

**Details of Industrial/Internship Summer training (2020-21)**

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**WET LEAK TESTING FOR BLOW MOULD  
COMPONENT (FUEL TANK) USING PRESSURE  
DROP METHOD  
A PROJECT REPORT**

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*in partial fulfillment for the award of the degree*

*of*

**BACHELOR OF ENGINEERING**

**IN**

**ELECTRONICS AND INSTRUMENTATION ENGINEERING**



**SRI SAIRAM ENGINEERING COLLEGE (AUTONOMOUS),  
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**MAY 2021**

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**BONAFIDE CERTIFICATE**

Certified that this project report “**WET LEAK TESTING FOR BLOW MOULD COMPONENT (FUEL TANK) USING PRESSURE DROP METHOD**” is the bonafide work of “**NANDHINI.T (412517107042), HARINI.V(412517107021), PRIYADHARSHINI.P (412517107050) and KOHILA.N.K (412517107035)**” who carried out the project work under my supervision.

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**INTERNAL EXAMINER**

**EXTERNAL EXAMINER**



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22.04.2021

### PROJECT COMPLETION CERTIFICATE

This is to certify that **MS. Harini V of B.E. Electronics and Instrumentation Engineering** from **Sri Sai Ram Engineering College, Chennai** has successfully completed the project entitled “**N251 Drilling & Leaktesting Machines**” for “**Plasmotech India PVT LTD**”, Chennai in association with **CDCE Robotics** during the period January 2021 – April 2021 and the project work done by her was found to be **Good & Satisfactory**.

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	<b>LIST OF ABBREVIATIONS</b>	X
	<b>LIST OF TABLES</b>	XI
<b>1</b>	<b>INTRODUCTION</b>	9
	1.1 GENERAL	9
<b>2</b>	<b>LITERATURE REVIEW</b>	10
	2.1 GENERAL	10
<b>3</b>	<b>SYSTEM DESCRIPTION</b>	13
	3.1 GENERAL	13
	3.2 HARDWARE DESCRIPTION	14
	3.2.1 Power supply	14
	3.2.2 SMPS	17
	3.2.3 Relays	20
	3.2.4 Contactor	23
	3.2.5 Miniature Circuit Breaker	25
	3.2.6 FRL Unit	27
	3.2.7 Pressure Transducer	28
	3.2.8 Pressure Regulator	29
	3.2.9 Pneumatic Cylinders	30
	3.2.10 Solenoid Valves	31

3.2.10 HMI	32
3.2.11 Photoelectric Sensor	35
3.2.12 Precision Regulator	36
3.2.13. PLC	36
3.2.15. Features and description	37
<b>3.3 ELECTRICAL PANEL LAYOUT</b>	<b>37</b>
<b>3.4 SOFTWARE DESCRIPTION</b>	<b>38</b>
3.4.1. Overview of Delta PLC	38
3.4.2. Functions of Delta PLC	38
3.4.3. Block diagram of Delta PLC	39
3.4.4. Characteristics of Delta PLC	40
3.4.5. Application specific systems	40
3.4.6. Cost sensitivity	41
3.4.7. Power management	41
3.4.8. Ladder Logic	42
<b>4 WORKING METHODOLOGY AND IMPLEMENTATION</b>	<b>44</b>

4.1 GENERAL	44
4.2 BLOCK DIAGRAM	44
4.3 WORKING	45
4.4 PROPOSED SYSTEM	46
4.5 INPUT CONFIGURATION	47
4.6 OUTPUT CONFIGURATION	48
<b>5 CONCLUSION AND FUTURE SCOPE</b>	<b>49</b>
5.1 SUMMARY OF PROJECT	49
5.2 FUTURE SCOPE OF PROJECT	49
<b>APPENDIX</b>	<b>50</b>
<b>REFERENCES</b>	<b>55</b>

## **ABSTRACT**

In today's competitive world quality assurance of a product is a must before launching it in the market. Quality analysis ensures that the end product or service is of high quality and thus assures a safe and better user experience, which takes 40% of the total time taken to produce the end product. Leak testing is one of the most important processes during the quality analysis of a product. Wet leak test approach is best suitable for processes where the exact location of the leak under water is detected. It is automatic function that after each & every NOK component it will take the component inside the water & fill the air for visual inspection of leak. The machine having feasibility to store the place of leak detection & count the repeatability of leak detection in each place. Water tank level & position Poke- Yoke detection method reduces the cycle time & uncertain break down. As the machine having capability to take the component inside the water automatically & take the component for de-clamping automatically after finishing the visual inspection, it reduces cycle time. With the industrial revolution 4.0, automation has made the process more reliable, accurate, efficient, and less time-consuming. The main idea of this work is to design an automation system to detect any leakage in a blow-moulded component using the differential pressure method. Programmable Logic Controller (PLC), Human Machine Interface (HMI), and pressure transducer are used for this approach.

**Keywords:** Quality analysis, Leak testing, PLC, HMI.

## **LIST OF ABBREVIATIONS**

<b>ABBREVIATION</b>	<b>EXPANSION</b>
PLC	Programmable Logic Controller
HMI	Human Machine Interface
MCB	Miniature Circuit Breaker
FSU	Field Service Unit
FRL	Filter Regulator and Lubricator
FPM	Fuel Pump Motor
SMPS	Switched Mode Power Supply

## **CHAPTER 1**

### **INTRODUCTION**

#### **1.1 GENERAL**

In today's competitive world quality assurance of a product is a must before launching it in the market. Quality analysis ensures that the end product or service is of high quality and thus assures a safe and better user experience, which takes 40% of the total time taken to produce the end product. Leak testing is one of the most important processes during the quality analysis of a product. With the industrial revolution 4.0, automation has made the process more reliable, accurate, efficient, and less time-consuming. The main idea of this work is to design an automation system to detect any leakage in a blow-moulded component using the differential pressure method. Programmable Logic Controller (PLC), Human Machine Interface (HMI), and pressure transducer are used for this approach.

## CHAPTER 2

### LITERATURE REVIEW

#### 2.1 GENERAL

Literature survey is the most important step in development process. Before developing the tool, it is necessary to determine the time factor, economy and company strength. Once these things are satisfied, then next steps are to determine the necessities for developing the system. Once the developer starts building the system they need lot of external support. This support can be obtained from books and from website. Before building the system, the above consideration is taken into account for developing the proposed system.

##### **2.1.1 Leak Detection by N.Hilleret:**

According to N. Hilleret [1] “Leak Detection” CERN, Geneva, Switzerland 203-212. Various methods of leak detection are explained and also gives information about instruments used for leak detection purpose. In the case of vacuum the vessels, it is necessary to check that tightness of vessel by means of guarantee of leak proof before installation. Depending upon the size of leak, method of leak detection is selected from various methods.

##### **2.1.2 Leak Testing Machine by Donald T. Soncrant:**

As stated by Donald T. Soncrant [2] , Fluidic type “LEAK TESTING MACHINE”. Describes the method to improve speed of testing of hollow

particles of fluid leakage consist of closed charged valve, open charged valve, compressor and hollow workpiece. Time delay valve is used to regulate pressurized air supply. When time delay valve cut off, test valve get actuated it measure flow rate through hollow component, if workpiece is acceptable it turns ON accept light. If the flow rate exceeds predetermined value, it turns ON reject light. This leakage testing method is used in the industry for testing hollow body for fluid leakage. Electronically actuated valve and relays used to conduct test in a sequence. Here, no special voltage reduction, filtering and voltage regulating devices are required. Operation is independent of voltage variation. This method is more reliable and less complex method. Hence used in the industry for testing of hollow components.

### **2.1.3 Design of Wet Leak Test Machine for Radiators: A Study by Darshan Dabholkar, Dipak Shenvi:**

According to Darshan Dabholkar, Dipak Shenvi [3]. “Design of Wet Leak Test Machine for Radiators: A Study” study of design of a wet leak test machine, used for the detection of leakages in radiators is based on the technique of submerging the part in the water that is stored in an immersion tank. Immersion tanks are a widely used method for location of leakages in complex assemblies and products. The part under test is pressurized with air while being submerged in a liquid, typically water. The operator looks for a stream of bubbles indicative of a leak. Proper selection and implementation of a production leak test method starts with an understanding of why the test is being performed,



followed by establishing what the leak rate limit is, and finally a determination of how the leak test will be performed.

#### **2.1.4 Method and Apparatus For Testing Leakage Rate by Joachim**

**W.Pauly:**

As stated by Joachim W. Pauly [4] "METHOD AND APPARATUS FOR TESTING LEAKAGE RATE", *May07/1974*. Vessel such as submarine is selected for testing of leakage of air, by establishing pressure level and test flow to the vessel. For determining the leakage of air in vessel, difference in pressure in the vessel is monitored, and determining whether the leakage rate from the vessel exceeds a predetermined rate by relating the test flow rate to its effect on the pressure level in the vessel. In 1st operation, variable test flow is delivered to the vessel and adjusted such that as needed to maintain pressure in the vessel at test level, rate of this flow is measured when stabilized and measured values are converted into standard units. In 2nd operation, constant flow rate is delivered to the vessel which is equivalent to leakage in vessel and effect of pressure difference in vessel indicates the relation between leakage rate and test flow rate.

## **CHAPTER 3**

### **SYSTEM DESCRIPTION**

#### **3.1 GENERAL**

The hardware components used in this project are as follows

- Power Supply
- SMPS
- Relays
- Contactor
- MCB
- FRL Unit
- Pressure Transducer
- Pressure Regulator
- Pneumatic Cylinder
- Solenoid Valve
- HMI
- Photoelectric Sensor

The software used in this project is as follows

- Delta PLC – WPL SOFT

## 3.2 HARDWARE DESCRIPTION

### 3.2.1 Power Supply

All electronic circuits work's only in low DC voltage, so there is need of power supply unit to provide the appropriate voltage supply for their proper functioning. This unit consists of transformer, rectifier, filter & regulator. AC voltage of typically 230 Volts rms is connected to a transformer voltage step down to the level to the desired ac voltage. A diode rectifier that provides the full wave rectified voltage is initially filtered by a simple capacitor filter to produce a dc voltage. This resulting dc voltage usually has some ripple or ac voltage variation. A regulator circuit can use this dc input to provide dc voltage that not only has much less ripple voltage but also remains the same dc value even the dc voltage varies somewhat, or the load connected to the output dc voltages changes.

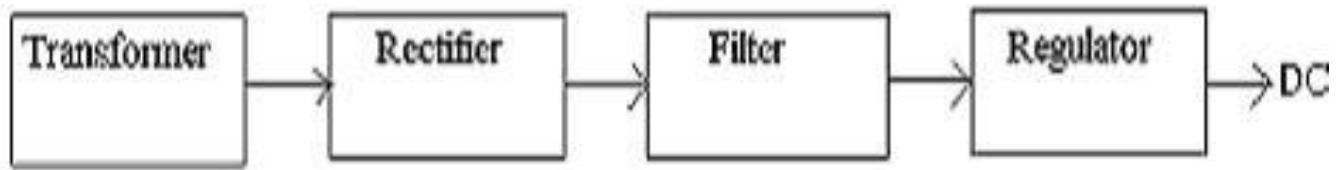


Fig 3.2 Block Diagram of Power Supply Unit

#### 3.2.1.1 Transformer

A transformer is a static piece of electric power in one circuit is transformed into electric power of same frequency in another circuit. It can raise or lower the voltage in the circuit, but with a corresponding decrease or increase in current. It works with the principle of mutual induction. In this by using a step down transformer to providing a necessary supply for the electronic circuit by stepping down a 230 ac into 12 V ac

### **3.2.1.2 Rectifier**

A dc level obtained from a sinusoidal input can be improved 100% using a process called full wave rectification. Here in this for full wave rectification bridge rectifier is used. From the basic bridge configuration, the two diodes (say D2 & D3) are conducting while the other two diodes (D1 & D4) are in off state during the period  $t = 0$  to  $T/2$ . Accordingly for the negative cycle of the input the conducting diodes are D1 and D4. Thus the polarity across the load is the same. In the bridge rectifier the diodes may be of variable types like 1N4001, 1N4003, 1N4004, 1N4005, 1N4007 etc... can be used. But here 1N4007 is used, because it can withstand up to 1000 V.

### **3.2.1.3 Filters**

In order to obtain a dc voltage of 0 Hz, the use of a low pass filter. So that a capacitive filter circuit is used where a capacitor is connected at the rectifier output and a dc is obtained across it. The filtered waveform is essentially a dc voltage with negligible ripples and it is ultimately fed to load.

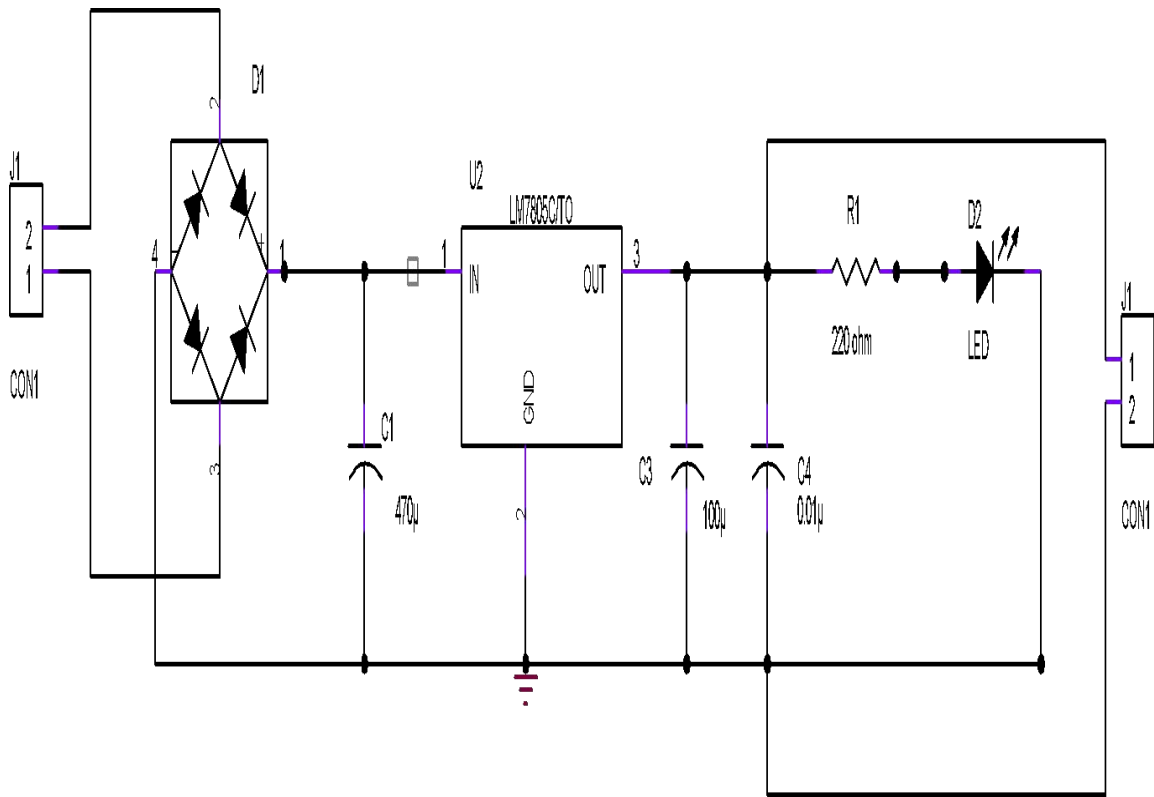
### **3.2.1.4 Regulators**

The output voltage from the capacitor is more filtered and finally regulated. The voltage regulator is a device, which maintains the output voltage constant irrespective of the change in supply variations, load variations and temperature changes. The use of fixed voltage regulator namely LM7805. The IC LM7805 is a +5v regulator which is used for microcontroller.

- Output Current up to 1A
- Output Voltages of 5, 6, 8, 9, 10, 12, 15, 18, 24V
- Thermal Overload Protection
- Short Circuit Protection

- Output Transistor Safe Operating Area Protection

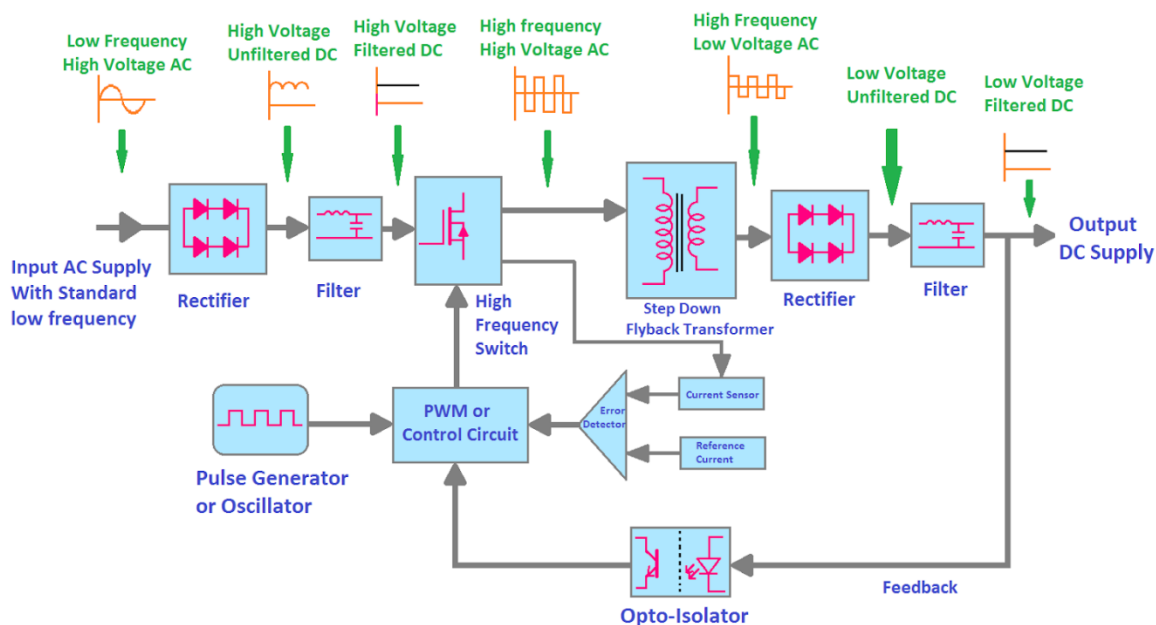
**CIRCUIT DIAGRAM OF POWER SUPPLY:**



**Fig 3.1 Circuit Diagram of Power supply**

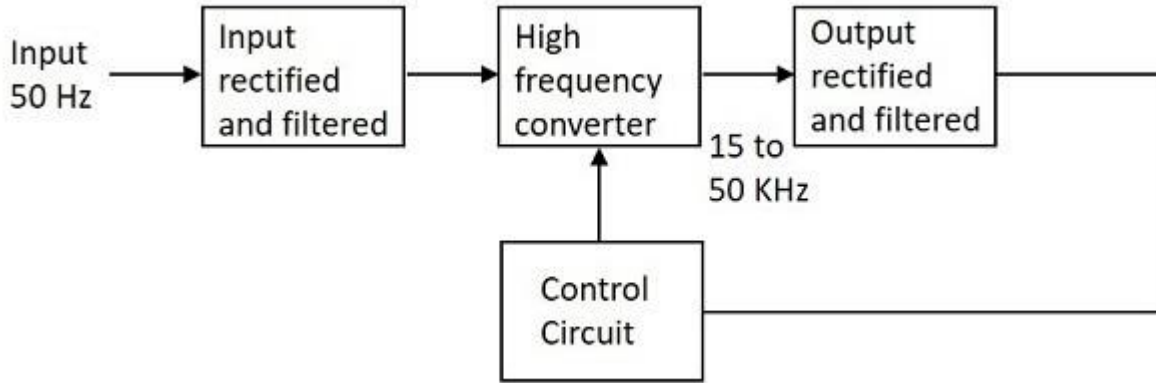
### 3.2.2 Switched Mode Power Supply:

SMPS is a type of power supply that uses semiconductor switching techniques, rather than standard linear methods to provide the required output voltage. The basic switching converter consists of a power switching stage and a control circuit. The power switching stage performs the power conversion from the circuit's input voltage,  $V_{IN}$  to its output voltage,  $V_{OUT}$  which includes output filtering.



**Fig 3.2 Block diagram of SMPS**

## WORKING:



**Fig 3.2.2 Working of SMPS**

### Input Stage

The AC input supply signal 50 Hz is given directly to the rectifier and filter circuit combination without using any transformer. This output will have many variations and the capacitance value of the capacitor should be higher to handle the input fluctuations. This unregulated dc is given to the central switching section of SMPS.

### Switching Section

A fast-switching device such as a Power transistor or a MOSFET is employed in this section, which switches ON and OFF according to the variations and this output is given to the primary of the transformer present in this section. The transformer used here are much smaller and lighter ones unlike the ones used for 60 Hz supply. These are much efficient and hence the power conversion ratio is higher.

### Output Stage

The output signal from the switching section is again rectified and filtered, to get the required DC voltage. This is a regulated output voltage which is

then given to the control circuit, which is a feedback circuit. The final output is obtained after considering the feedback signal.

### **Control Unit:**

This unit is the feedback circuit which has many sections. The output sensor senses the signal and joins it to the control unit. The signal is isolated from the other section so that any sudden spikes should not affect the circuitry. A reference voltage is given as one input along with the signal to the error amplifier which is a comparator that compares the signal with the required signal level.

By controlling the chopping frequency, the final voltage level is maintained. This is controlled by comparing the inputs given to the error amplifier, whose output helps to decide whether to increase or decrease the chopping frequency. The PWM oscillator produces a standard PWM wave fixed frequency.

### **Types of SMPS**

SMPS is the Switched Mode Power Supply circuit which is designed for obtaining the regulated DC output voltage from an unregulated DC or AC voltage. There are four main types of SMPS such as

- DC to DC Converter
- AC to DC Converter
- Fly back Converter
- Forward Converter

### **Advantages**

- The advantages of SMPS include,
- The efficiency is as high as 80 to 90%



- Less heat generation; less power wastage.
- Reduced harmonic feedback into the supply mains.
- The device is compact and small in size.
- The manufacturing cost is reduced.
- Provision for providing the required number of voltages.

### **Disadvantages**

- There are few disadvantages in SMPS, such as
- The noise is present due to high frequency switching.
- The circuit is complex.
- It produces electromagnetic interference.

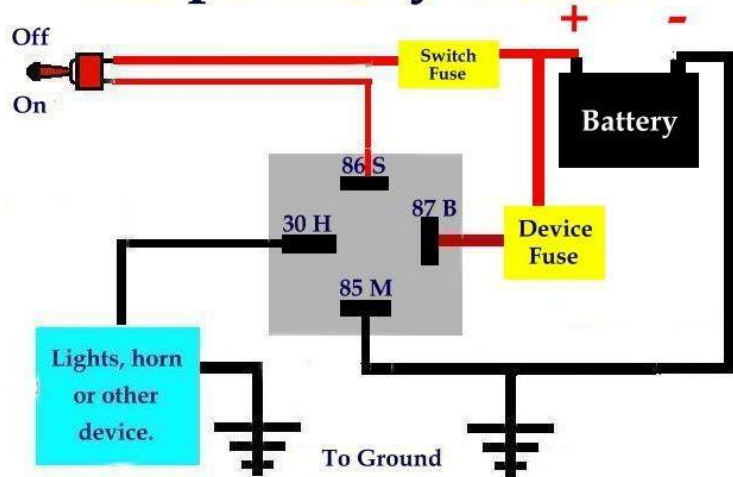
### **Applications:**

There are many applications of SMPS. They are used in the motherboard of computers, mobile phone chargers, HVDC measurements, battery chargers, central power distribution, motor vehicles, consumer electronics, laptops, security systems, space stations, etc.

### **3.2.3 RELAYS:**

Relays are switches that open and close circuits electromechanically or electronically. Relay's control one electrical circuit by opening and closing contacts in another circuit. As relay diagrams show, when a relay contact is normally open (NO), there is an open contact when the relay is not energized.

## Simple Relay Circuit.



**Fig 3.3 Relay circuit**

When a relay contact is Normally Closed (NC), there is a closed contact when the relay is not energized. In either case, applying electrical current. Relays are generally used to switch smaller currents in a control circuit and do not usually control power consuming devices except for small motors and Solenoids that draw low amps. Nonetheless, relays can "control" larger voltages and amperes by having an amplifying effect because a small voltage applied to a relays coil can result in a large voltage being switched.

Protective relays can prevent equipment damage by detecting electrical abnormalities, including over current, undercurrent, overloads and reverse currents. In addition, relays are also widely used to switch starting coils, heating elements, pilot lights and audible alarms.

### Relay Contact Types

The terminology "Poles and throws" is also applicable for relay. Depending on the number of contacts and number of circuits it switches relays can be classified. Before we know about this classification of contacts, we have to know the poles and throws of a relay switch.

## **Poles and Throws**

Relays can switch one or more circuits. Each switch in relay is referred as pole. Number of circuits a relay connects is indicated by throws.

Depending on the poles and throws, relays are classified into,

- Single pole single throw
- Single pole double throw
- Double pole single throw
- Double pole double throw

### **Single Pole Single Throw**

A single pole single throw relay can control one circuit and can be connected to one output. It is used for the applications which require only ON or OFF state.

### **Single Pole Double Throw**

A single pole double throw relay connects one input circuit to one of the two outputs. This relay is also called as changeover relay. Though the SPDT has two output positions, it may consist of more than two throws depends on the configuration and requirement of the application.

### **Double pole single throw**

A double pole single throw relay has two poles and single throw, and it can be used to connect two terminals of a single circuit at a time. For example, this relay is used for connecting both phase and neutral terminals to the load at a time.

### **Double pole double throw**

A DPDT (double pole double throw) relay has two poles and two throws for each pole. In motor direction control, these are used for phase or polarity reversal. The switching action between contacts for all these relays is performed when the coil gets energized as shown in figure below.

Relays can be classified into different types depending on their functionality, structure, application etc.

### **Relay Applications**

Relays are used to protect the electrical system and to minimize the damage to the equipment connected in the system due to over currents/voltages. The relay is used for the purpose of protection of the equipment connected with it.

These are used to control the high voltage circuit with low voltage signal in applications audio amplifiers and some types of modems.

These are used to control a high current circuit by a low current signal in the applications like starter solenoid in automobile. These can detect and isolate the faults that occurred in power transmission and distribution system. Typical application areas of the relays include,

- Lighting control systems
- Telecommunication
- Industrial process controllers
- Traffic control
- Motor drives control
- Protection systems of electrical power system
- Computer interfaces
- Automotive
- Home appliances

### **3.2.4 CONTACTOR:**

Contactors are electrically controlled switching devices which are used for switching electrically. The basic operation of this is similar to a relay, but the only difference is that contactors can carry large current compared to relay up to 12500A. They cannot provide short circuit or overload protection but can break the contact when coil excites. They are generally used for 3 phase circuits.

An electromagnetic field is generated whenever current flows where the moving coils attract each other. A large amount of current is drawn initially by an electromagnetic coil. The moving contact is pushed forward by moving core, as a result, the force created by the electromagnet holds the moving and fixed contacts together. On de-energizing, the contactor coil gravity or spring moves back the electro-magnetic coil to its initial position and there is no flow of current in the circuit. If contactors are energized with AC current, a small portion of the coil is the shaded coil, where the magnetic flux in the core is slightly delayed. This effect is too average as it prevents the core from buzzing at twice line frequency. There are internal tipping point processes to ensure rapid action so that contactors can open and closed very rapidly.

#### **Types of contactors**

##### **Magnetic Contactors**

These are the most common types available and for good reason as they are more efficient than the previously mentioned types. These contactors operate electromechanically and do not require human intervention. With their advanced technologies, they can be operated remotely, and this makes them safer and more efficient since they will not require to be operated manually. Only a small amount of current is needed by the magnetic contactor to open and close the circuit, so it is also energy efficient.

##### **Knife Blade Switch**

The knife blade switch contactors were introduced in the late 1800s. It is safe to assume that they were probably the first types of contactors that were used. Their applications were mostly to control electric motors. They consisted of a

metal strip which is designed to drop into a contact when operational. The switch was equipped with a lever for pulling it up or pushing it down. Back then, the contactors were so big; one had to stand next to the knife switchblade to level the switch into a closed position. However, as with old technologies, this method of switching was not efficient enough, and there was functional problems that came with it. The main problem was that it made the contacts wear out quickly. It was difficult to manually open or close the switch quick enough to prevent arcing; as a result, the soft copper switches underwent corrosion, this process made them more vulnerable to dirt and moisture which led to rusting. As years passed and technology began to advance, larger motors were developed. The larger the motors, the more currents they require to work. But it is extremely dangerous to operate such high current carrying switches, so these types of contactors were no longer efficient. Even though technology was continuously improving, the knife blade switches could not be fully developed due to the problems and risks of operational hazards and short life of the contacts.

### **Manual Controller**

Since the knife blade switch became potentially dangerous to use, engineers came up with another contactor device, which offered a number of features that were missing in the knife blade switch. This device was referred to as a manual controller. These features included:

- Safe to operate
- Non-exposed unit, which is properly encased
- Physically smaller size
- Single break contacts replaced with double break contacts

As their name implies, double break contacts can open the circuit in two places at the same time. Thus, even in smaller space, it allows you to work with more current. Double break contacts divide the connection in such a way that it forms two sets of contacts.

The switch or button of the manual controller is not operated remotely and is

attached to the controller physically. The power circuit is engaged once the manual controller is activated by an operator. Once activated, it carries the electricity to the load.

### **3.2.5 MINIATURE CIRCUIT BREAKER:**

A miniature circuit breaker is an electromagnetic device that carries a complete molded insulating material. The primary function of this device is to switch the circuit. This means to automatically open the circuit (which has been connected to it) when the current passing through the circuit goes beyond a set value or limit. The device can be manually switched ON or OFF just like normal switches whenever necessary.

MCBs are time-delay tripping devices. In these devices, the operating time is controlled by the magnitude of over current passing through it, which means that the device functions whenever there is an overload existing for long periods, long enough to endanger the circuit being protected.

So, the MCB is basically used for protecting the circuit (wiring, connected Load, equipment, appliances, etc.) in cases of Overload, Short Circuit, Over-current.

During overload, the current coursing through the bimetal causes the temperature of the bimetal to rise. The heat that accompanies the rise in temperature within the bimetal then causes a deflection in the bimetal. This is due to the expansion of metals. The deflection releases the trip latch, and the contacts get separated. In other MCBs, the magnetic field created by the coil causes a pull on the bimetal such it causes a deflection which will activate the tripping mechanism.

In short circuit or heavy overload situations, magnetic tripping is used more. Under normal working conditions, the slug is held in place by the light spring. This is because the magnetic field created by the coil is not strong enough to attract the latch. When there is a problem in the circuit, and current flows through it, the magnetic field created by the coil is strong enough to pull the

spring holding the slug in position thereby moving the slug and activating the tripping mechanism.

### **MCB OPERATION:**

If the circuit is overloaded for a long time, the bi-metallic strip becomes overheated and deformed. This deformation of Bi-metallic strip causes, displacement of latch point. The moving contact of the MCB is arranged by means of spring pressure, with this latch point, that a little displacement of latch causes, release of spring and makes the moving contact to move for opening the MCB.

The current coil or trip coil is placed so that during short circuit fault the magneto-motive force (mmf) of the coil causes its plunger to hit the same latch point and make the latch to be displaced. Again, when operating lever of the miniature circuit breaker is operated by hand, that means when MCB goes off position manually, the same latch point is displaced as a result moving contact separated from fixed contact in the same manner.

It may be due to deformation of a bi-metallic strip, or increased mmf of a trip coil or maybe a manual operation, the same latch point is displaced and same deformed spring is released, which ultimately responsible for movement of the moving contact. When the moving contact separated from fixed contact, there may be a high chance of arc. This arc then goes up through the arc runner and enters arc splitters and is finally quenched. When we switch it on, we reset the displaced operating latch to its previous on position and the MCB is ready for another switch off or trip operation.

Most MCBs make use of a combination of both thermal and magnetic tripping mechanisms. In both operations, an arc is formed when the contacts start separating. Then through an arc runner, the arc is forced into arc splitter. The arc splitter plates are also referred to as arc chutes. In which an arc is formed



into a series of arcs and at the time, energy is extracted and cools it. Therefore, the arrangement removes arcs.

### **3.2.6 FRL UNIT:**

Filter, regulator, and lubricator (FRL) compressed air systems are used to deliver clean air, at a fixed pressure, and lubricated (if needed) to ensure proper pneumatic component operation and increase their operation lifetime. The air supplied by compressors is often times contaminated, over pressurized, and non-lubricated meaning that an FRL unit is required to prevent damage to equipment.

An FRL unit is comprised of a filter (F), regulator (R), and a lubricator (L). They are often used as one unit to ensure clean air in a pneumatic system but can also be used individually. Having a proper FRL unit installed in a pneumatic system provides higher reliability of the components downstream, reduced power waste due to over pressurization, and increased component lifetime. Filters remove water, dirt and other harmful debris from an air system. This is often the first step in improving the air quality. Regulators adjust and control the air pressure of a system to ensure that down-line components do not exceed their maximum operating pressures. This is the second step in the FRL system. Lubricators reduce the internal friction in tools or equipment by releasing a controlled mist of oil into the compressed air. This is often done last and/or right before the component needing lubrication.

### **3.2.7 PRESSURE TRANSDUCER:**

A **transducer** is a device that converts energy from one form to another. Usually, a transducer converts a signal in one form of energy to a signal in another. A **pressure transducer**, often called a **pressure transmitter**, is a transducer that converts pressure into an analog electrical signal.

The conversion of pressure into an electrical signal is achieved by the physical deformation of strain gages which are bonded into the diaphragm of the pressure transducer and wired into a Wheatstone bridge configuration. Pressure applied to the pressure transducer produces a deflection of the diaphragm which introduces strain to the gages. The strain will produce an electrical resistance change proportional to the pressure. Pressure transducers are generally available with three types of electrical output: millivolt, amplified voltage and 4-20mA.

### **Types of Pressure Transducers**

The classification of pressure transducers can be done based on the design. These are available in different sizes as well as shapes; however, the technology within the transducer can also vary. There are four types of pressure-transducers which include the following.

- Strain Gauge
- Capacitance
- Potentiometric
- Resonant Wire

### **Pressure Transducer Applications**

- These transducers are applicable in any liquid power application which requires a precise & high-resolution measurement of force.
- These transducers are used where a measurement of force is required with incorporated digital display.
- These transducers are applicable within closed-loop applications like compensation of electronic pressure, which will calculate force upstream & downstream of a relative metering tap to precisely calculate pressure fall.
- These transducers are used in closed-loop pumps for controlling.
- These transducers are used like an electronically changeable pressure switch.

### **3.2.8 PRESSURE REGULATOR:**

A pressure regulator is a device which controls the pressure of liquids or gases (medium) by reducing a high input pressure to a controlled lower output pressure. They also work to maintain a constant output pressure even when there are fluctuations in the inlet pressure. A typical pressure regular consists of a pressure reducing element, a loading element, and a sensing element. Spring loaded poppet valves are commonly used as a pressure reducing element. Poppet valves have elastomeric sealing in regular applications and a thermoplastic sealing in high pressure applications. This seals the valve seating against any gas or fluid leakage. The poppet valve is controlled by the spring force to open the valve and let the medium flow from inlet to outlet. As there is a rise in output pressure, the poppet valve closes due to the force generated by the sensing element, which overcomes the spring force. The loading element is used to force the sensing element to open a valve.

The amount of spring force can be varied which determines the amount of outlet pressure obtained. Pistons are normally used sensing element for high pressures, rugged applications and applications where wider tolerances on the outlet pressure are acceptable. They tend to be sluggish due to friction between the pinion sealing and regulator body. For higher accuracy, a diaphragm type of sensing element is suitable. They are made of elastomer or a thin disc type of material which is sensitive to changes in pressure. Diaphragms tend to have lower friction than piston type designs. They also provide a higher sensing area, for a given regulator size.

### **3.2.9 PNEUMATIC CYLINDERS:**

A pneumatic cylinder, which is also referred to as an air cylinder, is one of the simplest, most cost-efficient solutions. Pneumatic cylinders are mechanical devices that convert the energy of compressed air to a linear motion. The main

components of a typical pneumatic cylinder are cap-end port, tie rod, rod-end port, piston, barrel, and piston Rod. For a double-acting pneumatic cylinder the cylinder barrel is sealed on both ends with a head cap and an end cap. Inside this cylinder, a piston drives the rod in a linear manner.

When compressed air enters through the cap-end port, the piston moves away from the end cap and pushes the rod out. This movement is called the positive/plus movement and the chamber associated with this movement is called the plus chamber. The minus chamber is located on the opposite side. When compressed air enters the rod-end port the rod is pushed back to the negative position. The cylinder diameter is the inside diameter of the cylinder or the diameter of the piston. The stroke length identifies how far the piston/piston rod can travel. The diameter and stroke of a pneumatic cylinder are two important attributes by which it is identified. In a double-acting cylinder (DAC), air is supplied to chambers on both sides of the piston. Higher air pressure on one side can drive the piston to the other side.

Double-acting cylinders are the most common type, as they give the user full control. The advantages of double-acting cylinders are their longer strokes (up to several meters) and constant output force through a full stroke. These cylinders provide relatively better control and operate at higher cycling rates. The drawbacks of double-acting cylinders are their need for compressed air for movement in both directions and a lack of a defined position in case of a power or pressure failure.

The most popular style of pneumatic actuator consists of a piston and rod moving inside a closed cylinder. This actuator style can be sub-divided into two types based on the operating principle: single acting and double acting.

Single-acting cylinders use one air port to allow compressed air to enter the cylinder to move the piston to the desired position, as well as an internal spring to return the piston to the “home” position when the air pressure is removed.

Double-acting cylinders have an air port at each end and move the piston forward and back by alternating the port that receives the high pressure air.

### **3.2.10 SOLENOID VALVE:**

A solenoid valve is an electrically controlled valve. The valve features a solenoid, which is an electric coil with a movable ferromagnetic core (plunger) in its center. In the rest position, the plunger closes off a small orifice. An electric current through the coil creates a magnetic field. The magnetic field exerts an upwards force on the plunger opening the orifice. This is the basic principle that is used to open and close solenoid valves.

### **3/2 VALVE:**

A 3/2 way valve has three ports and two positions and can therefore switch between two circuits. 3/2-way valves can have different functions such as normally closed, normally open, diverting, or universal. More ports or combinations of valves in a single construction are possible.

### **2/2 VALVE:**

A 2/2-way valve has two ports (inlet and outlet) and two positions (open or closed). A 2/2-way valve can be ‘normally closed’ (closed in de-energized state) or ‘normally open’ (open in de-energized state).

### **5/2 VALVE:**

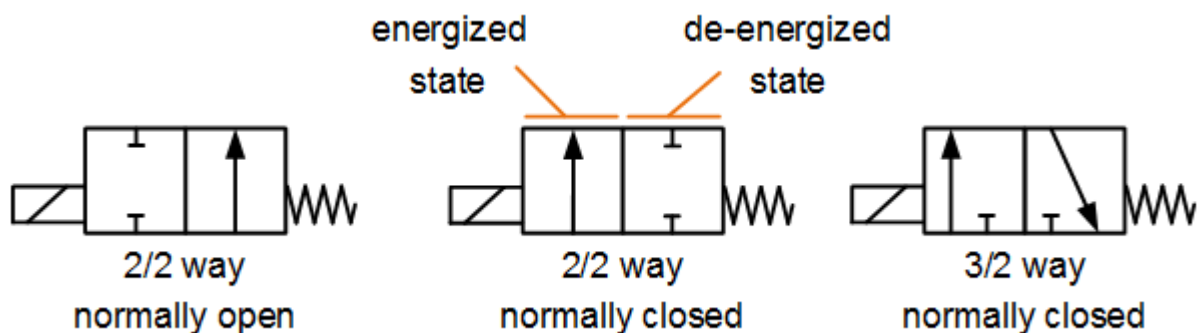
The 5/2-way pneumatic valve has five connection ports and two states. It has one pressure port (P,1), two ports (A,2) and (B,4) that connect to the device that needs to be controlled, and two exhaust ports (EA,3) and (EB,5). The two states of the valve are:

- Pressure port (P,1) connects to port (A,2), while port (B,4) vents through exhaust port (EB,5)

- Pressure port (P,1) connects to port (B,4), while port (A,2) vents through port (EA,3).

### 5/3 VALVE:

A 5/3-way valve has five ports and three states. They have two solenoids that each can control a valve state. If no solenoid is energized, the valve returns to the central state. Therefore, the valve is mono-stable. The central state can have different functions, such as closing off all ports. An example of an application is a double acting cylinder that must be locked at intermediate positions along the stroke.



### 3.2.11 HUMAN MACHINE INTERFACE:

A Human-Machine Interface (HMI) is a user interface or dashboard that connects a person to a machine, system, or device. While the term can technically be applied to any screen that allows a user to interact with a device, HMI is most commonly used in the context of an industrial process.

Although HMI is the most common term for this technology, it is sometimes referred to as Man-Machine Interface (MMI), Operator Interface Terminal (OIT), Local Operator Interface (LOI), or Operator Terminal (OT). HMI and

Graphical User Interface (GUI) are similar but not synonymous: GUIs are often leveraged within HMIs for visualization capabilities.

In industrial settings, HMIs can be used to:

- Visually display data.
- Track production time, trends, and tags.
- Oversee KPI's.
- Monitor machine inputs and outputs.

Like how you would interact with your air-conditioning system to check and control the temperature in your house, a plant-floor operator might use an HMI to check and control the temperature of an industrial water tank, or to see if a certain pump in the facility is currently running.

HMIs come in a variety of forms, from built-in screens on machines, to computer monitors, to tablets, but regardless of their format or which term you use to refer to them, their purpose is to provide insight into mechanical performance and progress.

### **Who Uses HMI:**

HMI technology is used by almost all industrial organizations, as well as a wide range of other companies, to interact with their machines and optimize their industrial processes.

- Energy
- Food and beverage
- Manufacturing
- Oil and gas
- Power
- Recycling
- Transportation
- Water and wastewater
- And many more

The most common roles that interact with HMIs are operators, system integrators, and engineers, particularly control system engineers. HMIs are essential resources for these professionals, who use them to review and monitor processes, diagnose problems, and visualize data.

## **Common Uses of HMI**

HMIs communicate with Programmable Logic Controllers (PLCs) and input/output sensors to get and display information for users to view. HMI screens can be used for a single function, like monitoring and tracking, or for performing more sophisticated operations, like switching machines off or increasing production speed, depending on how they are implemented.

HMIs are used to optimize an industrial process by digitizing and centralizing data for a viewer. By leveraging HMI, operators can see important information displayed in graphs, charts, or digital dashboards, view and manage alarms, and connect with SCADA and MES systems, all through one console.

Previously, operators would need to walk the floor constantly to review mechanical progress and record it on a piece of paper or a whiteboard. By allowing PLCs to communicate real-time information straight to an HMI display, HMI technology eliminates the need for this outdated practice and thereby reduces many costly problems caused by lack of information or human error.

### **3.2.12 PHOTOELECTRIC SENSOR:**

A photoelectric sensor is a device used to determine the distance, absence, or presence of an object by using a light transmitter, often infrared, and a photoelectric receiver. They are largely used in industrial manufacturing. There are three different useful types: opposed (through-beam), retro-reflective, and proximity-sensing (diffused).

#### **Opposed-Mode (Through-Beam) Sensing**

In opposed-mode sensing, also known as through-beam sensing, the sensor's emitter and receiver are housed in two separate units. The emitter is placed opposite the receiver so that the light beam goes directly from the emitter to the receiver.



The opposed mode should be used whenever possible because it is the most reliable sensing mode. This is because light passes directly from the emitter to the receiver. An object is detected when it breaks the effective beam, which is the column of light directly between the emitter's lens and the receiver's lens. The diameter of the effective beam is the same diameter as the lenses of the emitter and receiver. An object must be the diameter of the effective beam or larger to be reliably detected.

Because the light beam goes directly from the emitter to the receiver and doesn't have to reflect off of anything, opposed-mode sensors have very high excess gain. Opposed-mode sensing offers much higher excess gain than any other mode of sensing, making it ideal in dusty, smoky, foggy, misty, or oily environments.

It doesn't matter how shiny or dark your object is, or even what color. The object physically passes between the emitter and receiver and is detected when it blocks the beam of light. Therefore, variables such as surface reflectivity, color, and finish don't affect opposed-mode sensing.

### **Retroreflective Sensing**

Unlike an opposed-mode sensor, a retroreflective sensor contains both the emitter and receiver elements in a single unit. The effective beam is established between the emitter, a retroreflector, and the receiver. As with an opposed-mode sensor, an object is sensed when it interrupts or "breaks" the effective beam. Most retroreflectors are made up of many small corner-cube prisms.

A light beam enters a corner cube prism through its hypotenuse face and is reflected from the three surfaces. In this way, the retroreflector returns the light beam to its source. Most corner-cube retroreflectors resemble bicycle reflectors and are molded using clear acrylic plastic, manufactured in various sizes, shapes, and colors.

If an opposed-mode sensor is not an option, a retroreflective-mode sensor may be a good choice. For example, a retroreflective-mode sensor offers a convenient alternative to opposed-mode if electrical connections are only

possible on one side.

Retroreflective-mode sensors offer relatively long ranges. Like opposed-mode sensing, retroreflective sensing is also a beam-break mode, so objects can often be detected regardless of their reflectivity. For this reason, the retroreflective mode is also a reliable sensing mode, even if the target's color or finish is inconsistent.

**Diffuse-Mode Sensing (Proximity)**

Diffuse-mode sensing is the most common type of proximity sensing. In diffuse mode sensing, light emitted from the sensor strikes the surface of the object to be detected and is diffused, sending some light back to the receiver element of the sensor. With a diffuse-mode sensor, the object is detected when it "makes" the beam. That is, the object reflects some of the sensor's transmitted light energy back to the sensor.

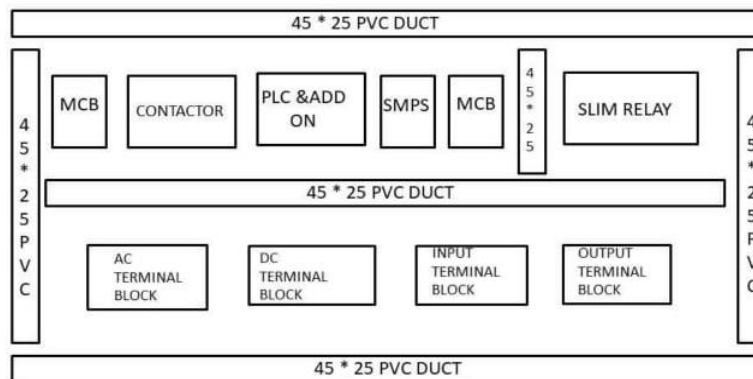
Most diffuse-mode sensors use lenses to focus the emitted light rays and to gather in more light. These lenses also help to extend the range of diffuse-mode sensors.

Diffuse-mode sensors have only one item to be mounted: the sensor itself. This is ideal for situations where a sensor can be mounted only on one side of the target. Diffuse-mode sensors are very easy and convenient and are often used when opposed or retroreflective-mode sensors aren't practical.

Name	Advantages	Disadvantages
Through-beam	<ul style="list-style-type: none"> <li>• Most accurate</li> <li>• Longest sensing range</li> <li>• Very reliable</li> </ul>	<ul style="list-style-type: none"> <li>• Must install at two points on system: emitter and receiver.</li> <li>• May not detect translucent objects.</li> <li>• False triggers when misaligned.</li> </ul>
Reflective	<ul style="list-style-type: none"> <li>• Only slightly less accurate than through-beam</li> <li>• Sensing range better than diffuse</li> <li>• Very reliable</li> </ul>	<ul style="list-style-type: none"> <li>• Must install at two points on the system: sensor and reflector.</li> <li>• Slightly more costly than diffuse</li> <li>• Sensing range less than through-beam</li> <li>• May not detect objects with high albedo</li> </ul>

LASER-Reflective	<ul style="list-style-type: none"> <li>• Single point installation</li> <li>• Good for detecting small objects.</li> <li>• Clearly defined sensing ranges</li> <li>• Very reliable</li> </ul>	<ul style="list-style-type: none"> <li>• Blind to objects outside specified range</li> <li>• Not good for mirror finishes</li> </ul>
Diffuse	<ul style="list-style-type: none"> <li>• Only install at one point</li> <li>• Cost less than through-beam or reflective</li> </ul>	<ul style="list-style-type: none"> <li>• Less accurate than through-beam or reflective</li> <li>• More setup time involved</li> </ul>

### 3.3 ELECTRICAL PANEL LAYOUT:



**Fig 3.3 Panel layout**



**Fig 3.3.1 Panel board wiring**

### **3.4 SOFTWARE DESCRIPTION:**

#### **3.4.1 Overview of Delta PLC:**

**Delta PLC** is a control system using electronic operations. It's easy storing procedures, handy extending principles, functions of sequential/position control, timed counting and input/output control are widely applied to the field of industrial automation control. This software is used for all the PLC series. Delta's DVP series programmable logic controllers offer high-speed, stable and highly reliable applications in all kinds of industrial automation machines. In addition to fast logic operation, bountiful instructions and multiple function cards, the cost-effective DVP-PLC also supports various communication protocols, connecting Delta's AC motor drive, servo, human machine interface and temperature controller through the industrial network in to a complete "Delta Solution" for all users. WPLSoft is a program-editing software made for the Delta DVP-PLC series used under WINDOWS.

#### **3.4.2 Functions of Delta PLC:**

Delta PLC is a control system using electronic operations. A **PROGRAMMABLE LOGIC CONTROLLER (PLC)** is an industrial computer control system that continuously monitors the state of input devices and makes decisions based upon a custom program to control the state of output devices. Function Blocks: Symbols can be introduced in call-by-value or call-by-reference types. Function blocks can be called in function block for up to 32 levels. project. - User Library: Users can design frequently used instructions for specific applications in different industries.

### 3.4.3 Block diagram of Delta PLC:

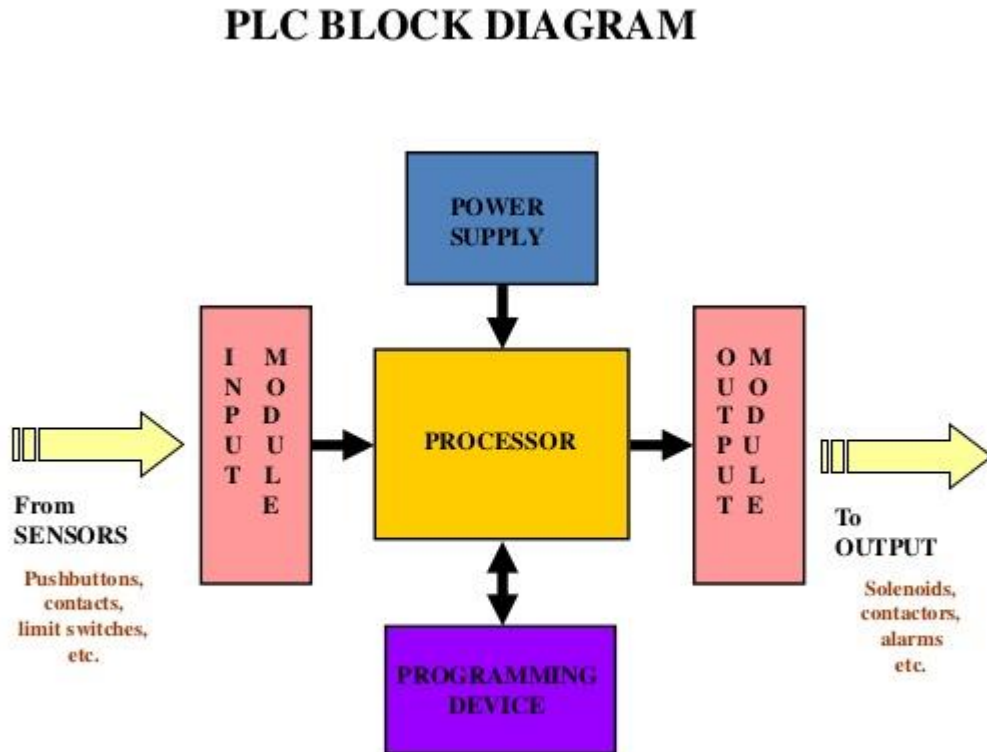


Fig 3.4 Block diagram of PLC

#### Processor section (CPU):

The processor section is brain of PLC which consists of RAM, ROM, logic solver and user memory. The central processing unit is heart of PLC. CPU controls monitors and supervises all operation within PLC. The CPU makes decision and executes control instructions based on the program instruction in memory.

## **Input and output module**

The input module is a mediator between input devices and central processing unit (CPU) which is used to convert analog signal into digital signal.

The output module is a mediator between output devices and central processing unit (CPU) which is convert digital signal into analog signal.

## **Power supply:**

Power supply is provided to the processor unit, input and output module unit. Power supply may be integral or separately mounted unit. Most of the PLC operates on 0 volts DC and 24 volts.

## **Memory section:**

The memory section is the area of the CPU in which data and information is stored and retrieved. Data Memory is used to store numerical data required in math calculation, bar code data etc. User memory contains user's application program.

## **Programming device:**

Programming devices are dedicated devices used for loading the user program into the program memory or edit it and to monitor the execution of the program of the PLC. It is also used to troubleshoot the PLC ladder logic program. Hand held terminal (HHT) or dedicated terminal or personal computer are programming devices commonly used in most of the PLCs.

### **3.4.4 Characteristics of Delta PLC:**

Characteristics. 95-100VAC is needed to start the PLC. If the voltage drops to 70VAC or less, the PLC will stop. A minimum of 18VDC is needed to start the PLC. Delta's high-performance, high-speed DVP series PLCs are the most efficient and incorporates communication capabilities. Advantages include numerous built-in convenient commands for easy operation access and communication function monitoring. The module-type unit affords tremendous space-saving, allowing simple, clip-on expansion possibilities. The PLCs high performance and extensive I/O units represent a high-value solution for machine control and industrial automation.

### **3.4.5 Application specific systems**

- Input and output device requirements. After determining the operation of the system, the next step is to determine what input and output devices the system requires.
- List the function required and identify a specific type of device.
- The need for special operations in addition to discrete (On/Off) logic.
- List the advanced functions required beside simple discrete logic.

### **3.4.6 COST SENSITIVITY:**

Cost-Sensitive Learning is a type of learning that takes the misclassification costs (and possibly other types of cost) into consideration. That is, the cost for labeling a positive example as negative can be different from the cost for labeling a negative example as positive. In addition, owing to the high cost of Information and Communication.

### **3.4.7 POWER MANAGEMENT:**

Power management system for appliances using PLC (Programmable Logic Controller) deals with automatically sending SMS (Short Message Service) to the user if the user had forgotten to turn OFF any particular devices under the control of PLC and later turning OFF the particular appliances after receiving SMS for a valid. Power management systems help ensure the safe, reliable, efficient, and compliant operation of your electrical distribution systems, including the assets connected to it. They can help you: Avoid electrical fires and prevent shock. Recover from outages more quickly and safely.

### **3.4.8 LADDER LOGIC:**

Ladder diagram, better known as ladder logic, is a programming language used to program PLCs (programmable logic controllers). Contacts are placed in series to represent AND logic and in parallel when using OR logic. As with real relays, there are normally open contacts and normally closed contacts.

The PLC executes the program loaded into it one rung at a time. As the PLC begins to process the rung, it reads the instructions on the left and determines if the Logic on that side of the rung is set to TRUE. The Logic evaluates to TRUE when a hypothetical current is able to pass through the instructions. Ladder diagrams help you to formulate the logic expressions in graphical form that are required to program a PLC. They represent conditional, input and output expressions as symbols. So writing a PLC program using ladder diagrams is similar to drawing a relay control circuit.

A PLC is an industrial microprocessor-based controller with programmable memory used to store program instructions and various functions. They are industrial computers used to control different electro-mechanical processes for use in manufacturing plants and other automation environments. The



software we use to program DVP-28 SV and DVP-16 SV programmable logic controller is Delta wpl Software.

WPL Soft is software for Delta PLC (Programmable logic controller). When PLC is in operation we use the software to monitor the set value or temporarily saved value in timer (T), counter (C), and register (D) and force On/Off of output contacts. WPL Soft supports multi-Delta PLC as ES/EX/SA series.

When the input power switch is energized the photoelectric sensor is energized. If a non-interruptible signal is reached the servo motor starts to run. This in turn energizes the pneumatic cylinders push button to push the setup in downward direction. Once the mould component is dipped into water the proximity sensor is energized which in turn sets the Off delay Timer.

After the timer is turned off the solenoid valves actuates the pneumatic cylinders to move upward. If the pressure is between 0.3 bar to 0.4 bar the conveyer sends the mould component to manual check operation. In case of reduced pressure value the mould is sent to rejection box.

## CHAPTER 4

### WORKING METHODOLOGY AND IMPLEMENTATION

#### 4.1 GENERAL:

- **Factory defect.** An inherent defect can cause a leak. Manufacturers correct this, hopefully before there is any damage or injury.
- **Leaky seals** The hazard was a potential fuel leak onto a hot engine.
- **Leaking fuel filter.** The fuel filter removes impurities and ensures that the engine system receives clean, debris-free fuel.
- To avoid these accidents which happen mostly due to manufacturing errors, leak testing is done before the usage of the particular component.
- A **leak test** is a procedure used to determine if an object, product, or system functions within a specified **leak** limit. A **leak** occurs when a gas or liquid flows through an object via an imperfection or manufacturing defect such as a hole, crack or weak seal

#### 4.2 BLOCK DIAGRAM

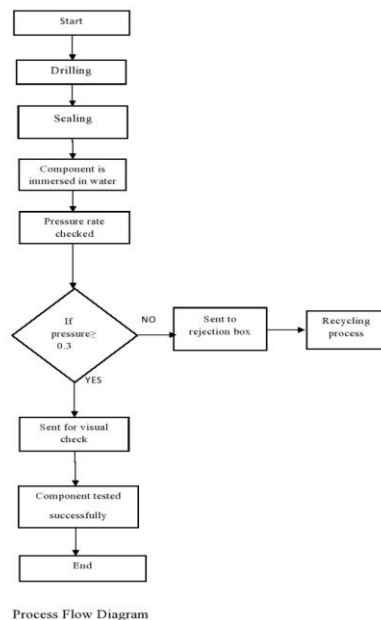


Fig 4.2 Process flow diagram

### 4.3 WORKING:

The mould component (fuel tank) is placed in the drilling machine and the required inlet holes(30mm diameter), Fuel Pump Motor(57-58mm diameter), Fuel Gauge sensor(4mm) and breather seal(4mm diameter) are drilled with the help of servo motor running at a speed of 3000rpm and are sent for wet leak testing.

The holes are sealed in the leak test machine and the pneumatic cylinders are used to pump the input pressure which is actuated by the solenoid valves of various types. The component is then immersed in the distilled water for a period of time and the pressure must be at the rate of 0.3bar to 0.4 bar. For each component a negligible amount of leak is allowed known as the acceptance value of  $\pm 0.2$ bar. This pressure inside the tank is measured using a transducer with current rating of 0- 6000amps. Then the tested component is sent for manual checking and is checked for water bubbles visually by the operator. If the pressure leak value is less than 0.3 bar the component will be rejected and is sent for recycling.

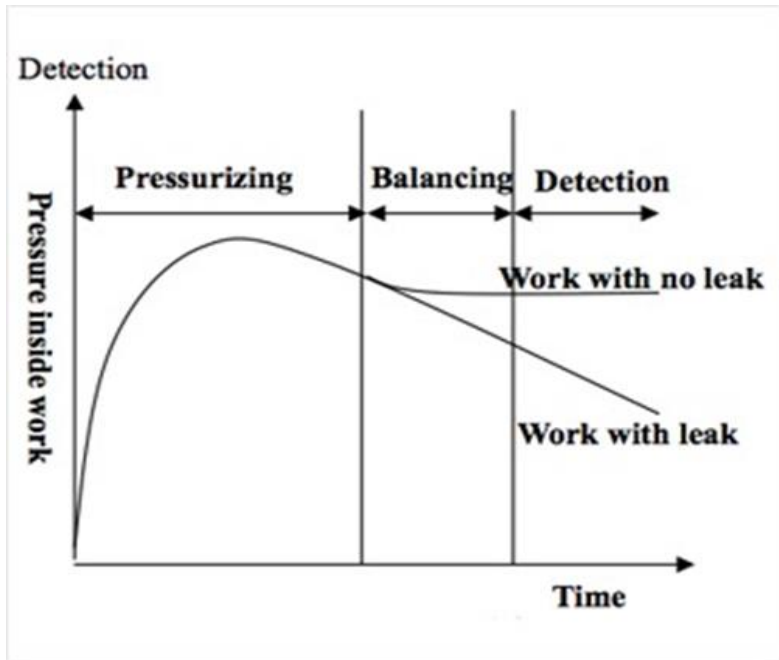


Fig 4.3 Graphical representation of process

In this method leak is detected by checking if the pressure in the test specimen fails to reach the pressure range already specified. The test specimen (or) work is immersed in water for a given period of time. The process is divided into two stages, firstly the initial stage wherein the work is immersed. The final stage is when the work is tested for leaks by measuring the pressure using pressure transducer. When there is no leak, the specimen will maintain its pressure value. However, the pressure will decrease in the presence of any leaks. Pressure drop method uses this concept for the detection of leaks. Here, even the location of the leak can be identified.

#### **4.4 PROPOSED SYSTEM:**

In today's competitive world quality assurance of a product is a must before launching it in the market. Quality analysis ensures that the end product or service is of high quality and thus assures a safe and better user experience, which takes 40% of the total time taken to produce the end product. Leak testing is one of the most important processes during the quality analysis of a product. With the industrial revolution 4.0, automation has made the process more reliable, accurate, efficient, and less time-consuming. The main idea of this work is to design an automation system to detect any leakage in a blow-molded component using the differential pressure method. Programmable Logic Controller (PLC), Human Machine Interface (HMI), and pressure transducer are used for the approach.

## 4.5 INPUT CONFIGURATION:

PLC I/O LIST			
Resp. Prakesh			
S.No	Description	Input No	
1	Digital pressure switch	X0	
2	LH Cycle start PB	X1	
3	RH Cycle start PB	X2	
4	Light curtain	X3	
5	Emergency P.B	X4	
6	Reset P.B	X5	
7	OK P.B	X6	
8	NOT OK P.B	X7	
9	Component presence sensor	X10	
10	Dipping CYL REV R-S	X11	
11	Dipping CYL FWD R-S	X12	
12	Neck sealing CYL REV R-S	X13	
13	Neck sealing CYL FWD R-S	X14	
14	FPM sealing CYL FWD R-S	X15	
15	FPM sealing CYL REV R-S	X16	
16	FSU sealing CYL FWD R-S	X17	
17	FSU sealing CYL REV R-S	X20	
18	Breather assy CYL FWD R-S	X21	
19	Breather assy CYL REV R-S	X22	
20	Breather Blocking CYL FWD R-S	X23	
21	Breather Blocking CYL REV R-S	X24	
22	Rejection Bin Sensor	X25	
23	Door close Sensor 1 Limit switch	X26	
24	Door close Sensor 2 Limit switch	X27	
25	FLOAT S/W	X30	
26	Spare	X31	
27	Spare	X32	
28	Spare	X33	

Fig 4.5 Input configuration

## 4.6 OUTPUT CONFIGURATION:

LIST			
S.No	Description	Output No	
1	Dipping CYL FWD Coil	Y0	
2	Dipping CYL REV Coil	Y1	
3	Neck Seal CYL FWD Coil	Y2	
4	Neck Seal CYL REV Coil	Y3	
5	FPM Seal CYL FWD Coil	Y4	
6	FPM Seal CYL REV Coil	Y5	
7	FSU Seal CYL FWD Coil	Y6	
8	FSU Seal CYL REV Coil	Y7	
9	Breather Seal CYL FWD Coil	Y10	
10	Breather Seal CYL REV Coil	Y11	
11	Breather Blocking CYL FWD Coil	Y12	
12	Breather Blocking CYL REV Coil	Y13	
13	3/2 Charge Valve 1	Y20	
14	2/2 Zero Leak Valve 1	Y21	
15	Spare	Y22	
16	Spare	Y23	
17	Spare	Y24	
18	TLB	Y25	
19	Tower Lamp Red	Y26	
20	Tower Lamp Green	Y27	
21	Tower Lamp Red	Y30	
22	Spare	Y31	
23	Spare	Y32	
24	Spare	Y33	
25	Spare	Y34	
26	Spare	Y35	
27	Spare	Y36	
28	Spare	Y37	

Fig 4.4 Output configuration

## **CHAPTER 5**

### **CONCLUSION AND FUTURE SCOPE**

#### **5.1 SUMMARY OF THE PROJECT**

The main objective of the project is to design and manufacture the dry leak testing machine. Initially the components that are involved in this testing process is studied. This machine consists of a HMI in order to execute the process with less error comparatively. Use of PLC can be done for the automation of the process. Proper selection and implementation of a production leak test method starts with an understanding of WHY the test is being performed, followed by establishing what the leak rate limit is, and finally a determination of how the leak test will be performed. A careful and thoughtful evaluation at each of these steps, combined with the selection of high quality leak test hardware, will result in a cost effective, high performance, and reliable production leak test. This is just a single application , this can be applied to even in food packing tins and cans. The main concept of this leak test is to ensure the materials we mold is safe enough to withstand the fuel and ensures that vaporization of the petrol. This project has described methods for the finding the leaks and their location in the part and helps in the field of automation and also to improve quality.

#### **5.2 FUTURE SCOPE THE PROJECT**

There are also several production efficiency benefits to an optimal leak testing process. A leak test will help validate supplier component quality and verify that operators have assembled system components correctly. In doing so, the manufacturer is able to improve production efficiency, and eliminate rework and product scrap waste. If a leak is missed early on in the manufacturing process, it can cause significant headaches later. The Industry 4.0 movement is disrupting manufacturing companies all over the world. Industry 4.0

technologies that embrace sensors and analytics to facilitate Six Sigma and lean process improvement in manufacturing are becoming the norm. The goal of companies that embrace the Industry 4.0 movement is to produce goods at lower costs, drive throughput efficiencies, and provide superior output quality than lagging competitors. In leak testing, Industry 4.0 is driving changes in many key areas: two of the most crucial areas of focus are data collection and the rise of intelligent test connection tools. As Industry 4.0 continues to revolutionize manufacturing processing and companies, leak testing methods will also evolve. “The leak testing market went largely unchanged for several years,” said Sirny. “With the emergence of Industry 4.0, we are seeing major changes in leak testing for the first time in a decade. I expect that we will see many more changes to the leak testing process and best practices in the coming years.”As Industry 4.0 continues to revolutionize manufacturing processing and companies, leak testing methods will also evolve. “The leak testing market went largely unchanged for several years,” said Sirny. “With the emergence of Industry 4.0, we are seeing major changes in leak testing for the first time in a decade. I expect that we will see many more changes to the leak testing process and best practices in the coming years.”



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**SRM TRP**  
ENGINEERING COLLEGE



## CERTIFICATE OF PARTICIPATION

This is to certify that **KOHILA.N.K** of **SRI SAIRAM ENGINEERING COLLEGE** has presented a Paper titled **Wet Leak Testing For Blow Mould Components Using Pressure Drop Method** in the International Conference on Artificial Intelligence for IoT and Sustainable Electrical Networks (ICAISEN'21) conducted by the SRM TRP Engineering College in association with IEEE SB, IIC, IETE and CSI on 29.04.2021.

*B. Ramasubramanian*

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**Dr.B.GANESH BABU**  
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**SRM TRP**  
ENGINEERING COLLEGE



## CERTIFICATE OF PARTICIPATION

This is to certify that **NANDHINI.T** of **SRI SAIRAM ENGINEERING COLLEGE** has presented a Paper titled **Wet Leak Testing For Blow Mould Components Using Pressure Drop Method** in the International Conference on Artificial Intelligence for IOT and Sustainable Electrical Networks (ICAISEN'21) conducted by the SRM TRP Engineering College in association with IEEE SB, IIC, IETE and CSI on 29.04.2021.

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**Dr.B.RAMASUBRAMANIAN**  
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**Dr.P.SUDHAKARAN**  
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**Dr.P.ELANGO VAN**  
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*Dr. B. Ganesh Babu*

**Dr.B.GANESH BABU**  
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**SRM TRP**  
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This is to certify that **V.HARINI** of **SRI SAIRAM ENGINEERING COLLEGE** has presented a Paper titled **Wet Leak Testing For Blow Mould Components Using Pressure Drop Method** in the International Conference on Artificial Intelligence for IOT and Sustainable Electrical Networks (ICAISEN'21) conducted by the SRM TRP Engineering College in association with IEEE SB, IIC, IETE and CSI on 29.04.2021.

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*B. Ramasubramanian*

**Dr.B.RAMASUBRAMANIAN**  
VICE PRINCIPAL &HOD/ECE

*P. S.*

**Dr.P.SUDHAKARAN**  
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*P. E.*

**Dr.P.ELANGOVAN**  
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*B. Ganesh Babu*

**Dr.B.GANESH BABU**  
PRINCIPAL

**RENAULT NISSAN  
AUTOMOTIVE INDIA PRIVATE LIMITED**

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Phone : +91 44 37199999 Fax : +91 44 37196803  
CIN No: U34100TN2007PTC073002 PAN No: AACDR7965B

**TO WHOMEVER IT MAY CONCERN**

This is to certify that **Ms. S MADHUPRABHA** studying **B.E - ELECTRONICS AND INSTRUMENTATION** from **SRI SAIRAM ENGINEERING COLLEGE** has successfully completed her Internship & project on “**TRACKING THE PARTS OF THE MACHINE USING PLC IN RENAULT NISSAN AUTOMOTIVE INDIA PRIVATE LIMITED**”. She has undergone internship from **16-03-2021 to 15-05-2021** under the guidance of **Mr. S. KANKAYAN, POWER TRAIN ENGINEERING.**

We wish **Ms. S MADHUPRABHA** all the best to her future endeavors.

For **Renault Nissan Automotive India Private Ltd**



**Jaljith Narayanan**  
**Human Resources**

**RENAULT NISSAN  
AUTOMOTIVE INDIA PRIVATE LIMITED**

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Phone : +91 44 37199999 Fax : +91 44 37196803  
CIN No: U34100TN2007PTC073002 PAN No: AACDR7965B

**TO WHOMEVER IT MAY CONCERN**

This is to certify that **Ms. SUSAN THOMAS** studying **B.E - ELECTRONICS AND INSTRUMENTATION** from **SRI SAIRAM ENGINEERING COLLEGE** has successfully completed her Internship & project on “**TRACKING THE PARTS OF THE MACHINE USING PLC IN RENAULT NISSAN AUTOMOTIVE INDIA PRIVATE LIMITED**”. She has undergone internship from **16-03-2021 to 15-05-2021** under the guidance of **Mr. S. KANKAYAN, POWER TRAIN ENGINEERING**.

We wish **Ms. SUSAN THOMAS** all the best to her future endeavors.

For **Renault Nissan Automotive India Private Ltd**



**Jaljith Narayanan**  
**Human Resources**





29-Jan-2021  
 Devi Shree V  
 B.Tech/B.E. Electronics & Instrumentation Eng  
 Sri Sairam Engineering College, Chennai

Dear Devi Shree,

Further to our offer for the position of Programmer Analyst Trainee and in response to your confirmation into the Internship opportunity we had extended, we are pleased to offer you an **Internship** with us for a **period of 3 to 6 months**, during which you will be offered a stipend Amount of **INR 12000/-** per month based on the Internship performance and completion.

Actual Internship dates and duration would be based on the business demand aligned skill tracks offered to you and would be shortly communicated to you.

Cognizant Internship being a pre joining skill and capability development program, it would form a critical part of your employment with Cognizant.

You will undergo a learning curriculum as per the learning track assigned to you. The learning path will include in-depth sessions, hands on exercise and project work. There will also be series of webinars, quizzes, SME interactions, mentor connects, code challenges, assessments etc. to accelerate your learning. The performance during Internship would be monitored through formal evaluations.

The Cognizant Internship completion would qualify as the entry criteria to your post joining training program and would be used as basis towards your allocation to projects/roles.

Prior to joining Cognizant, you must successfully complete the prescribed Internship program. In event of non-completion of the Internship, Cognizant may at its sole discretion revoke this offer of employment.

Please also note that:

- The Internship Training will be done from Monday through Friday for 8 hours from 9 am to 6 pm (IST).
- Interns are covered under Cognizant's calendar holidays of the respective location of internship and you would need to adhere with attendance requirements. Pre-approvals are to be sought towards unavoidable leave or break requests from the program.
- There would be zero tolerance to plagiarisms and misconduct during the internship.
- You would be required to ensure timely completion and submission of assignments, project work and preparation required prior to the sessions.
- You may be required, to travel to other locations within India if there is a business need as per your internship plan
- Cognizant reserves clauses regarding IT infra if applicable and access to information and material of Cognizant during the period and could modify or amend the Cognizant GenC program terms and conditions from time to time

At the time of your reporting for the internship, you will be required to sign a Non - Disclosure Agreement with the company. During the course of your Internship and after completion of the same, you are required to maintain strictest confidentiality with respect to company proprietary or products that you access or come into contact with, during your project as an Intern, at all times as per our Policy. Use of company proprietary information or products shall not be made without prior permission from the concerned authority.

You will also be required to submit the following documents at the time of reporting;

- Photocopy of your Passport & Visa



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Intership

Ms. M. Udhaya udhaya.ei@sairam.edu.in

To: ms

3 Attachments

Reply

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Wed, Aug 11, 12:35 PM

For SS Fine Motors and Appliances Private Limited

Authorized Signatory

TO: VERUNISOUZER IT MAY LINGERUS

Place: (blank)

This is to certify that M/s. SS FINE MOTORS AND APPLIANCES PRIVATE LIMITED (CIN No: U51109TN2019PTC014100) 2<sup>nd</sup> Year BE - Electronics & Information Engineering, Student of Sri Sai Stars Engineering College, Chennai had undergone internship at the Production Dept of SS Fine Motors and Appliances Private Limited.

He was present in the office from 15/08/2021 to 19/08/2021.

During the internship period his behavior and conduct was good.

We wish to wish him for his bright future as a doctor.

For SS Fine Motors and Appliances Private Limited

Authorized Signatory

CIN No. U51109TN2019PTC014100

No. 52, Hyderabad (old) Complex, 4<sup>th</sup> Floor, #11, 136, Tamil Nadu, India

Phone: +91-434-23666, +91-8744-34123, Fax: +91-434-274029, E-mail: info@ssmotorsandappliances.com

Website: www.ssfine.com

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has successfully completed the Industry Internship Programme at VATO Energy India Pvt Ltd, Chennai through Online from 1<sup>st</sup> July 2020 to 15<sup>th</sup> July 2020 in the area of **"Solar Photovoltaic systems & its Design"**

Best wishes from VATIO Energy for future endeavors !

G. Rajaganesan, Director - Technical  
VATIO Energy India Pvt Ltd.



20<sup>th</sup> July 2020

Date



# NLC India Limited

"NAVRATNA" - Govt. of India Enterprise

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Internship Training in NLC India Limited, Neyveli between  
09.03.2021 and 20.03.2021

*NLCIL wishes him / her Success in all future endeavours.*



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General Manager / L&D  
Learning & Development Centre  
NLC India Ltd., Neyveli-607803.

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..... SRI SAI RAM ENGINEERING COLLEGE, CHENNAI

..... has undergone

..... Internship Training in NLC India Limited, Neyveli between

..... 08.03.2021 and 20.03.2021 .....

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Hosur  
10-03-2021

**TO WHOM SOEVER IT MAY CONCERN**

This is to certify that Mr. YAGNESHWARAN A, (ID NO: SEC19E1032) 2<sup>nd</sup> Year, BE - Electronics & Instrumentation Engineering, Student of Sri Sai Ram Engineering College, Chennai had undergone Internship in the Production Department in our company

He was present in our office from 01-03-2021 to 10-03-2021.

During the internship period his character and conduct was good.

We wish his all the best for all his future endeavors.

**For SS Fine Motors and Appliances Private Limited**

**Authorized Signatory**



**CIN No. U31900TZ2010PTC016130**

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SS FINE MOTORS AND APPLIANCES PRIVATE LIMITED

Hosur  
10-03-2021

**TO WHOM SOEVER IT MAY CONCERN**



This is to certify that Mr. HARIHARAN M. (ID NO: SEC19EI007) 2<sup>nd</sup> Year, BE - Electronics & Instrumentation Engineering, Student of Sri Sai Ram Engineering College, Chennai had undergone Internship in the Production Department in our company

He was present in our office from 01-03-2021 to 10-03-2021.

During the internship period his character and conduct was good.

We wish his all the best for all his future endeavors.

For SS Fine Motors and Appliances Private Limited

  
  
Authorized Signatory



CIN No. U31900TZ2010PTC016130

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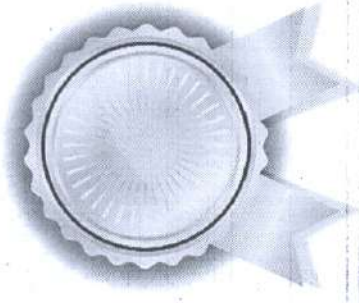
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**Y K SUDHARSHAN**

**Studying 3 - Year, B.E, E&I in SRI SAI RAM ENGINEERING COLLEGE**

has successfully completed the Industry Internship Programme at VATIO Energy India Pvt Ltd, Chennai through Online from 1<sup>st</sup> July 2020 to 15<sup>th</sup> July 2020 in the area of  
**“Solar Photovoltaic systems & its Design”**

Best wishes from VATIO Energy for future endeavors !



20<sup>th</sup> July 2020

G.Rajaganesan, Director – Technical  
VATIO Energy India Pvt Ltd.

Date

15<sup>th</sup> April 2021

**TO WHOMSOEVER IT MAY CONCERN**

This is to certify that **Mr.L.PRANAY (412517107046)**, who is pursuing B.E –Electronics & Instrumentation Engineering in Sri Sairam Engineering College, Chennai-44 currently in Final Year, has undergone Internship training in our works from 1<sup>st</sup> February 2021 to 31<sup>st</sup> March 2021.

We wish her all the success in his studies and career.

For PLACKA Instruments India Pvt Ltd,

  
Authorized Signatory

## Placka Instruments India Pvt. Ltd.

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E-mail : sales@plackainstruments.com  
Website : www.plackainstruments.com







29-Jan-2021

**Tripuravishalini Selvaraj**  
**B.Tech/B.E. Electronics And Instrumentation Engineering**  
**Sri Sairam Engineering College, Chennai**

**Dear Tripuravishalini,**

Further to our offer for the position of Programmer Analyst Trainee and in response to your confirmation into the Internship opportunity we had extended, we are pleased to offer you an **Internship** with us for a **period of 3 to 6 months**, during which you will be offered a stipend Amount of **INR 12000/-** per month based on the Internship performance and completion.

Actual Internship dates and duration would be based on the business demand aligned skill tracks offered to you and would be shortly communicated to you.

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- You would be required to ensure timely completion and submission of assignments, project work and preparation required prior to the sessions.
- You may be required, to travel to other locations within India if there is a business need as per your internship plan
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At the time of your reporting for the internship, you will be required to sign a Non - Disclosure Agreement with the company. During the course of your Internship and after completion of the same, you are required to maintain strictest confidentiality with respect to company proprietary or products that you access or come into contact with, during your project as an Intern, at all times as per our Policy. Use of company proprietary information or products shall not be made without prior permission from the concerned authority.

You will also be required to submit the following documents at the time of reporting:

- ~~Photocopy of your Passport & Visa~~