc.)

The high performance and processing power of AS200EA which is modularly extendable, enables the plant owners to implement all requirement concerning the depth and scope of automation at low cost, the processing power and the system's memory size are determined by the number of modules. The number is determined by the plant task i.e. both the processing power and memory size are increased to the same extent as scope of the plant and are thus

optimally adjusted.

The AS220EA has an in built fault guidance system, which immediately detects irregularity and enables specific and aroid elimination of faults.

Power supply system to the modules is completely decentralized. Each module requires an external supply of +24Dc (20V to 33V). All voltage such as -24 V DC, +15V DC and 5 V DC are generated internally within the module from +24 V DC. This design features excludes the dependence on central power supply conversion equipment and thereby enhances availability of the entire system.

AUTOMATION SYSTEM AS – 220 EA

Automation System AS 220EA consist of different system cabinet installed at different location is given as below:-

USE	RELAY CABINET	MARSHILING CABINET	SYSTEM CABINET	LOCATION
Turbine Instruments	CRA – 01 CRA - 01	CVA – 01 CVA – 01	CGA -01 CGA – 02	By Room
All drives / motors related with Blr & TG	CRA – 02 CRA - 02	CVA – 02 CVA – 02	CGA – 03 CGA – 04	Switch Gear
HPH, LPH, BFP &CEP Instruments		CVA – 03 CVA – 03	CGA – 05 CGA - 06	MCC

			CGA – 07	
All mill,Blr & drum		FTC – 01 FTC – 02	CGA – 08 CGA – 09 CGA – 10	VFD Room
PA & FD fan instruments. ID fan instruments		FTC – 03 FTC – 04	CGA – 11 CGA – 12	ESP Control Room

HIGHLIGHTS OF AS220EA

- Plan able degree of redundancy from 0-100%
- Low diversity of hardware
- Only +24V DC (unstabilized) power supply required
- Standalone and free programmable I/O modules.
- Non volatile memories- no battery backup.
- I/O modules have both bus and hardware interface.
- Convectional control station / indicating instruments are hardwired directly to I/O modules- independent of bus system.
- Extensive in built monitoring.