A Project Report
on
' PROTECTION OF INDUCTION MOTOR WITH PLC AUTOMATION'

Submitted To

Shri Guru Gobind Singhji Institute of Engineering and Technology,
Vishnupuri, Nanded.

For the partial fulfillment for award of the
Degree of Bachelor of Technology in Electrical Engineering

Completed At

The Supreme Industries Limited
Gadegaon , Jalgaon

Submitted By:

Mr . Hemant Vasant Patil (2017BEL012)

Guided by :

Prof A .T.Chandan

Department of Electrical Engineering
Shri Guru Gobind Singhji Institute of Engineering and
Technology,Vishnupuri,Nanded,431606(M.S)

CERTIFICATE

SHRI GURU GOBIND SINGHJI INSTITUTE OF ENGINEERING AND TECHNOLOGY, VISHNUPURI, NANDED.

This is to certify that the project entitled **"PROTECTION OF INDUCTION MOTOR WITH PLC AUTOMATION"** in the fulfillment of the **"Structure-B (Internship), Final Year, B.Tech "** for Shri Guru Gobind Singhji Institute of Engineering and Technology, Vishnupuri , Nanded-431606. This bonafide work carried and completed under guidance and supervision of Prof. A. T. Chandan during academic schedule 2020-2021.

Submitted By

Mr . Hemant Vasant Patil (2017BEL012)

Dr. S. T. Hamde

(Head EE Department)

Prof. A. T. Chandan

(Internal Project Guide)

Mr. D. B. Salunke

(External Project Guide)

Place: Nanded
Date: 29/05/2021

DECLARATION

I, Student of Bachelor of Technology in Electrical Engineering, Shri Guru Gobind Singhji Institute of Engineering and Technology, Vishnupuri , Nanded – 431606 hereby declare that the work presented in this final project is an authentic record of my own and has been carried out taking care of engineering ethics under the guidance of Prof. A. T.Chandan.

Mr . Hemant Vasant Patil

(2017BEL012)

ACKNOWLEGEMENT

First, I would like to express my sincere gratitude in debtedness to Dr. S. T. Hamde (electrical HOD), I would like to thanks Mr. S.Y. Prabhudesai (Sr.GM, Tsil, Gadegaon) Sir for giving opportunity to do internship and project in company.

I would like to express my sincere gratitude to MR.V.S. Patil (DGM Engg and project, Gadegaon) Sir .

I would also like to thank our MR.D.B. Salunke (Electrical head) of Electrical Engineering Department for guiding me about and providing a helping hand .

This gives me a great pleasure to express my deep sense of gratitude to Prof. A. T. Chandan of Electrical Engineering Department for guidance, suggestions, support, help .

I am greatly indebted for his keen interest in this work and time to time guidance, encouragement and providing required facilities for completing the project work.

Name of Student :

Hemant Vasant Patil

CONTENT

ABSTRACT

Induction motors are used in many industrial applications in a wide range of operating areas as they have simple and robust structure, and low production costs. Induction motors are now being used more as compared to before due to their certain advantages such as versatility, dependability and economy, good self-starting capability, offers users simple, rugged construction easy maintenance, low cost and reliability.

If any problems become evident due to faults that normally happen in the motor like stator faults, rotor faults, bearing faults, eccentricity faults etc., we can either vary the input voltage and current to bring the motor back to normal conditi-on or we can shut down the motor before damaging the stator and rotor components of the motor to point from which recovery is not possible, thus avoiding unexpected failure of the motor and preventing an entire industrial process from shutting down all of a sudden . In this paper different problems are dealt, such as over current , over temperature, over speed, inrush current, vibration monitoring which are being faced by IM's during it's course of operation. PLC based Automation is used to reduce and detect the faults on Induction Motor .

LIST OF FIGURES

LIST OF FLOW CHART

ABBREVIATION

1. VFD	Variable Frequency Drive
2. MCB	Miniature Circuit breaker
3. MCCB	Molded Case Circuit Breaker
4. MPCB	Motor Protection Circuit Breaker
5. PLC	Programmable Logic Controller

CHAPTER 1

INTRODUTION

1.1 INTRODUCTION

Founded in 1942, Supreme is an acknowledged leader of India's plastics industry. Handling volumes of over 3,20,000 tonnes of polymers annually effectively makes the country's largest plastics processors.

Not surprisingly, we also offer the widest and most comprehensive range of plastic products in India. Our 25 advanced plants are powered by technology from world leaders, and complement our extensive facilities for R & D and new product development. In fact, Supreme is credited with pioneering several products in India. These include Cross- Laminated Films, HMHD Films, Multilayer Films, SWR Piping Systems and more.

Supreme Industries Limited is India's leading plastic processing company with seven business divisions. The company has forayed into different types of plastic processing in Injection Moulding , Rotational Moulding (ROTO), Extrusion, Compression Moulding, Blow Moulding etc.

Supreme Industries limited offers wide range of plastic products with a variety of applications 2018-19 will see The Supreme Group turnover cross a projected Rs.125 billion (USD 2billion).

ORGANIZATION

Board of Director :

Mr. B L Taparia (chairman)
Mr. M P Taparia (MD)

MAINTANCE TEAM :

Mr . S Y Prabhudesai(GM)
Mr . V S Patil (DGM)
Mr. D B Salunke (ELEC Manager)

PLASTIC PIPING DIVISION :

Supreme is the renowned leader of India's plastic industry having valuable experience in providing innovation and cost effective piping solution . Supreme' wide range of piping product caters to almost every application segment . Each product has been custom designed to match the specify need of a specific application , which makes it practically sound. Supreme has established a mega project at gadegaon just 18 kms away from Jalgaon city. The entire set up is certified with ISO 9001:2008 Quality Management System. ISO 14001 Environmental Management System .This is world class project is the first of its kind in the country in terms of size , technology

1.3 OBJECTIVE :

1. To study about Industrial Culture and Automation .
2. To study about Electrical substation , control panel.
3. learning PLC software and application of PLC
4. Leaning Industrial Process and automation
5. Design of different Panels and their application

1.4 Literature Review:

Induction motor are important part of industry . 90% of industrial load are induction motor. So induction motor so worked efficiently, and if motor fails it will affect our production and protection of motor is very important so smart monetering an protection is important .PLC based monitoring alert the system and makes it more efficient.

.

CHAPTER 2

INDUSTRY POWER DISTRIBUTION

2.1 132/11 KV Substation :

Supreme industry has huge load of machinery. For this machinery to run electricity supply is needed. This supply is provided by

1. DEEPNAGAR BHUSAWAL THERMAL POWER PLANT
2. PAHUR LINE

Tapping is done because if Deepnagar side is blocked then we can take supply from Pahur line.

A Substation generally have switching , protection & control equipment & one or more transformer .

It is divided into two parts :

1. Panel Section
   - A. Control Panel Section
   - B. Relay & Protection Panel Section
1. Switch Yard
   132 KV Section
2. Battery Room

2.1.1 SWITCH YARD

1.ALUMINIUM CONDUCTOR STEEL RAINFORCE :

Aluminium conductor steel-reinforced cable (ACSR) is a type of high-capacity, high- strength stranded conductor typically used in overhead power lines. The outer strands are high- purity aluminium, chosen for its good conductivity, low weight and low cost. The center strand is steel for additional strength to help support the weight of the conductor. Steel is higher strength than aluminium which allows for increased mechanical tension to be applied on the conductor. Steel also has lower elastic and inelastic deformation (permanent elongation) due to mechanical loading (e.g. wind and ice) as well as a lower coefficient of thermal expansion under current loading.

2 . LIGHTNING ARRESTER :

Used for protecting the equipment from surge voltages .They are usually connected between phase and ground in an AC system and pole and ground in case of DC system.

3. Sulphur Hexafluoride (SF6) Circuit Breaker :

A circuit breaker in which SF6 under pressure gas is used to extinguish the arc is called SF6 circuit breaker. SF6 (sulphur hexafluoride) gas has excellent dielectric, arc quenching, chemical and other physical properties which have proved its superiority over other arc quenching mediums such as oil or air.

Rate of rise of dielectric strength is very high. Can be liquefied and stored in steel tanks Dielectric strength increase linearly with pressure .Gas is inert. Therefore contacts will not get eroded .Gas is non –inflammable , Colorless .

4 . ISOLATOR :

The isolator can be defined as; it is one type of mechanical switch used to isolate a fraction of the electrical circuit when it is required. Isolator switches are used for opening an electrical circuit in the no-load condition. It is not proposed to be opened while current flows through the Lt. Electrical isolator which is commonly known as isolator or disconnector is a piece of equipment that is used in electric devices and power systems with the main function of effectively isolating two different parts of an instrument. By definition, isolation is the process of complete separation of various parts of an apparatus and this separation can either be physical or electrical or both.

5.CAPACITOR BANK : .

Capacitors, on the other hand, constitute leading power factor load; thus compensating a major part of the inductive loads and result in power factor close to unity but still lagging in nature. This improvement of power factor fullfills the requirements of the supply company.

6 . TRANSFORMER :

A. POWER TRANSFORMER :

Transformer nameplates contain several standard items of information and other optional information. Transformer nameplate must specify the following parameters:

Volt-Ampere (VA) or kilovolt-amperes (kVA) rating, The voltage rating of both the primary and secondary circuits ,The impedance rating of the transformer (normally restricted to 10MVA or larger),The required clearances for transformers with ventilated openings, The amount and kind of insulating liquid where used.

On dry-type transformers (no liquid coolant or insulation), the nameplate listing must also include the class temperature rating of the winding insulation

This transformer converts –

HIGH VOLTAGE SIDE	LOW VOLTAGE SIDE
132 KV	11KV

B . CONDITION FOR PARALLEL OPERATION OF TRANSFORMER

1.The line voltage ratio of two transformers must be equal.

2. The per unit impedance of each transformer should be equal and they should havesame ratio of equivalent leakage reactance to the equal resistance(X/R).

3.The transformers should have same secondary winding polarity.

4.The Transformers should have same phase sequence (Three phase transformer)

5.The transformers should have the zero relative phase replacement between the secondary line voltages (Three phase transformers)

C . CURRENT TRANSFORMER :

The Current Transformer (C.T.), is a type of “instrument transformer” that is designed to produce an alternating current in its secondary winding which is proportional to the current being measured in its primary. Current transformers reduce high voltage currents to a much lower value and provide a convenient way of safely monitoring the actual electrical current flowing in an AC transmission line using a standard ammeter. The principal of operation of a basic current

transformer is slightly different from that of an ordinary voltage transformer. RATIO n = Np/Ns = Is/Ip

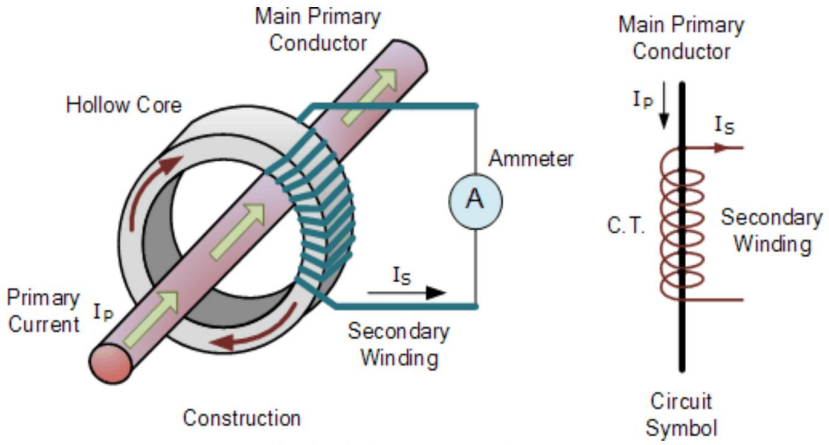


Fig No – 2.1 ,current transformer

C . POTENTIAL TRANSFORMER :

Potential transformer is a voltage step-down transformer which reduces the voltage of a high voltage circuit to a lower level for the purpose of measurement. These are connected across or parallel to the line which is to be monitored

2.1.2 CONTROL BUILDING :

All equipments safety panels are in control building. For transformer, relays are used . control panel shows all voltmeter, ammeter, power factor, frequency , reading. RELAYS areused to protect transformer from load.

2.1.3 RELAY

A relay is an electrically operated switch. Many relays use an electromagnet to mechanically operate a switch, but other operating principles are also used, such as solid-state relays. Relays are used where it is necessary to control a circuit by a separate low-power signal, or where several circuits must be controlled by one signal. The first relays were used in long distance telegraph circuits as amplifiers: they repeated the signal coming in from one circuit and re-

transmitted it on another circuit .these relays works on dc 48 volt supply. Battery are placed for external supply of relay.

TYPES OF RELAYS :

1. THERMAL RELAY
2. ELECTRIMAGNETIC RELAYS
3. INDUCTION RELAY

4 . Buchholz Relay :

Buchholz relay in transformer is an oil container housed the connecting pipe from main tank to conservator tank. It has mainly two elements. The upper element consists of a float. The float is attached to a hinge in such a way that it can move up and down depending upon the oil level in the Buchholz relay .

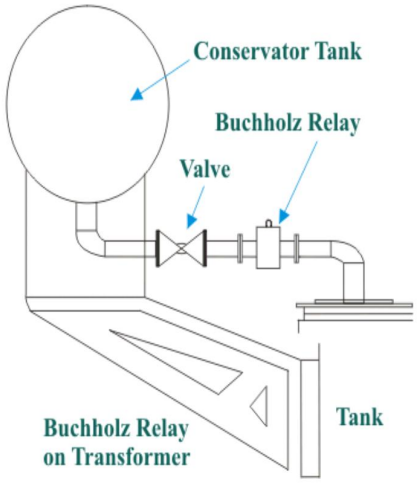


fig no – 2 .2 , . Buchholz Relay

1. DC OR AC RELAY
2. SOLID STATE RELAYS
3. HYBRID RELAYS

11KV / 415 V Transformer room .There are 12 transformer in pipe plant . there are three main region where load is divided mixture side , Utility section and machines section According to this section transformer load is divided . There are VCB which protect the system in.

2 .2 PROCESS 132 KV to 11KV Power flow

Supply is taken with the help of aluminium conductor . tapping is done by industry for supply. ENERGY METER takes and shows reading of CT current & PT voltage ratio .WAVE TRAPS are arranged in substation using POWER LINE CARRIER COMMUNICATION used for transmit communication and control information. SF6 CIRCUIT BREAKER use for safety of system. CURRENT TRANSFORMER are taken in series and POTENTIAL TRANSFORMER are taken in parallel in system POWER TRANSFORMER Step down VOLTAGE from 132kv to 11kv then it goes to control panel of transformer. Relays are placed in panel for safety of transformer and its HV & LV winding . CONTROL PANEL shows all primary and secondary current and voltage values of transformer .

This 11kv supply is transferred to distribution side of industry .11kv supply is given to INCOMER 1 control panel .VACCUM CIRCUIT BREAKER are

2.2.1 Vaccum Circuit Breaker -

A breaker which used vacuum as an arc extinction medium is called a vacuum circuit breaker. In this circuit breaker, the fixed and moving contact is enclosed in a permanently sealed vacuum interrupter. The arc is extinct as the contacts are separated in high vacuum. It is mainly used for medium voltage ranging from 11 KV to 33 KV.

Working Vacuum Circuit Breaker -When the fault occurs in the system, the contacts of the breaker are moved apart and hence the arc is developed between them. When the current carrying contacts are pulled apart, the temperature of their connecting parts is very high due to which ionization occurs. Due to the ionization, the contact space is filled with vapour of positive ions which is discharged from the contact material. The density of vapour depends on the current in the arcing. Due to the decreasing mode of current wave their rate of release of vapour fall and after the current zero, the medium regains its dielectric strength provided vapour density around the contacts reduced. Hence, the arc does not restrike again because the metal vapour is quickly removed from the contact zone.

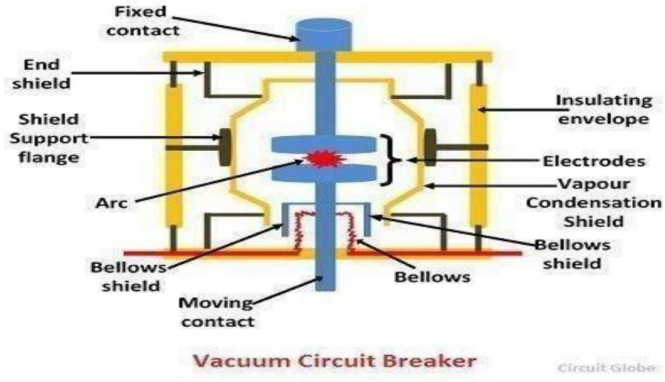


fig No -2.3 , Vaccum circuit breaker

2.2.2 AIR CIRCUIT BREAKERS (ACB)

Air Circuit Breaker (ACB) is an electrical device used to provide Overcurrent and short-circuit protection for electric circuits over 800 Amps to 10K Amps. These are usually used in low voltage applications below 450V. We can find these systems in Distribution Panels(below 450V). Here in this article, we will discuss the working of Air Circuit Breaker. Air circuitbreaker is circuit operation breaker that operates in the air as an arc extinguishing medium, at a given atmospheric pressure. There are several types of Air circuit breakers and switching gears available in the market today that is durable, high-performing, easy to install and maintain. The air circuit breakers have completely replaced oil circuit breakers.

In =1600 amp Ue =415 volt 50 Hz

FAULT OF ACB : Fault happens then ACB gets trip .

1. OVERLOAD FAULT
2. SHORT CIRCUIT – PHASE TO PHASE
3. GROUND FAULT – PHASE TO GROUND

2.2.3 BUSBARS

In electric power distribution, a busbar (also bus bar) is a metallic strip or bar, typically housed inside switchgear, panel boards, and busway enclosures for local high current power distribution. They are also used to connect high voltage equipment at electrical switchyards, and

low voltage equipment in battery banks. They are generally uninsulated, and have sufficient stiffness to be supported in air by insulated pillars. These features allow sufficient cooling of the conductors, and the ability to tap in at various points without creating a new joint.

2.2.4 BUSCOUPLER :

Bus coupler is a device which is used to couple one bus to the other without any interruption in power supply and without creating hazardous arcs. Bus coupler is a breaker used to couple two busbars in order to perform maintenance on other circuit breakers associated with that busbar . if ACB gets damaged then we switch off bus coupler and change ACB means it does not disturb our plant.

2.2.5 CAPACITOR BANK :

to increase POWER FACTOR capacitor banks are used .Normally in factories or other high power consuming places, most probably there will be a consumption of the inductive load. Inductive voltage means that there must be a lagging power factor. In order to reduce the tariff & utilization of power, the power factor must be taken near 1.

To do this we supply a capacitive load to compensate for the inductive load. This is the system of a capacitor bank.

The power factor regulator combines comprehensive operation with user-friendly control setting. It uses numerical techniques in computing the phase difference between thefundamentals of current and voltage, thus precise power factor measurement is achieved even in presence of harmonics

2.2.6 MCCB MOULDED CASE CIRCUIT BREAKERS (MCCB)

Rated current up to 2,500 A. Thermal or thermal-magnetic operation. Trip current may be adjustable in larger ratings. At LTPCC section current is about 700 amps where MCCB are used for safety of system and equipments

From LTPCC PANEL it goes to PDB PANEL (POWER DISTRIBUTION BOARD) . from this panel supply is distributed to all machines .

2.3 CONTROL PANEL

Control panel is a cabinet which contains electrical components to control the motors and equipment. An electrical control panel is a combination of electrical devices which use electrical power to control the various mechanical function of industrial machinery or equipments

Fig No- 2.4 , control panel

Types of Control Panel:

Control panel can be divided on the basis of it's application. They can be divided as below:

PCC (Power Control Centre) Panel

APFC (Automatic Power Factor Control) Panel

MCC (Motor Control Centre) Panel

VFD Panel

PLC Panel

DCS Panel

LT Panel

HT Panel

1. PCC Panel

PCC panel full type is the power control center in Distribution and management for numerous wattage supply in business. Therefore, it's the most vital thing about electricity. In other words, PCC panels are a distribution boards rule that contains any power and would be merely power distribution. Industries would like low maintenance, higher operating and cheap style for LT PCC Panels we've summarised name ACCU-PCC (The correct PCC PanelManufacturer).

2. APFC Panel

The reactive power supplied by the capacitor bank can be adjusted according to variations in the power factor and the load of the receivers. The equipment is applied at points in an installation where the active-power or reactive power variations are relatively large for example: At the bus bars of a main distribution switch-board,

Above the 15% level, it is advisable to install an automatically-controlled bank of capacitors. Control is usually provided by contactors. For compensation of highly fluctuating loads, fast and highly repetitive connection of capacitors is necessary.

fig No – 2. 5, APFC PANEL

Advantages:

1. Consistently high power factor under fluctuating loads. Prevention of leading power

2.Lower energy consumption by reducing losses. Continuously sense and monitor load.

3. Automatically switch on/off relevant capacitors steps for consistent power factor. Ensures easy user interface.
4. Automatically variation, without manual intervention, the compensation to suit the load requirements

3. MCC Panel

In many commercial and industrial applications, quite a few electric motors are required, and it is often desirable to control some or all of the motors from a central location. The apparatus designed for this function is the motor control center (MCC). A motor control center is an assembly to control some or all electric motors in a central location. It consists of multiple enclosed sections having a common power bus and with each section containing a combination starter, which in turn consists of motor starter, fuses or circuit breaker, and power disconnect.

It is used for controlling of diverse motors of a particular plant it may contain DOL feeder Star/Delta feeder or VFD could feed from a PCC. You can operate these feeders from On Panel, From nearest to motor by push button box & also from intelligent PLC System. Motors with score under 55kw are fed from MCC and above rating until 160kw are fed from PCC. MCC working voltage is generally 415V of 3phase supply. MCC has its incomer from PCC.

4. VFD Panel

Variable frequency drive control panel (also named VFD panel, AC drive electrical control panel) is consisted of inner VFD inside the cabinet with external control, protect, display and other electrical, it's an frequency conversion device to control three phase AC motor (including fans and pumps) in variable speed to save energy.

VFD panels adopt enclosed cabinet structure, generally, the protection class is IP20, IP21, IP30, and some panels may reach IP64, IP65 and even IP66 where the application environments need weatherproof, waterproof. The panels surface are coating spray by suppliers, and easy to install in parallel, the panel top configure bus and wiring the VFD keypad to the panel's door for operating directly.

Salient features of VFD Panel Power switching and protection Adjustable speed

Visual control Security protection

5. PLC Panel

Programmable Logic Controllers (PLCs) are small industrial computers with modular components designed to automate customized control processes. PLCs are often used in factories and industrial plants to control motors, pumps, lights, fans, circuit breakers and other machinery. Integrated PLC Panel can monitor any process and provide data wherever and however you need it.

Ease in modification of logic, reduced size, means of remote communications and advances in the technology have made PLC Automation Control Panels an edge over conventional relay based systems. Control Systems Engineers has provided PLC based Panels from PLC of Allen Bradley, Siemens, Modicon, GE Fanuc. From small I/O application to the complex I/O systems are provided by the Control Systems Engineers. Control Systems Engineers have developed communication software's for remote communication of the PLC Panels in various different protocols. With PLC based Panels HMI/MMI are provided to provide the operator various messages.

6. Advantages:

1. Easy to change logic i.e. flexibility Reliable due to absence of moving parts Low power consumption
2. Easy maintenance due to modular assembly Facilities in fault finding and diagnostic

Analog signal handling and close loop control programming Counter, timer .

CHAPTER 3

UTILITY AND PROCESS

3.1 UTILITY SECTION

3.1.1 CHILLER

A **chiller** is a machine that removes heat from a liquid coolant via a vapor-compression, adsorption refrigeration, or absorption refrigeration cycles.

This liquid can then be circulated through a heat exchanger to cool equipment, or another process stream (such as air or process water). As a necessary by-product, refrigeration creates waste heat that must be exhausted to ambience, or for greater efficiency, recovered for heating purposes.

Vapor compression chillers may use any of a number of different types of compressors. Most common today are the hermetic scroll, semi-hermetic screw, or centrifugal compressors.

The condensing side of the chiller can be either air or water cooled. Even when liquid cooled, the chiller is often cooled by an induced or forced draft cooling tower. Absorption and adsorption chillers require a heat source to function.[2][3]

Chilled water is used to cool and dehumidify air in mid- to large-size commercial, industrial, and institutional facilities.

Water or liquid chillers can be liquid-cooled, air-cooled, or evaporatively cooled. Water or liquid- cooled systems can provide efficiency and environmental impact advantages over air-cooled systems. A chiller is a machine that removes heat from a liquid via a vapor-compression or absorption refrigeration cycle. This liquid can then be circulated through a heat exchanger to cool equipment, or another process stream (such as air or process water).

As a necessary by-product, refrigeration creates waste heat that must be exhausted to ambience, or for greater efficiency, recovered for heating purposes.

.

Chilled water is used to cool and dehumidify air in mid- to large-size commercial, industrial, and institutional facilities. Water chillers can be water-cooled, air-cooled, or evaporatively cooled. Water-cooled systems can provide efficiency and environmental impact advantages over air-cooled systems.

The single-effect absorption cycle uses water as the refrigerant and lithium bromide as the absorbent. It is the strong affinity that these two substances have for one another that makes the cycle work. The entire process occurs in almost a complete vacuum.

1. Solution Pump :

A dilute lithium bromide solution (63% concentration) is collected in the bottom of the absorber shell. From here, a hermetic solution pump moves the solution through a shell and tube heat exchanger for preheating.

2. Generator :

After exiting the heat exchanger, the dilute solution moves into the upper shell. The solution surrounds a bundle of tubes which carries either steam or hot water. The steam or hot water transfers heat into the pool of dilute lithium bromide solution. The solution boils, sending refrigerant vapor upward into the condenser and leaving behind concentrated lithium bromide. The concentrated lithium bromide solution moves down to the heat exchanger, where it is cooled by the weak solution being pumped up to the generator.

3. Condenser :

The refrigerant vapor migrates through mist eliminators to the condenser tube bundle. The refrigerant vapor condenses on the tubes. The heat is removed by the cooling water which moves through the inside of the tubes. As the refrigerant condenses, it collects in a trough at the bottom of the condenser.

4. Evaporator :

The refrigerant liquid moves from the condenser in the upper shell down to the evaporator in

pressure], the refrigerant liquid boils at approximately 39 °F (4 °C), creating the refrigerant effect. (This vacuum is created by hygroscopic action - the strong affinity lithium bromide has for water - in the Absorber directly below.)

5. Absorber :

As the refrigerant vapor migrates to the absorber from the evaporator, the strong lithium bromide solution from the generator is sprayed over the top of the absorber tube bundle. The strong lithium bromide solution actually pulls the refrigerant vapor into solution, creating the extreme vacuum in the evaporator. The absorption of the refrigerant vapor into the lithium bromide solution also generates heat which is removed by the cooling water. Now the dilute lithium bromide solution collects in the bottom of the lower shell, where it flows down to the solution pump. The chilling cycle is now completed and the process begins once again.

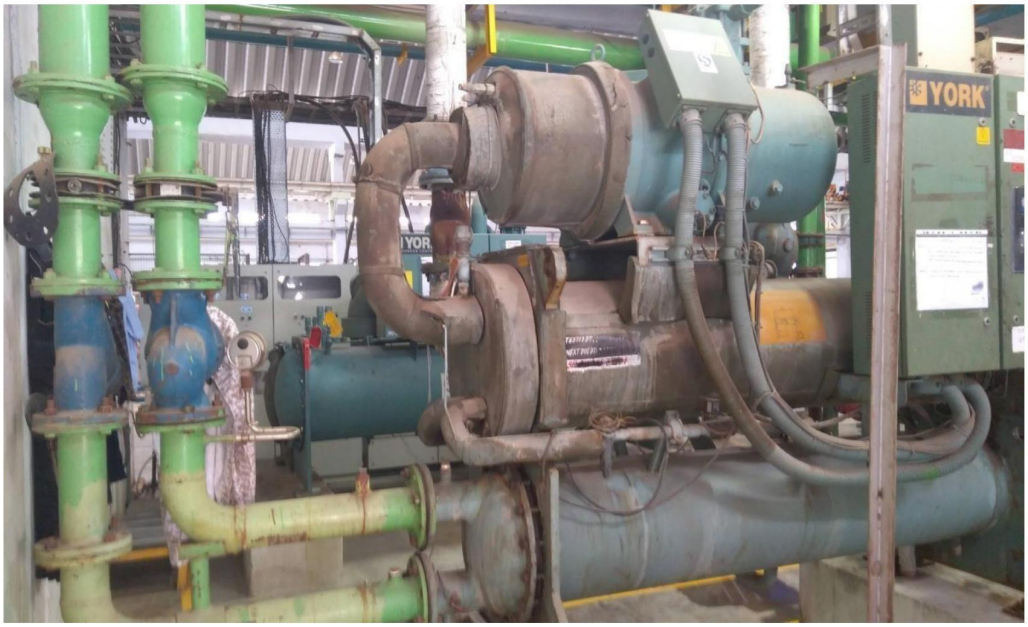


Fig no -- 3.1 , Chiller image

3.1.2 SCREW COMPRESSOR :

A rotary-screw compressor is a type of gas compressor, such as an air compressor, that uses a rotary-type positive-displacement mechanism. They are commonly used to replace piston compressors where large volumes of high-pressure air are needed, either for large industrial

applications or to operate high-power air tools such as jackhammers and impact wrenches.
The gas compression process of a rotary screw is a continuous sweeping motion, so there is very little pulsation or surging of flow, as occurs with piston compressors.

3.1.3 WORKING :

Rotary-screw compressors use two meshing helical screws, known as rotors, to compress the gas. In a dry-running rotary-screw compressor, timing gears ensure that the male and female rotors maintain precise alignment. In an oil-flooded rotary-screw compressor, lubricating oil bridges the space between the rotors, both providing a hydraulic seal and transferring mechanical energy between the driving and driven rotor. Gas enters at the suction side and moves through the threads as the screws rotate. The meshing rotors force the gas through the compressor, and the gas exits at the end of the screws.

The effectiveness of this mechanism is dependent on precisely fitting clearances between the helical rotors and between the rotors and the chamber for sealing of the compression cavities. However, some leakage is inevitable, and high rotational speeds must be used to minimize the ratio of leakage flow rate over effective flow rate.

In contrast to Roots blowers, screw compressors are made with different profiles on the two rotors: the male rotor has convex lobes which mesh with the concave cavities of the female rotor. Usually the male rotor has fewer lobes than the female rotor, so that it rotates faster. Originally, screw compressors were made with symmetrical rotor cavity profiles, but modern versions use asymmetrical rotors, with the exact rotor designs being the subject of patents .

PUMPS -

1.PRIMARY CHILLER PUMP
2.SECONDARY CHILLER PUMP
3.PRIMARY PROCESS PUMP
4.SECONDARY PROCESS PUMP
5.CONDENSER PUMP

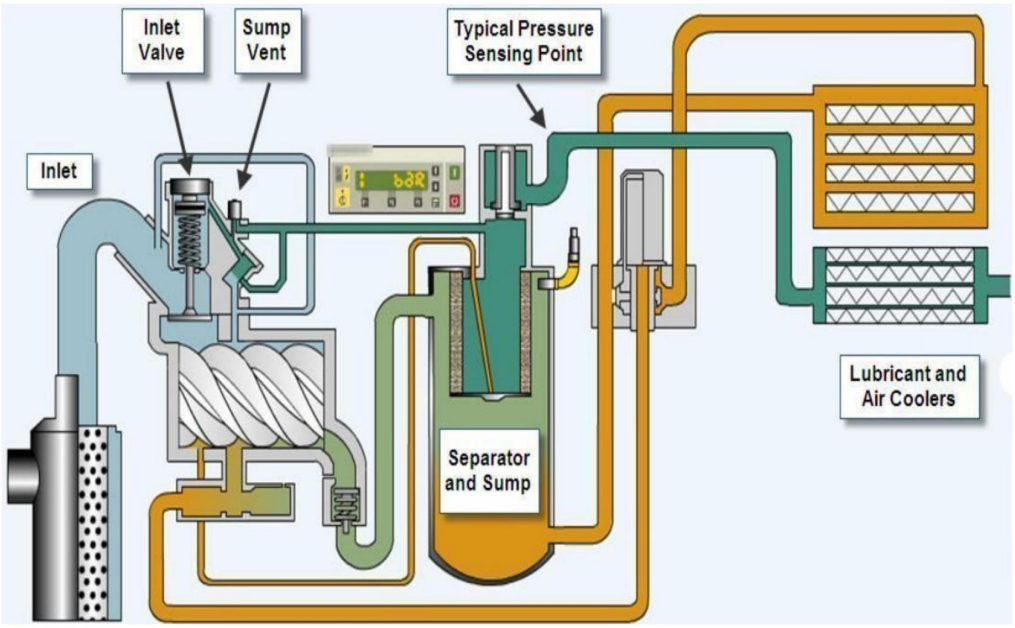


Fig no -3.2 , Compressor

Centrifugal pumps are used to transport fluids by the conversion of rotational kinetic energy to the hydrodynamic energy of the fluid flow. The rotational energy typically comes from an engine or electric motor. They are a sub-class of dynamic axis symmetric work-absorbing turbo machinery. The fluid enters the pump impeller along or near to the rotating axis .

Where are pumps used?

Starting from irrigation, water supply, gasoline supply, etc the pump finds its application in air conditioning systems, refrigeration, chemical movement, sewage movement, flood control, marine services, and finally in all industries like powerplants, process industries. Process Industries (Refinery, Oil & Gas, Chemical and Petrochemical Plants) can not be thought of without the application of pumps. That's why pumps are called the heart of a process plant.

3.2 PIPE MAKING – MIXER :

mixed material . mixer mixes all material in that proportion . for PVC PIPES when RESIN is added to HOT MIXER by pressure pump there are 3 fins which move in high speed touching body create friction and heat , by this material get added by proportion. It goes to cooler mixer where material cool at that temperature where we need for pipe making . then viva vibrator it goes to SILO . This all system is work on PLC SCADA Systems

MIXER SIDE -

PVC Big Bag Un-Loader

⇩

SILO

⇩

MAJOR

⇩

HOT MIXER

⇩

(1 FIN) COOLER MIXER

⇩

INTERMEDIATE TANK

⇩

VIBRATION TANK

⇩

PRESSURE CONVEYING SYSTEM SILO

⇩

Mixer

Flow chart - 3.2.1

Fig No - 3.3 , Hot mixer

Fig No - 3.4 , Pipe making machine

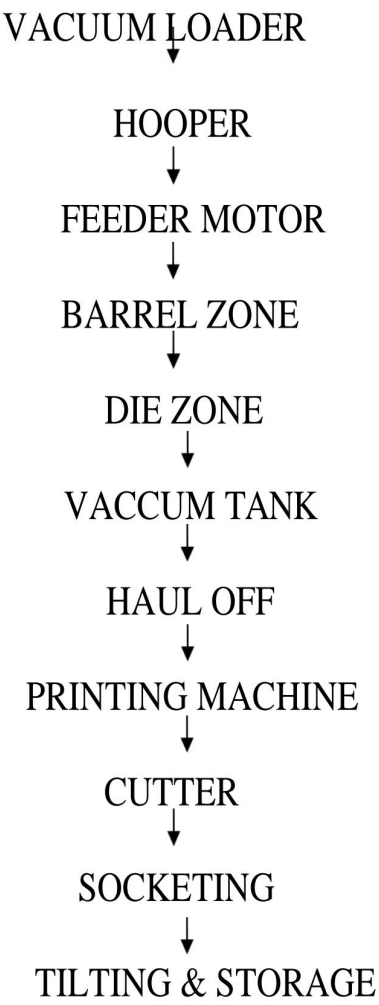
The effectiveness of this mechanism is dependent on precisely fitting clearances between the helical rotors and between the rotors and the chamber for sealing of the compression cavities. However, some leakage is inevitable, and high rotational speeds must be used to minimize the ratio of leakage flow rate over effective flow rate.

In contrast to Roots blowers, screw compressors are made with different profiles on the two rotors: the male rotor has convex lobes which mesh with the concave cavities of the female rotor. Usually the male rotor has fewer lobes than the female rotor, so that it rotates faster. Originally, screw compressors were made with symmetrical rotor cavity profiles, but modern versions use asymmetrical rotors, with the exact rotor designs being the subject of patents.

Silo :

Storage silos are cylindrical structures, typically 10 to 90 ft (3 to 27 m) in diameter and 30 to 275 ft (10 to 90 m) in height with the slipform and Jumpform concrete silos being the larger diameter and taller silos. They can be made of many materials. Wood staves, concrete staves, cast concrete, and steel panels have all been used, and have varying cost, durability, and airtightness tradeoffs. Silos storing grain, cement and woodchips are typically unloaded with air slides or augers. Silos can be unloaded into rail cars, trucks or conveyors.

3.3 PRODUCTION :



Flow chart - 2 ,Production

3.3.1 VACUUM LOADER :

It sucks the raw material , prepared mix batch from SILO to HOPPER .

3.3.2 HOPPER :

It stores material before providing to extruder. Material can be seen passing through it also it has magnetic arrangement which pulls away the metal pieces left in the raw material .

3.3.3 FEEDER MOTOR :

It feeds material to extruder .

3.3.4 PIPE EXTRUSION MACHINE :

This machine is designed to create a uniform piece of piping that is often a long continuous piece of pipe that can be installed without the need for a large number of coupling and attachments the pipe extrusion process is often completed using different form of plastic pellets or powder pushed into the machine at high pressure and heat levels that creates a high performance and strong piece of plastic piping.

3.3.5 BARREL ZONE :

in barrel zone material is heated partially between the screw(app 160-180 temp) and pushed the material in forward direction. Blower are arrange to barrel zone in case if temperature exceeds the permitted limits, blower are activated and bring down the temperature.

3.3.6 DIE ZONE :

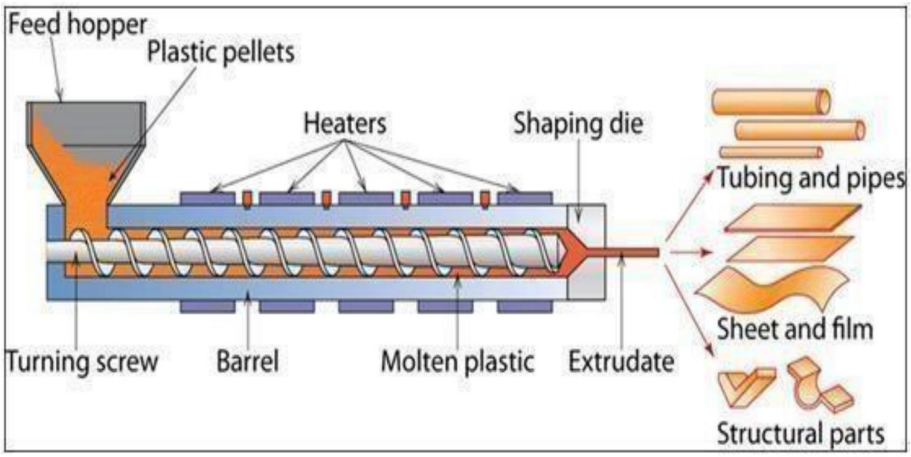


Fig no – 3.5 , Extrusion machine

3.3.7 SCREEN CHANGER :

It is located inside the die and acts like a filtering unit. It filters the material and avoids unnecessary substances in it . bush and punch are critical part for production and should be handled with care. They are different for different classes and sizes.

3.3.8 VACUUM TANK :

In this vacuum is maintained to provide pipe its circular cross sectional area . vacuum pumps are placed below the tank which create vacuum . At the entrance of the tank vacuum die is attached to maintain the circular cross section of The vacuum has to be maintained at particular values otherwise the pipe gets damaged and turned into scrap it loses its circular cross section as well as thickness . Water pumps are also placed below the tank to circulate water inside the tank for cooling pipes . a filtering is for filter impure water .

3.3.9 HAUL OFF :

Main function of haul off is to pull the pipe In forward direction to cutter machine .Its speed has to be maintained equal with the extruder speed which is controlled by electric panels present on it .The speed mismatch can be a great problem as it generates lot of rejection and therefore the line speed must be set ideal so that no rejection takes place.

fig No – 3.6 , haul off

3.3.10 PRINTING MACHINE :

A. WHEEL PRINTING :

in this printing is done by wheel and different class of pipes. In this paint tray has to be filled every 4hours .colorspecification. 4 kg - blue , 2. 6 kg – green , 3. Aquagold – SCH 80 red/green .

B. INK JET PRINTING :

mainly this printing is used for CPVC , HDPE ,PPR PIPES . as these pipe surface cannot be printed easily, first their surface has to be made rough and then jet of ink is imparted on that surface. This printing process is costly and require programming.

3.3.11 CUTTER :

main function of cutter is to cut pipe according to the given length . this length is specified by a sensor attach just before HAUL OFF called as ENCODER. Blades used in cutter are CARBIDE BLADE , FS BLADE , DIAMOND BLADE .

TYPES OF CUTTER –
1. SPR UPSTROKE CUTTER
2. PLANETARY CUTTER
3. TOOL CUTTER

3.3.12 SOCKETING :

It is used for joining pipes without coupler . the socketed part is female and the next side is male . it is first heated to a specified temperature and for specified time ,then it is passed to socketing die where the heated part is expanded . at the same time the brand logo is punched and cooled .

fig No -3.7 ,socating machine

3.3.13 STORAGE :

After socketing pipes are uplifted from conveyer belt to put in trolly. And then carried out to storage areas .

3.3.14 GRINDNING SECTION :

Rejected pipes comes in grindning section where pipe grind change into small powder, which is light gray in color . grinder crush pipe into 6mm material , this material is pass through it.

CHAPTER 4

INDUSTRY PROJECTS

4.1.SOLAR ENERGY AT TSIL :

Photovoltaics directly convert solar energy into electricity. They work on the principle of the photovoltaic effect. When certain materials are exposed to light, they absorb photons and release free electrons. This phenomenon is called as the photoelectric effect. Photovoltaic effect is a method of producing direct current electricity based on the principle of the photoelectric effect. Based on the principle of photovoltaic effect, solar cells or photovoltaic cells are made.

They convert sunlight into direct current (DC) electricity. But, a single photovoltaic cell does not produce enough amount of electricity. Therefore, a number of photovoltaic cells are mounted on a supporting frame and are electrically connected to each other to form a photovoltaic module or solar panel. Commonly available solar panels range from several hundred watts (say 100 watts) up to few kilowatts (ever heard of a 5kW solar panel?). They are available in different sizes and different price ranges. Solar panels or modules are designed to supply electric power at a certain voltage (say 12v), but the current they produce is directly dependent on the incident light. As of now it is clear that photovoltaic modules produce DC electricity. But, for most of the times we require AC power and, hence, solar power system consists of an inverter

4.2 RO SYSTEM :

Reverse Osmosis / RO is a technology used to remove dissolved solids and impurities from water using a semi-permeable RO membrane which allows the passage of water but leaves the majority of dissolved solids and other contaminants behind. The RO membranes require water to be under high pressure (greater than osmotic pressure) to do this. The water that passes through the RO membrane is referred to as the "permeate" and the dissolved salts that are rejected by the RO membrane is referred to as the "concentrate. In supreme huge ponds are there for industrial use. Industry need huge amount of water. By pipe line water comes to plant. Some additives are added to remove turbidity from water, water comes in tank where big is there and filter are which remove sand and dust Then it comes to big tank. From that it goes to ACF

What is Activated Carbon Filter .Activated Carbon Filter is widely accepted system in water filtration techniques. The treated water is free from chloramines (chlorine and ammonia mixture) and organic compounds

therefore, best for discharge and production use. Activated Carbon Filter is also utilized in pre- treatment for ro water plant and dm plant as the treated water keeps these systems safe from oxidation or organic fouling. From this water goes to softener. hard water conversion. Water is softened on a large scale by the addition of just enough lime to precipitate the calcium as carbonate and the magnesium as hydroxide, whereupon sodium carbonate is added to remove the remaining calcium salts.Then it goes to tank. For drinking of water another tank is available. Softener water goes to RO SYSTEM where water becomes clean for drinking which put in a nother tank.

From softener it goes to all plant . for cooling of chiller water comes from cooling tower and MIST COOLING TOWER.

4.3 MIST COOLING TOWER :

Installation of a COLDMIST mist cooling system permits the atomization of water to micro droplets around 6-8 microns in size. These droplets are light in weight and are easily flash evaporated . Light droplets remain airborne for longer periods of time before succumbing to natural gravity forces and falling to the ground. When these droplets come into contact with hot air they flash evaporate and - in so doing - effectively consume/remove heat in the air. The ambient temperature is thereby reduced by 10-12 degrees.

Repeated millions of times a second, this flash evaporation process results in large amounts of heat energy consumption thus removing heat from the air. Our system operates by removing heat from the air rather than cooling the air. Whilst the end result is the same the methodology is different to standard air conditioning. Once the flash evaporation process has completed, it is important to ensure that the evaporated water molecules are removed from the area allowing for fresh water micro droplets to be replaced thus permitting the process to be repeated. Failure to remove the evaporated molecules whilst continuing to introduce new water droplets will result in humidity build- up and wetting. The misting equipment essential to micro atomize mains water includes high pressure pumps and correctly sized misting nozzles.

CHAPTER 5

EXPERIMENTAL STUDY

5.1 .Induction Motor :

An induction motor, also referred to as a synchronous motor, used in industrial environments. These motors feature armature windings, and work on the principle of electromagnetic induction. The electro-magnetic field in the rotor is produced by the rotating field of the stator. In short, the power is transferred to the rotor winding by stator through induction.

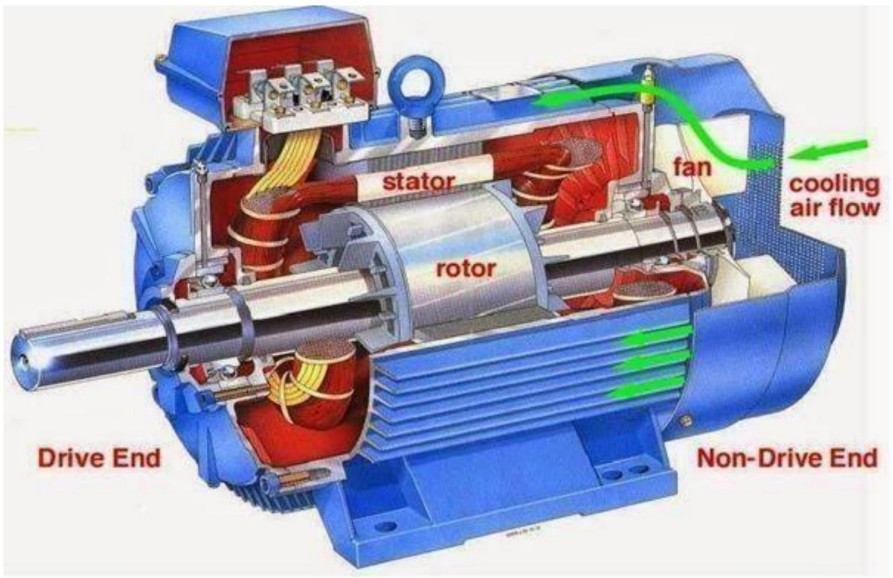


Fig no - 5.1 , Induction motor

5.1.2 Motor Starter :

Devices that control the use of electrical power to equipment, usually a motor. As the name implies, starters “start” motors. They can also stop them, reverse them, accelerate them, and protect them. The primary function of a motor starter is to start and stop the motor to which it is connected. These are specially designed electromechanical switches similar to relays. The main difference between a relay and a starter is that a starter contains overload protection for the motor.

5.2 Direct Online Starter :

The simplest form of motor starter for the induction motor is the Direct On Line starter. The Direct On Line Motor Starter (DOL) consist a MCCB or Circuit Breaker, Contactor and an overload relay for protection. Electromagnetic contactor which can be opened by the thermal overload relay under fault conditions.

Typically, the contactor will be controlled by separate start and stop buttons, and an auxiliary contact on the contactor is used, across the start button, as a hold in contact. I.e. the contactor is electrically latched closed while the motor is operating.

5.2.1 Principle of Direct On Line Starter (DOL) :

To start, the contactor is closed, applying full line voltage to the motor windings. The motor will draw a very high inrush current for a very short time, the magnetic field in the iron, and then the current will be limited to the Locked Rotor Current of the motor. The motor will develop Locked Rotor Torque and begin to accelerate towards full speed.

As the motor accelerates, the current will begin to drop, but will not drop significantly until the motor is at a high speed, typically about 85% of synchronous speed. The actual starting current curve is a function of the motor design, and the terminal voltage, and is totally independent of the motor load.

Provided the torque developed by the motor exceeds the load torque at all speeds during the start cycle, the motor will reach full speed. If the torque delivered by the motor is less than the torque of the load at any speed during the start cycle, the motor will stops accelerating. If the starting torque with a DOL starter is insufficient for the load, the motor must be replaced with a motor which can develop a higher starting torque.

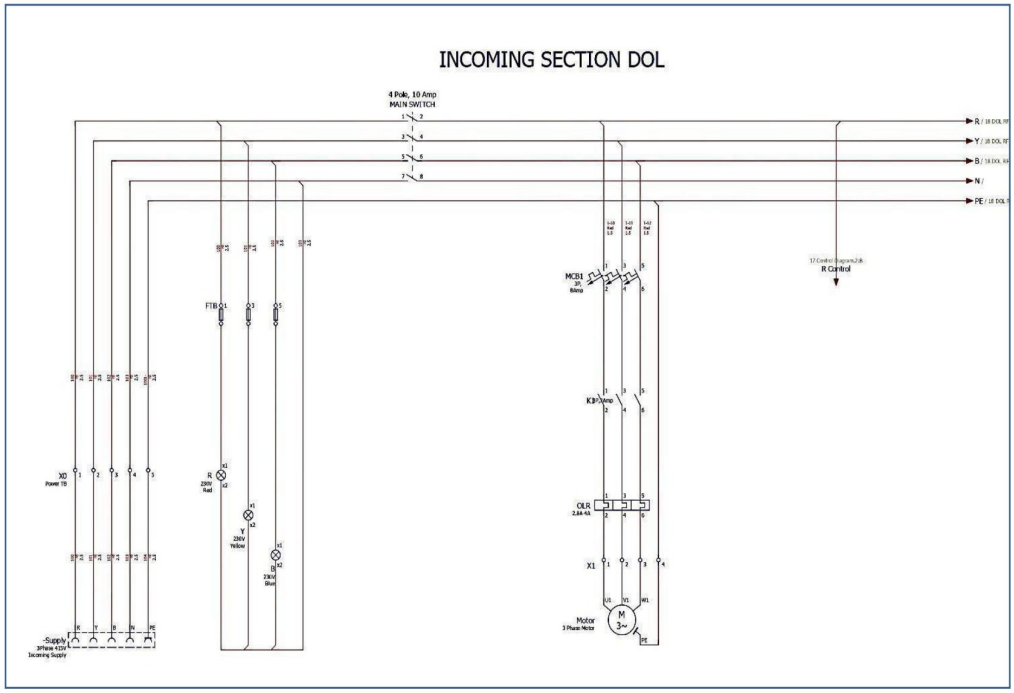


Fig No - 5.2 ,DOL starter power wiring

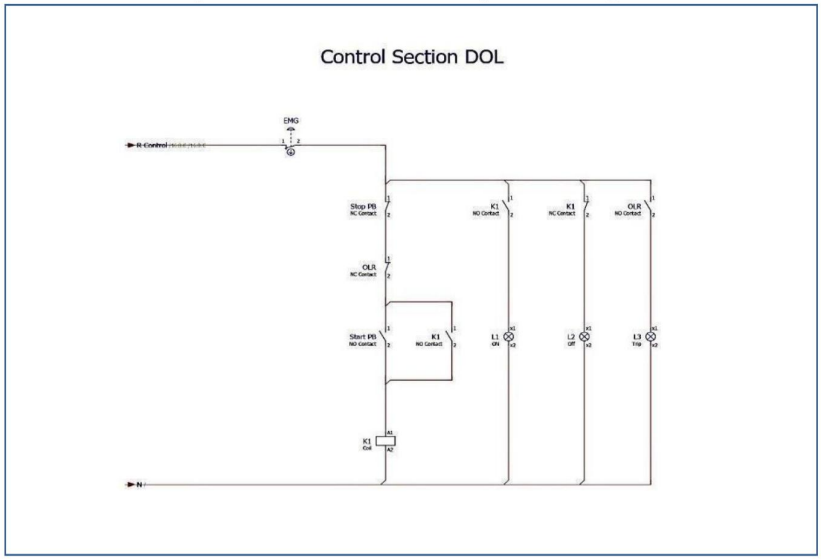


Fig No - 5.3 , DOL starter Control wiring

5.3 Star Delta Starter –

Most induction motors are started directly on line, but when very large motors are started that way, they cause a disturbance of voltage on the supply lines due to large starting current surges. To limit the starting current surge, large induction motors are started at reduced voltage and then have full supply voltage reconnected when they run up to near rotated speed. Star delta starter is used for for reducing starting inrush current.

5.3.1Working Principle of Star-Delta Starter :

This is the reduced voltage starting method. Voltage reduction during star-deltastarting is achieved by physically reconfiguring the motor windings as illustrated in the figure fireduces the voltage across each winding 3. This also reduces the torque by a factor of three.

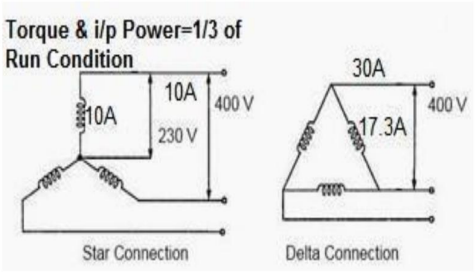


Fig No – 5.4 Star and delta

After a period of time the winding are reconfigured as delta and the motor runs normally. Star/Delta starters are probably the most common reduced voltage starters. They areused in an attempt to reduce the start current applied to the motor during start as a means of reducing the disturbances and interference on the electrical supply.

The Star/Delta starter is manufactured from three contactors, a timer and a thermal overload. The contactors are smaller than the single contactor used in a Direct on Line starter as they are controlling winding currents only. The currents through the winding are 1/root 3 (58%) of the current in the line.

There are two contactors that are close during run, often referred to as the main contractor and the delta contactor. These are AC3 rated at 58% of the current rating of the motor. The third contactor is the star contactor and that only carries star current while the motor is connected in star.

The current in star is one third of the current in delta, so this contactor can be AC3 rated at one third (33%) of the motor rating.

Components of Star Delta Starter Contactors (Main, star and delta contactors) 3 NOs
Timer (Timer ON) 1 NO
Three-pole thermal overcurrent release 1 N

Motor Starting Characteristics of Star-Delta Starter Available starting current: 33% Full Load Current. Peak starting current: 1.3 to 2.6 Full Load Current. Peak starting torque: 33% Full Load Torque.

5.3.2 Advantages of Star-Delta starter :

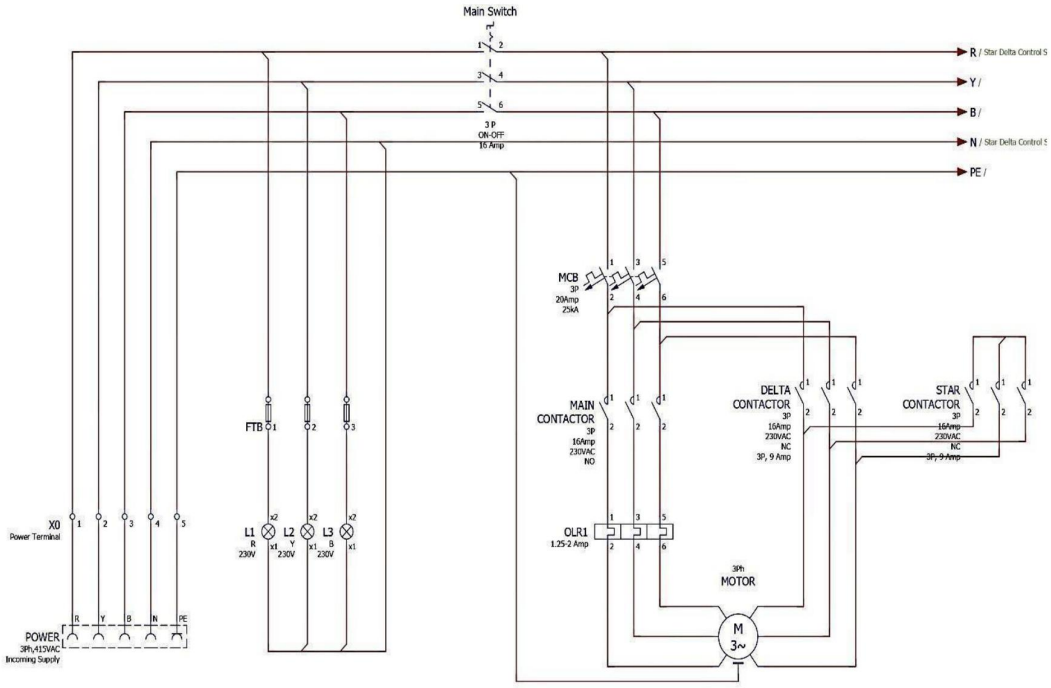
1. The operation of the star-delta method is simple and rugged
2. It is relatively cheap compared to other reduced voltage methods.
3. It draws 2 times starting current of the full load ampere of the motor connected

5.3.3 Disadvantages of Star-Delta starter :

1.Low Starting Torque (Torque = (Square of Voltage) is also reduce). Six
2.Terminal Motor Required (Delta Connected).
3.It requires 2 set of cables from starter to motor.

1. Star State. The Main [KM3] and the Star [KM1] contactors are closed and the delta [KM2] contactor is open. The motor is connected in star and will produce one third of DOL torque at one third of DOL current.

Star – Delta starter Power wiring



2. Star Transition State. The motor is connected in star and the resistors are connected across the delta contactor via the aux [KM4] contactor.
3. 3 .Closed Transition State. The Main [KM3] contactor is closed and the Delta [KM2] and Star [KM1] contactors are open. Current flows through the motor windings and the transition resistors via KM4.
4. Delta State. The Main and the Delta contactors are closed. The transition resistors are shorted out. The Star contactor is open. The motor is connected to full line voltage and full power and torque are available.

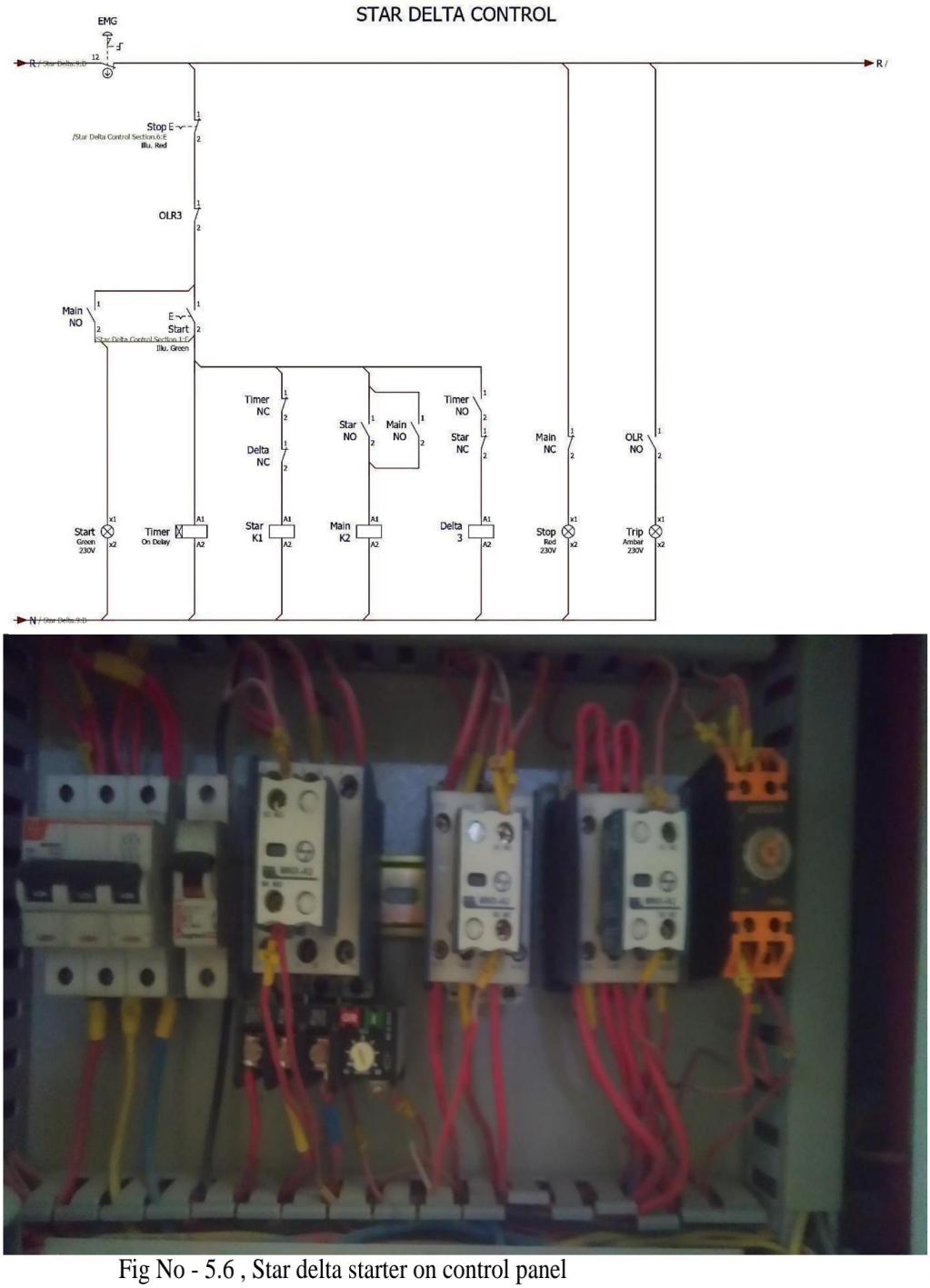


Fig No - 5.6 , Star delta starter on control panel

5.3.4 Contactor -

A contactor is an electrically-controlled switch used for switching an electrical power circuit.

purpose relays, contactors are designed to be directly connected to high-current load devices.

Two types –A1A2 coil - 230energized A1A2 coli – 440energized
Three phase incoming and outgoing contact and A1 and A2 energizing coil

fig No – 5.7, Contactor

5.3.5 OVERLOAD RELAY PROTECTION :

An overload relay is a device that protects an electric motor against overloads and phase failure .An overload is a condition at which a motor draws a current above its rated value, for a prolonged period.

three major conditions for overload trips:

1. Overloading of the motor.
2. Input phase loss
3. Phase imbalance.

How does an OLR Guard from Phase Failures?

In normal operation of OLR, the flow of current throughout every pole to the electric motor remains similar at a time. If any phase is interrupted, then the flow of current throughout the remaining two phases increases to the usual value. Therefore the relay gets heated up & trips. Phase failures are also called phase loss otherwise single phasing of the motor. relays cannot defend from short circuits but, they must be used through protection devices of a short circuit to protect them or any short circuits within the electric motor can injure them easily. These relays can defend from phase loss, phase imbalance, overloads.

fig No -5.8 ,overload relay

When the motor draws excess current, it is referred to as an overload. This may cause overheating of the motor and damage the windings of the motor. Because of this, it is important to protect the motor, motor branch circuit, and motor branch circuit components from overload conditions. Overload relays protect the motor, motor branch circuit, and motor branch circuit components from excessive heat from the overload condition. Overload relays are part of the motor starter (assembly of contactor plus overload relay). They protect the motor by monitoring the current flowing in the circuit. If the current rises above a certain limit over a certain period of time, then the overload relay will trip, operating an auxiliary contact which interrupts the motor control circuit, de-energizing the contactor. This leads to the removal of the power to the motor. Without power, the motor and motor circuit components do not overheat and become damaged. The overload relay can be reset manually, and some overload relays will reset automatically after a certain period of time. After which, the motor can be restarted.

5.3.6 MCB PROTECTION :

MCB stands for Miniature Circuit Breaker. The MCB is an electromechanical device which guards the electric wires &electrical load from overcurrent so as to avoid any kind of fire or electrical hazards. It automatically switches OFF electrical circuit during any abnormal condition in the electrical network such as overload & short circuit conditions. MCB can be reset. We are using 4 MCB of different rating mainly as 2 pole 4 Amp, 2 pole 6 Amp, 2 pole 10 Amp, and 1 pole 2 Amp of Siemens make.

fig No -5.9, MCB

Overload protection is provided by the Bi-metallic During 'slow' continuous over-current, characteristic to overload, the bimetallic strip is heated by the electrical charge and thus bends, releasing the mechanical latch. The latch, which is connected to the operating mechanism causes the contacts to open and breaks the circuit. During Short Circuit, the sudden and dramatic rise of electric current causes electro- mechanical displacement of the plunger (4) from the tripping coil or solenoid (2).

5.3.7 ELCB(Earth Leakage Circuit Breaker) PROTECTION :

An Earth-leakage circuit breaker (ELCB) is a safety device used in electrical installations with high Earth impedance to prevent shock. It detects small stray voltages on the metal enclosures of electrical equipment, and interrupts the circuit if a dangerous voltage is detected. Once widely used, more recent installations instead use residual-current devices (RCDs, RCCBs or GFCIs) which instead detect leakage current directly.

Fig no 5.10, ELCB

CHAPTER – 6

DESIGN AND DEVELOPMENT OF PLC PANELS

6.1 Programmable logic controller :

A programmable logic controller (PLC) or programmable controller is an industrial digital computer that has been ruggedized and adapted for the control of manufacturing processes, such as assembly lines, robotic devices, or any activity that requires high reliability, ease of programming, and process fault diagnosis.

PLCs can range from small modular devices with tens of inputs and outputs (I/O), in a housing integral with the processor, They can be designed for many arrangements of digital and analog I/O, extended temperature ranges, immunity to electrical noise, and resistance to vibration and impact. Programs to control machine operation are typically stored in battery-backed-up or non- volatile memory.

PLCs were first developed in the automobile manufacturing industry to provide flexible, rugged and easily programmable controllers to replace hard-wired relay logic systems.

Since then, they have been widely adopted as high-reliability automation controllers suitable for harsh environments.

They can be designed for many arrangements of digital and analog I/O, extended temperature ranges, immunity to electrical noise, and resistance to vibration and impact. Programs to control machine operation are typically stored in battery-backed-up or non-volatile memory.

6.1.2 Architecture :

A PLC is an industrial microprocessor-based controller with programmable memory used to store program instructions and various functions. It consists of:

1. a processor unit (CPU) which interprets inputs, executes the control program stored in memory and sends output signals,
2. a power supply unit which converts AC voltage to DC,
3. a memory unit storing data from inputs and program to be executed by the processor,
4. an input and output interface, where the controller receives and sends data from/to external devices.

PLCs were first developed in the automobile manufacturing industry to provide flexible, rugged and easily programmable controllers to replace hard-wired relay logic systems. Since then, they have been widely adopted as high-reliability automation controllers suitable for harsh environments.

fig No - 6.1, PLC

6.1.3 PLC PANEL NEAR MOTORS :

All input of motor and uttilty section are given to plc .PLC panel is there in utility section to take data from motor to plc and from plc ladder logic it gives output .

The most basic function of a programmable controller is to emulate the functions of electromechanical relays. Discrete inputs are given a unique address, and a PLC instruction can test if the input state is on or off. Just as a series of relay contacts perform a logical AND function, not allowing current to pass unless all the contacts are closed, Programmable logic controllers are intended to be used by engineers without a programming background. . For this reason, a graphical programming language called Ladder Diagram (LD, LAD) was first developed. It resembles the schematic diagram of a system built with electromechanical relays .

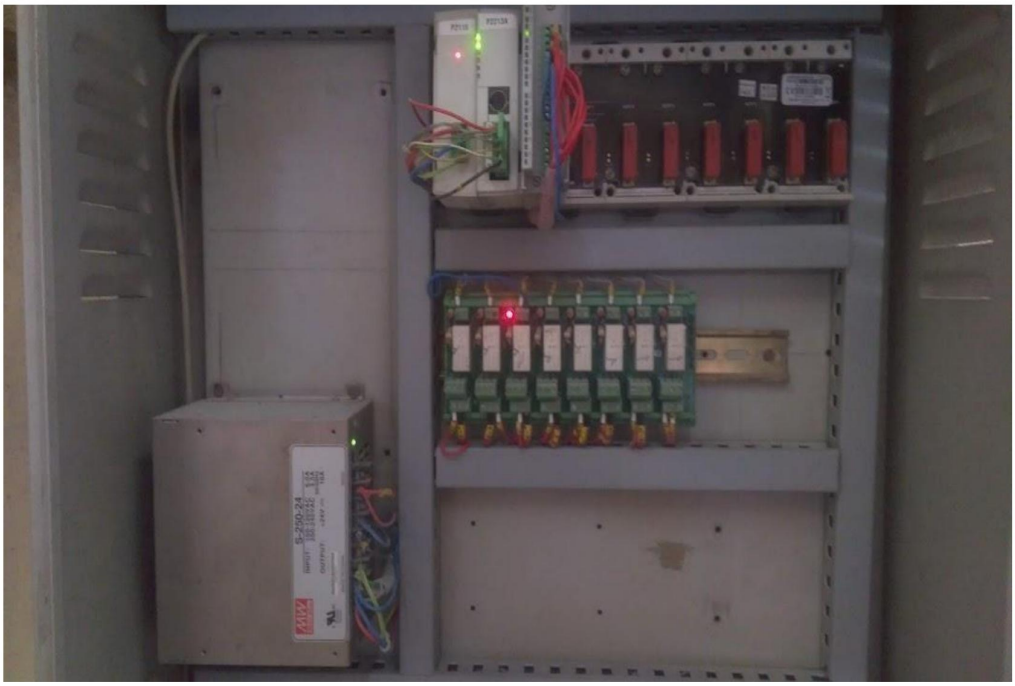


fig No - 6.2, PLC panel image

6.1.4 PLC 2213A -

PLC inputs

1. X0 – 24V input from proximity sensor
2. X1 – Push button
3. X2 – pull button
4. X3 – Overload contact 5 .
5. X4 - temperature controller

PlC output –

1. Given by canopen communication to communication panel
2. Overload output given to electronic hooter
3. Y3 as trip indication.

fig No - 6.3 , PLC 2213A

6.1.5 PLC SIMULATION :

PLC simulation is a feature often found in PLC programming software. It allows for testing and debugging early in project's development.

PLC simulation done on DELTA –ISP SOFT PLC SOFTWARE

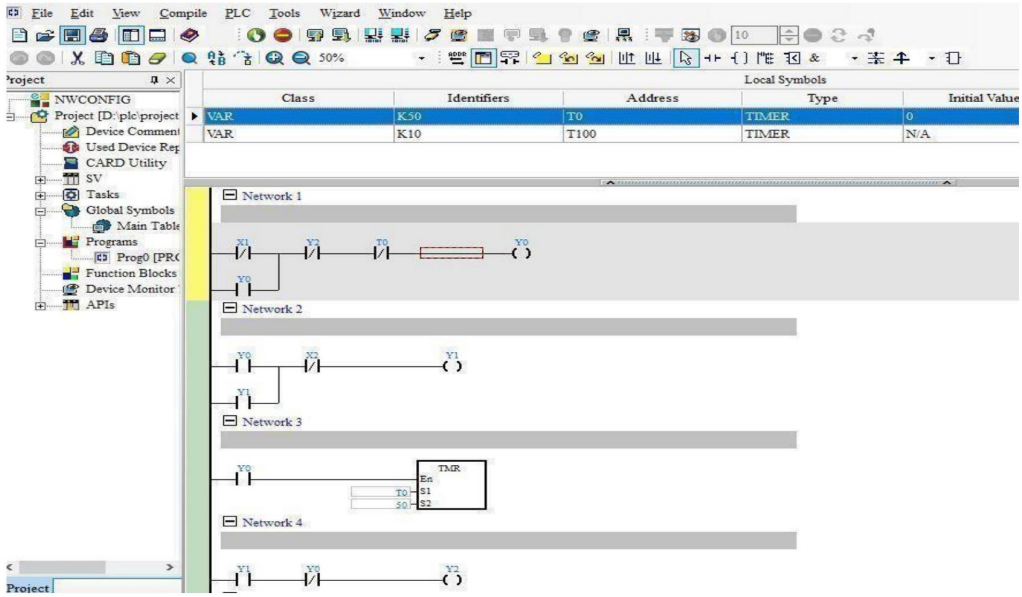


fig No – 6.4 , Starting ,running , forward reverse operationand overload and overcurrent trip indication

6.1.6 SMPS :

A switched-mode power supply (switching-mode power supply, switch-mode power supply, switched power supply, SMPS, or switcher) is an electronic power supply that incorporates a switching regulator to convert electrical power efficiently.

Like other power supplies, an SMPS transfers power from a DC or AC source (often mains power, see AC adapter) to DC loads, such as a personal computer, while converting voltage and current characteristics. Unlike a linear power supply, the pass transistor of a switching-mode supply continually switches between low-dissipation, full-on and full-off states, and spends very little time in the high dissipation transitions, which minimizes wasted energy. A hypothetical ideal switched-mode power supply dissipates no power. Voltage regulation is achieved by varying the ratio of on-to-off time (also known as duty cycles). In contrast, a linear power supply regulates the output voltage by continually dissipating powerin the pass transistor. This higher power conversion efficiency is an important advantage of a switched-mode power supply.

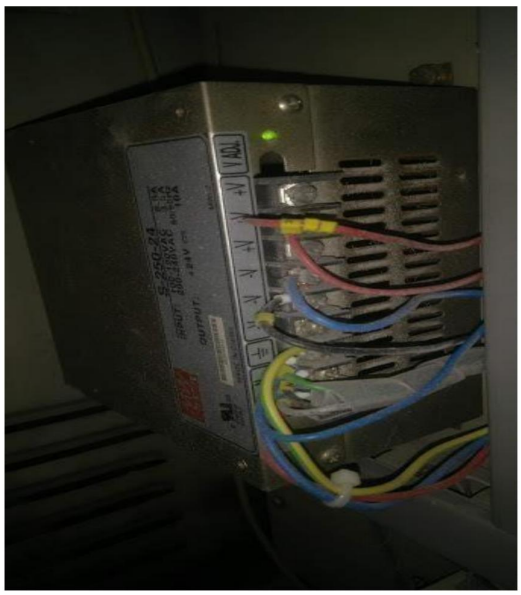


fig No – 6.5, SMPS

6.1.7 RELAY BOARD

PLC Interface Relay is the interface between automation equipment and system

peripherals with high switching capacity. By the simply replacing the relay without disconnect the wiring. ....PLC relay simplifies installation with integrated input and protective circuit.

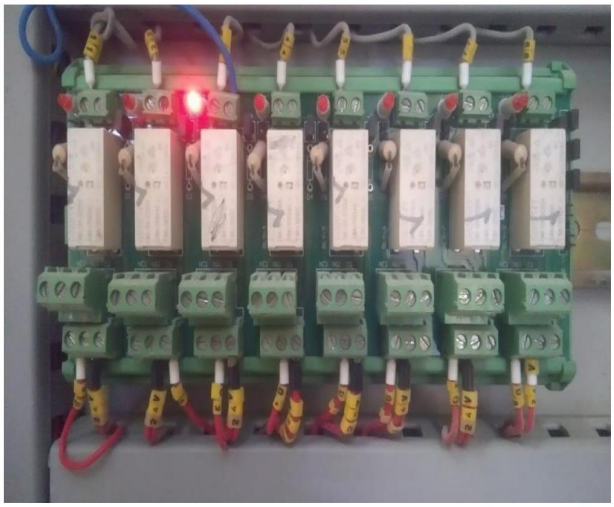


fig No - 6.6, Relay Board

6.1.8 PLC TO RELAY BOARD CONNECTION-

PLC output gets ON relay gets 0V and 24 V from relay common and relay coil get operated and NO contact becomes NC contact .

Relay board -input - 24 DCoutput – load , lamp , 1 phase equipment .

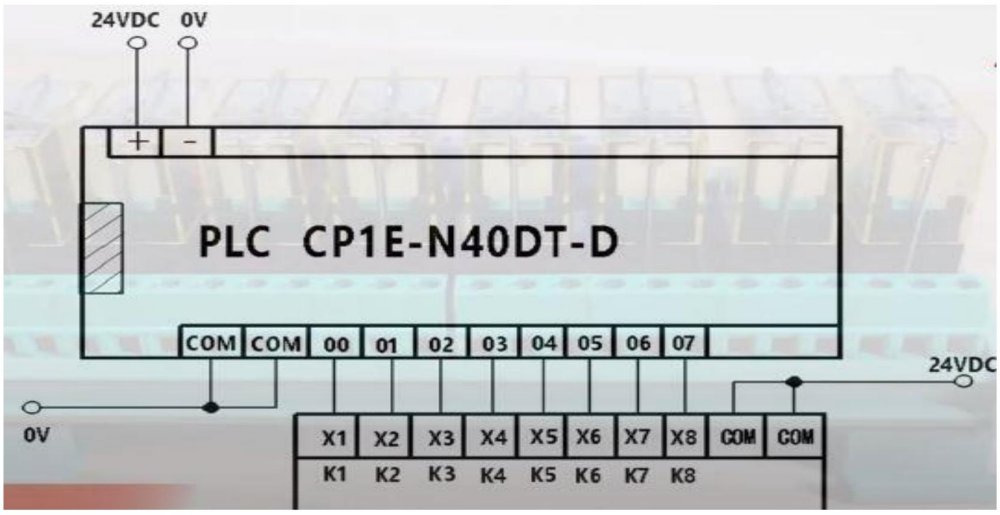


fig No – 6.7 ,PLC to relay board connection

6.1.9 PLC INPUT - 3 WIRE PROXIMITY SENSOR :

A 3wire inductive proximity sensor is an electronic device that can detect ferrous (Fe) targets without any physical contact. ,t operates an internal electronic switch. Because the sensor is an electronic device it requires a DC power source. I am using 3 wire PNP proxmity sensor which give 24V output then this 24V PLC .

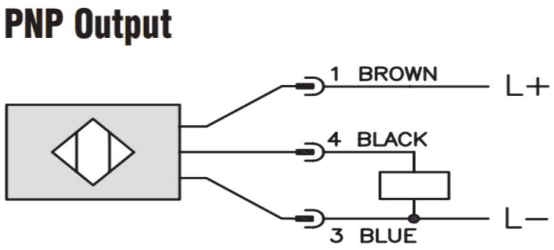


Fig no 6.8 PNP sensor

6.2 PLC 2213A COMMUNICATION :

PLCs use built-in ports, such as USB, Ethernet, RS-232, RS-485, or RS-422 to communicate with external devices (sensors, actuators) and systems (programming software, SCADA, HMI). Communication is carried over various industrial network protocols, like Modbus, or EtherNet/IP. Many of these protocols are vendor specific.

PLCs used in larger I/O systems may have peer-to-peer (P2P) communication between processors. This allows separate parts of a complex process to have individual control while allowing the subsystems to co-ordinate over the communication link. These communication links are also often used for HMI devices such as keypads or PC-type workstations.

6.2.1COMMUNICATION PANEL

Output of PLC 2213A is taken with the help of 12 core cable given to canopen communication and from canopen base unit communication and its output then it is given to relay board

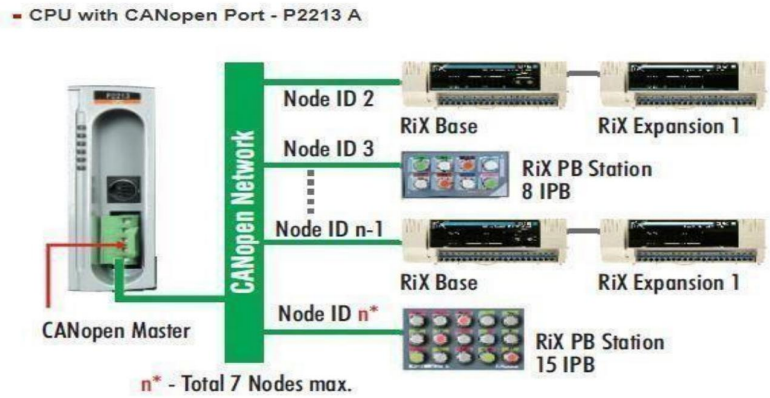


fig No -6.9 , plc communication

fig No – 6.10 ,can open master

6. 2.2 Electronic HOOTER and indicating lamp :

The best quality industrial electric siren. The best quality sound of the sire form the manufacturer of MM Enterprises Systems. Also known as in following names.. Hooter, Fire Alarm, Siren, Motor Siren, Factory Siren.Output from relay board is given to electronic hooter and indicator to know the status of motor of utility section .

CHAPTER 7

HARDWARE AND RESULT

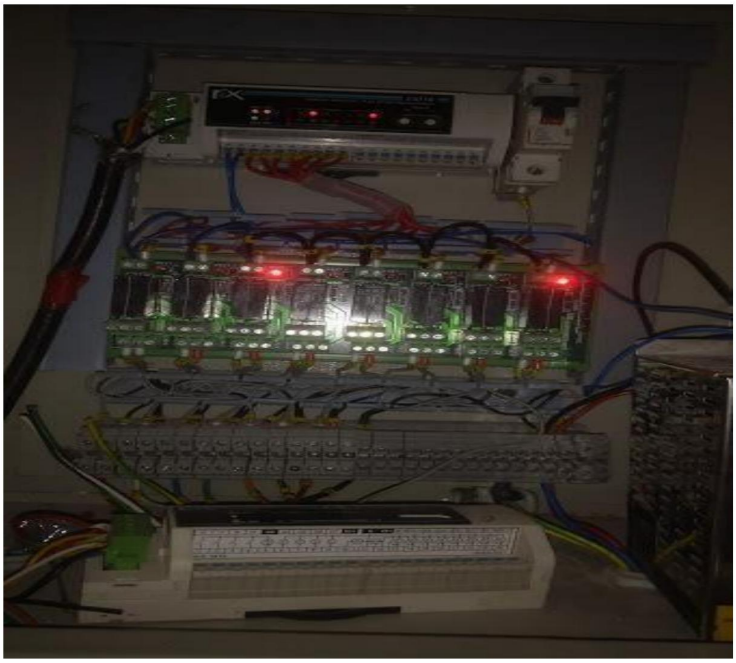


Fig . No 7.1 ,communication panel.

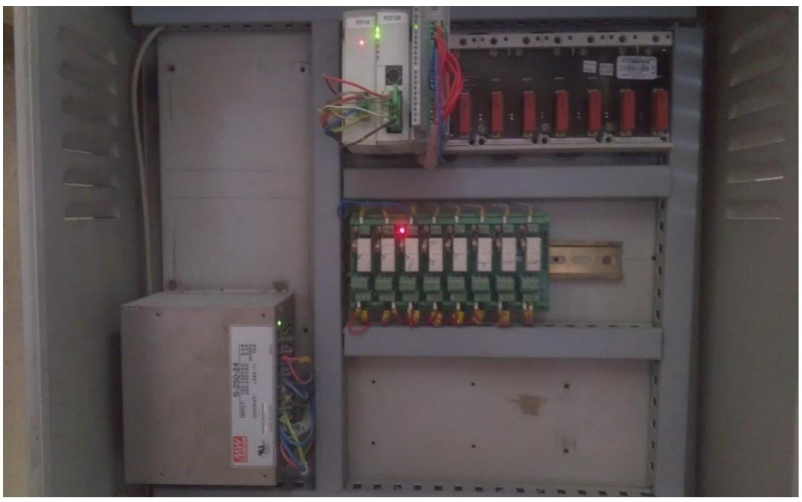


Fig no - 7.2 PLC panel at utility

CHAPTER 8

CONCLUSION AND FUTURE SCOPE

CONCLUSION

After practical implementation, the following conclusions were obtained:

1. Induction motor play important role in industries .
2. So protection and monitoring of induction motor is very important .
3. PLC plays an important role in automation in industries .
4. Plc makes relay diagram small and more Effiective .also we can communicate from plc to other devices such as VFD , drive ,HMI .
5. MCB provides short circuit protection, whereas MPCB provides both short circuit and overload protection
6. ELCB provides protection from earth faults .
7. Relays and transformers provides isolation in circuit.
8. Relays are used in the output side of PLC.
9. In starter power and control wiring are important .
10. Control Panel play big role in industry , which can put many devices in manner .
11. Industrial Automation makes system fast , reliable , efficient And needed less man power .

Future scope of project

PLC are used in industry in wide ranges , PLC compress big circuit into smaller , it increase efficiency of circuit and we can have many input and output .PLC can communicate with HMI , VFD , and other drive which make system efficient and error less . PLC decrease relay logic and wiring and maintance of circuit .

As I wrap up our summer internship, I wanted to thank you for being a wonderful mentors these past weeks. I have really enjoyed building our basic concepts with you. I have enjoyed in room sessions and on field work.

8.3. REFERENCES

1. M. E. H. Benbouzid, "A review of induction motors signature analysis as a medium for faults detection," IEEE Transactions on Industrial
Electronics, vol. 47, pp. 984-993, 2000.

2. Fault detection and protection of induction motors using sensors, 2008, Ramazan Bayindir, Ibrahim Sefa, İlhami Colak, and Askin Bektas.

3.A. Siddique, G. S. Yadava, and B. Singh, "A review of stator fault monitoring techniques of induction motors," IEEE Trans. Energy
Convers.,vol. 20, no. 1, pp. 106-114, Mar. 2005.

4. M. E. H. Benbouzid, "Bibliography on induction motors faults detection and diagnosis," IEEE Trans. Energy Convers., vol. 14, no. 4, pp. 1065-
1074, Dec. 1999.

5. R. Bayindir and I. Sefa, "Novel approach based on microcontroller to online protectionof induction motors," Energy Convers. Manage, vol. 48,
no. 3, pp. 850-856, 2007.

6. M. G. Ioannides, "Design and implementation of PLC-based monitoring control system for induction motor," IEEE Trans. Energy
Convers.,vol. 19, no. 3, pp. 469-476, Sep. 2004.