A

Project Report On

"UNDERGROUND WASTE MANAGEMENT USING PLC"

SUBMITTED IN PARTIAL FULFILMENT OF REQUIREMENT FOR

BACHOLERS OF ELECTRICAL ENGINEERING

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CERTIFICATE

This is to certify that the following students have satisfactorily carried out final semester B.E.project work entitled **"Underground waste management using PLC"**.

This work is been submitted for the award of Degree of Bachelor of Electrical Engineering. Itis submitted in the partial fulfillment of the prescribed syllabus of Savitribai Phule Pune university, Pune for the academic year 2021-2022.

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Abstract

Underground waste management using PLC is a system in which underground trolley or dustbin inserted to transport the municipal/ industrial/ commercial waste to a designated dumping yard with a high speed. As we seen this waste affects human life and effect on animals too. Animals eat plastics as a food which may cause their death. This happens because we generate so much garbage in our day- to- activities like our grocery and some snack food are packed in plastic and it will come out as garbage and this waste spread all over the road side area. Safai Karamcharis collect the garbage daily, they spend their 8-9 hours in garbage and by dealing with garbage on daily basis they cause severe health issues. Also, the people in the slums are surrounded by garbage and this badly affects to their lives. Garbage is carried through rivers and mixed with ground water. Floods are caused by stagnant waste drains and toxic substances released from the waste can poison the environment. Also as said by waste experts, waste can be very dangerous to the environment health and safety. And these have an effect on the financial and social ramifications. So, the purpose of this report is to measure for waste management without harming human and environmental life. Waste management through underground developed infrastructure can be planned as a necessary development which will allow efficient and cost-effective handling of one of the more urgent needs of modern society. In this system we have tried to overcome the waste problems and to be pollution free environment with spreading cleanliness and greenery.

Key Words: - PLC, Garbage, Safai Karamcharis, Greenery.

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Chapter 1

Introduction: -

Garbage pollution arises when the waste collected in dumping sites keeps rotting, spreading odour and cause air pollution in the surrounding areas, which also creates problems at the administrative level. It is often seen that waste including inorganic material such as iron cans, paper, plastic, glass pieces, or leftover food, animal bones, vegetable peels, etc are dumped in the open. Air pollution also spreads when the garbage is burnt in the open in villages, thereby posing a serious threat to health and environment. In countries like India, things used earlier as bags were not harmful. Earlier the pottery was used for liquid substances, and jute bag was used to carry goods. Now, the plastic has changed the situation and a problem has arisen with it because the plastic never degrades. Its recycling is possible, but there is no proper system to deposit it. Garbage is present everywhere in some form or the other whether there is a village or a city, a temple or a mosque. This problem has been increasing since the last nearly three decades, leading to health issues and degradation of environment. Today we are victims of many types of waste including domestic, agricultural and industrial waste. Every year tons of waste or garbage are produced in the country, and only one percent of it is recycled. The rest either accumulates in the fields or in the streets and in the end, during the rainy season; it reaches the oceans through rivers. There are many reasons for the production of garbage. One reason for this is growing urbanization and prosperity. The more financially strong is the country or the city, the more garbage it will produce. Today, China and India are the prominent examples of this in the world. Both are taking strides in economic development, but in the process, they are also producing piles of garbage. Other reasons for this include changing lifestyle, lack of waste management and also the big question of the ethics that is fast eroding. We assume that it is our compulsion to produce garbage and its disposal is the work of the government. Perhaps this is where we are making the biggest mistake.

1.1 Problem Statement: -

The process of dumping wastes in dustbins is good. But these things Doesn't Ends here, instead actual process begins here. Separating the dry and wet wastes is the first step. Then the processing separating of biodegradable and non- biodegradable wastes has been done. It is also recommended that separate dry and wet wastes to keep out the mixing of dry and wet wastes. Improper management of wastes leads to contamination in landfills causes serious issues in fertility of land as well as ground water. Most of the wastes are reused or recycles so that proper separations of segregation of wastes are really important aspect of it. Survey says that most of the disposal process involves rag pickers in urban areas. However, it is so Time consuming and during this process it may leads to cuts and bruises in bare hands. It also leads to severe infections and illness. The another method of segregation is by making use of microcontroller. Even this poses some serious problems like more time consumption, not suitable in all types of environments and unable to segregate medical waste, sanitary waste and e-waste properly failing to obey certain rules and regulations imposed by the government in their segregation. So to overcome the problems from all these methods PLC based system is implies due to inherent advantages like modular design, provision to make required short-term adjustments without having a large impact on the whole system, flexibility, cost, less wiring etc. The proposed work presents automatic system using PLC where IR sensors, Buzzers, Motors, Relays are interconnected with PLC in such a manner so that they function in a proper sequence can detect the materials or wastes moving continuously on the conveyor belt. Where these components work as they programmed and move the waste as we want.

1.2 Objectives: -

In earlier days, all are suffering from garbage pollution and air pollution because of garbage thrown roadside openly. It will cause health issues. To avoid above problem this project will be a best solution. By implementing this project we can adopt a healthy life style. So, overcome the garbage related problems this system is found which is pollution free, protects the environment and spreads cleanliness & greenery.

1.3 Scope of Project: -

1) The garbage collected can be burn & generate electricity.
2) In future we can set time for moving the trolley to collect the waste.
3) Further we can also separate wet garbage & dry garbage.
4) This system can be implement in a smart city.
5) We can adopt healthy life style.

1.3 Scope of Project: -

Chapter 2

Literature Review: -

1)'Some Major Issues in Municipal Solid Waste Management: A Review', (2010)

International Conference on Emerging Technologies for Sustainable Environment, Aligarh, India.

A major part of the world today has a throwaway culture, producing huge amounts of solid wastes. Advancements in environmental measurement techniques clearly indicate that demand on earth's resources is not sustainable and should be addressed immediately. What should be the correct balance between environmental, economic, technical, social and regulatory factors, when one solid waste system designed and implemented? What must be the right fraction of the waste recycling, composing, reduction and recovery options in the scheme? All these questions need to be answered before the commencement of any solid waste management operation. To make such a scheme efficacious it is important that it is environmentally sustainable, economically viable and socially acceptable (Nilsson-Djerf and McDougall, 2000; Khan and Faisal, 2008).

2)Literature Review of Stakeholders in Solid Waste Management

Shivi Khanna

According to (Sujauddin, 2008) demographic factors like gender, number of members in a family, access to education for citizens, income determine quantity of waste generated. Waste collection fees charged on the basis of waste volume or weight also determines waste segregation attribute. If waste segregation is done at source preparation of compost at home is possible using kitchen and garden waste. In a few developing countries people are concerned about hazardous effect due to garbage but have a "Not In My Backyard" NIMB attitude.

3)Review on Solid Waste Management Practice in India: A State of Art

Sonam Sahu

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In 2007 Sharholy and Ahmad gives a review report over Municipal solid waste management in Indian cities. In his report they discuss about the qualitative and quantitative analysis, characteristics and composition, storage and collection. Transfer and transport, disposals and treatment of Municipal Solid Waste. The study is concluded with a few fruitful suggestions, which may be beneficial to encourage the competent authorities/researchers to work towards further improvement of the present system.

4)Solid Waste Management in Urban India By- Akhil S, Anuj N.K, Kunal V & Nadha K.

Generally, in India, MSW is disposed of in low-lying areas without taking proper precautions or operational controls. Therefore, municipal solid waste management (MSWM) is one of the major environment problems of Indian mega cities. SWM involves activities associated with generation, storage and collection, transfer and transport, treatment and disposal of solid wastes. However, in most Indian cities, the MSWM system comprises only four activities, i.e., waste generation, collection, transportation and disposal. Poor collection and inadequate transportation cause the accumulation of MSWM at every nook and corner.

5)Underground Solutions for Urban Waste Management: Status and Perspectives

Prepared by the Task Force Globalisation

Lead Authors: Dimitrios Kaliampakos, prof. NTUA

Andreas Benardos, Lecturer NTUA

Today, the total waste generated worldwide in an annual basis amount to more than 4 billion tons. Almost 45% of these are considered as municipal solid waste, while the rest is industrial waste, including hazardous one.

The daily waste production per capita ranges from 0.6 kg to 1.4 kg, with people in highly developed countries producing more waste. In the coming year, both the increase of global population and growth or GDP per capita in developing countries is expected to create to boost in global municipal waste production. Only for the case of urban food waste it has been estimated that between 2005 and 2025 its generation will increase by around 45%.

Chapter 3

Methodology: -
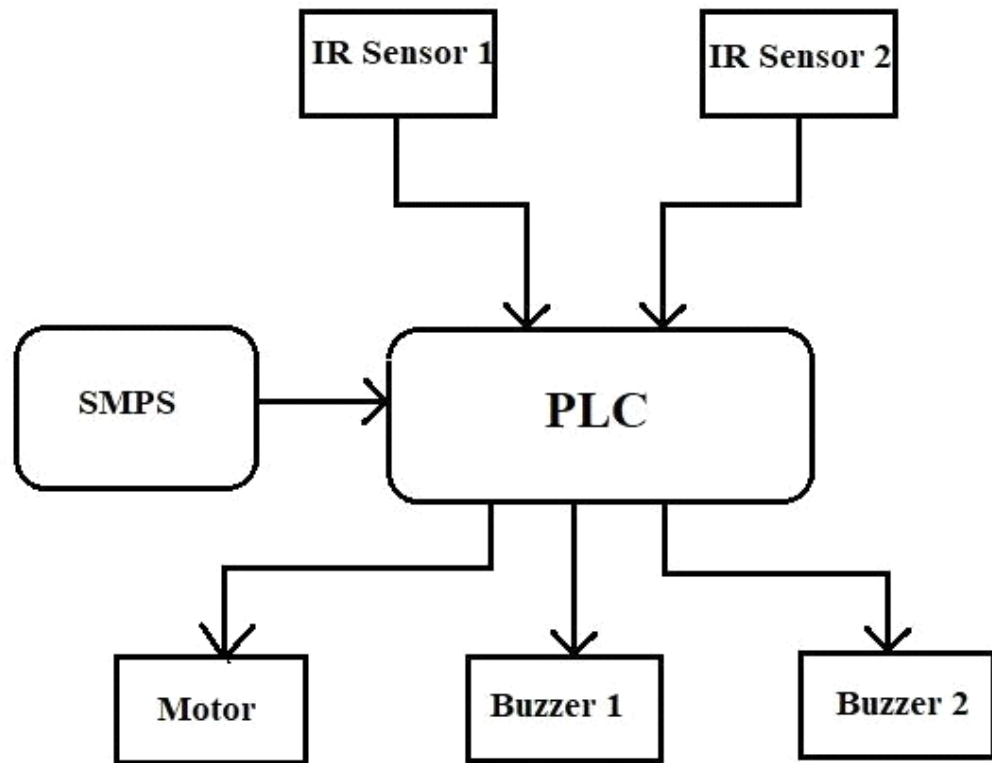
Fig. 3.1 Block Diagram

In this system we designed underground trolley system to throw the garbage away from area so that we have used a pulley and rope system to move the trolley from area to another area and another area to dumping station. We have used some sensors to sense the trolley for a position below the building or on the position of underground so that whenever the trolley come to a building or to a area buzzer will beep for some time then the people of that building will throw the garbage in trolley by pipe inserted near to a building. After some time trolley will move to another building and again the buzzer of another building beep for some time, so that people of another building can throw garbage in the trolley and after some time again trolley move toward the dumping station and the garbage will automatically put in that dumping station. The whole system runs by using sensor technology and PLC system. We have used PLC here to make decision where the trolley being stop and how much long the trolley will move.

Chapter 4

Hardware Description

4.1 PLC (Programmable Logic Controller): -

It is an industrial digital computer which has been ruggedized and adapted for the control of manufacturing processes, such as assembly lines, or robotic devices, or any activity that requires high reliability control and ease of programming and process fault diagnosis. PLCs were first developed in the automobile manufacturing industry to provide flexible, ruggedized and easily programmable controllers to replace hard-wired relays, timers and sequencers. Since then, they have been widely adopted as high-reliability automation controllers suitable for harsh environments. A PLC is an example of a "hard" real-time system since output results must be produced in response to input conditions within a limited time, otherwise unintended operation will result.

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Programming of PLC: –

PLC programs are typically written in a special application on a personal computer, then downloaded by a direct-connection cable or over a network to the PLC. The program is stored in the PLC either in battery-backed-up RAM or some other non-volatile flash memory. Often, a single PLC can be programmed to replace thousands of relays.

A ladder diagram is a method of drawing control circuits which pre-dates PLCs. The ladder diagram resembles the schematic diagram of a system built with electromechanical relays. As an example, say a facility needs to store water in a tank. The water is drawn from the tank by another system, as needed, and our example system must manage the water level in the tank by controlling the valve that refills the tank.

Input

I1 = Dumping point sensor

I2 = Sensor 1

I3 = Sensor 2

Output

Q1 = Chain motor

Q2 = Trolley up (release)

Q3 = Trolley up

Q4 = Dumping actuator open

Q5 = Dumping actuator close

Q6 = Station 2 open

Q7 = Station 2 close

Q8 = Station 1 open

Q9 = Station 1 close

Fig. 4.1 PLC Module

Advantages of PLC: -

1) Rugged and designed to withstand vibrations, temperature, humidity and noise.

2) Have interfacing for inputs and outputs already inside the controller.

3) PLCs are easily programmed and have an easily understood programming language.

4) Small physical size & shorter project time.

5) Less & simple wiring.

6) Ease of maintenance/troubleshooting.

Disadvantages of PLC: -

1) It's always difficult to find errors; and requires skillful work force.

2) There is difficulty with changes or replacements.

3) There's too much work required in connecting wires.

4.2 SMPS (Switched-Mode Power Supply): -

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) 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. Ideally, a switched-mode power supply dissipates no power. Voltage regulation is achieved by varying the ratio of onto-off time. In contrast, a linear power supply regulates the output voltage by continually dissipating power in the pass transistor. This higher power conversion efficiency is an important advantage of a switched-mode power supply. Switched-mode power supplies may also be substantially smaller and lighter than a linear supply due to the smaller transformer size and weight.

The main advantage of the switching power supply is greater efficiency than linear regulators because the switching transistor dissipates little power when acting as a switch. Other advantages include smaller size and lighter weight from the elimination of heavy line frequency transformers, and comparable heat generation. Standby power loss is often much less than transformers. Disadvantages include greater complexity, the generation of high amplitude, high-frequency energy that the low-pass filter must block to avoid electromagnetic interference (EMI), a ripple voltage at the switching frequency and the harmonic frequencies thereof. Very low cost SMPSs may couple electrical switching noise back onto the mains power line, causing interference with A/V equipment connected to the same phase. Non-power-factor corrected SMPSs also cause harmonic distortion.

Fig. 4.2 Switched Mode Power Supply

4.3 Relay 24 volt: -

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 Automotive-style miniature relay, dust cover is taken off 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 retransmitted it on another circuit.

Relays were used extensively in telephone exchanges and early computers to perform logical operations. A type of relay that can handle the high power required to directly control an electric motor or other loads is called a contactor. Solid state relays control power circuits with no moving parts, instead using a semiconductor device to perform switching.

Relays with calibrated operating characteristic sand sometimes multiple operating coils are used to protect electrical circuits from overload or faults; in modern electric power systems these functions are performed by digital instruments still called "protective relays". Magnetic latching relays require one pulse of coil power to move their contacts in one direction, and another, redirected pulse to move them back. Repeated pulses from the same input have no effect. Magnetic latching relays

are useful in applications where interrupted power should not be able to transition the contacts.

Fig. 4.3 Relay 24Volt

4.4 Relay 5V: -

A 5V relay is coated with blue colour plastic material. For both AC & DC loads, the utmost operating voltage & current are also displayed on the relay. This relay operates with 5V, so it is called a 5V relay.

Working principle of Relay 5V: -

The relay uses the current supply for opening or closing switch contacts. Usually, this can be done through a coil to magnetize the switch contacts & drags them jointly once activated. A spring drives them separately once the coil is not strengthened.
By using this system, there are mainly two benefits, the first one is, the required current for activating the relay is less as compared to the current used by relay contacts for switching. The other benefit is, both the contacts & the coil are isolated galvanically, which means there is no electrical connection among them.

Advantages of Relay 5V: -

1) A remote device can be controlled easily.

2) It is triggered with less current but it can also trigger high power machines Easily contacts can be changed.

3) At a time, several contacts can be controlled using a single signal Activating part can be isolated.

4) It can switch AC or DC.

5) At high temperatures, it works very well.

Disadvantages of Relay: -

1) When contacts of relay modules are used overtime then they may damage.

2) Noise can be generated through the opening & closing of the contacts.

3) Time taken for switching is High.

Application of relay: -

1) Used in over voltage/under voltage protection system.

2) Mains Switching.

3) Speed control of motors through start-delta converters.

4) Automatic electrical appliances.

5) Electrical isolation in between high & low power sources.

6) Lights.

7) AC voltage load switching using less voltage DC.

8) Delivery of Isolated power.

9) Home automation projects.

10) Switching with High Current.

4.5 IR Sensor: -

IR technology is used in daily life and also in industries for different purposes. For example, TVs use an IR sensor to understand the signals which are transmitted from a remote control. The main benefits of IR sensors are low power usage, their simple design & their convenient features. IR signals are not noticeable by the human eye. The IR radiation in the electromagnetic spectrum can be found in the regions of the visible & microwave. Usually, the wavelengths of these waves range from 0.7 μm 5 to 1000μm. The IR spectrum can be divided into three regions like near-infrared, mid, and far-infrared. The near IR region's wavelength ranges from 0.75 – 3μm, the mid-infrared region's wavelength ranges from 3 to 6μm & the far IR region's infrared radiation's wavelength is higher than 6μm.

An infrared sensor is an electronic device, that emits in order to sense some aspects of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. These types of sensors measure only infrared radiation, rather than emitting it that is called a passive IR sensor. Usually, in the infrared spectrum, all the objects radiate some form of thermal radiation.

Fig.4.4 IR Sensor

These types of radiations are invisible to our eyes, which can be detected by an infrared sensor. The emitter is simply an IR LED (Light Emitting Diode) and the detector is simply an IR photodiode that is sensitive to IR light of the same wavelength as that emitted by the IR LED. When IR light falls on the photodiode, the resistances and the output voltages will change in proportion to the magnitude of the IR light received.

Working Principle Of IR: -

The working principle of an infrared sensor is similar to the object detection sensor. This sensor includes an IR LED & an IR Photodiode, so by combining these two can be formed as a photo-coupler otherwise optocoupler. The physics laws used in this sensor are planks radiation, Stephan Boltzmann & weins displacement.

IR LED is one kind of transmitter that emits IR radiations. This LED looks similar to a standard LED and the radiation which is generated by this is not visible to the human eye. Infrared receivers mainly detect the radiation using an infrared transmitter. These infrared receivers are available in photodiodes form. IR Photodiodes are dissimilar as compared with usual photodiodes because they detect simply IR radiation. Different kinds of infrared receivers mainly exist depending on the voltage, wavelength, package, etc.

Once it is used as the combination of an IR transmitter & receiver, then the receiver's wavelength must equal the transmitter. Here, the transmitter is IR LED whereas the receiver is IR photodiode. The infrared photodiode is responsive to the infrared light that is generated through an infrared LED. The resistance of photo-diode & the change in output voltage is in proportion to the infrared light obtained. This is the IR sensor's fundamental working principle.

Once the infrared transmitter generates emission, then it arrives at the object & some of the emission will reflect back toward the infrared receiver. The sensor output can be decided by the IR receiver depending on the intensity of the response.

Advantages of IR Sensor: -
1) It uses less power.
2) The detection of motion is possible in the presence or absence of light approximately with equal reliability.
3) They do not need contact with the object for detection.
4) There is no data leakage because of the ray direction.
5) These sensors are not affected by oxidation & corrosion.
6) Noise immunity is very strong.

Disadvantages of IR sensor: -

1) Line of sight is required.
2) Range is limited.
3) These can be affected by fog, rain, dust, etc.
4) Less data transmission rate.

4.6 DC Motor 10RPM: -

An electric motor is an electrical machine that converts electrical energy into mechanical energy. Most electric motors operate through the interaction between the motor's magnetic field and winding currents to generate force in Animation of an Electric motor. the form of rotation. Electric motors can be powered by direct current (DC) sources, such as from batteries, motor vehicles or rectifiers, or by alternating current (AC) sources, such as a power grid, inverters or electrical generators. An electric generator is mechanically identical to an electric motor, but operates in the reverse direction, accepting mechanical energy (such as from flowing water) and converting this mechanical energy into electrical energy. Electric motors may be classified by considerations such as power source type, internal construction, application and type of motion output. In addition to AC versus DC types, motors may be brushed or brushless, maybe of various phase (see single-phase, two phases, or three-phase), and may be either air cooled or liquid-cooled. General-purpose motors with standard dimensions and characteristics provide convenient mechanical power for industrial use. The largest electric motors are used for ship propulsion, pipeline compression and pumped-storage applications with ratings reaching 100 megawatts. Electric motors are found in industrial fans, blowers and pumps, machine tools, household appliances, power tools and disk drives. Small motors may be found in electric watches. In certain applications, such as in regenerative braking with traction motors, electric motors can be used in reverse as generators to recover energy that might otherwise be lost as heat and friction.
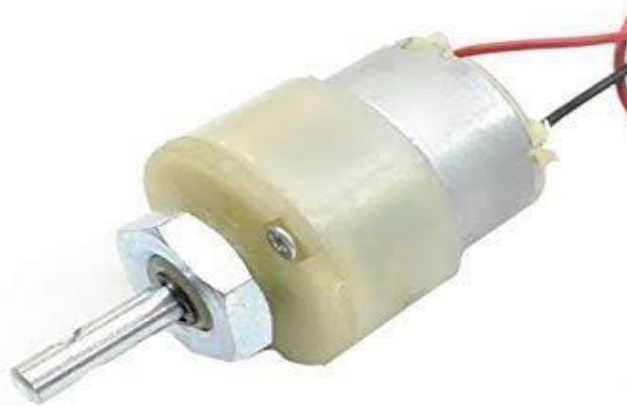

Fig. 4.5 DC Motor

4.7 7805 Voltage Regulator: -

Voltage regulator like IC7805 belMings to the 78xx series ICs. In the 78xx series, xx represents the fixed output voltage value and 7805 is a fixed linear voltage regulator. Batteries provide a voltage of 1.2V, 3.7V, 9V, and 12V. This voltage is good for the circuits which voltage requirements are in that range. The regulated power supply in this regulator is +5V DC.

Fig. 4.6 7805 Voltage Regulator

7805 Voltage Regulator Working: -

This is the circuit diagram of producing a regulated output of 5V from the AC mains supply. This circuit uses the following components –

1) 230V – 12V step down transformer
2) 1A fuse
3) 7805 voltage regulator IC
4) Capacitors
5) IN4007 diode
6) Bridge rectifier
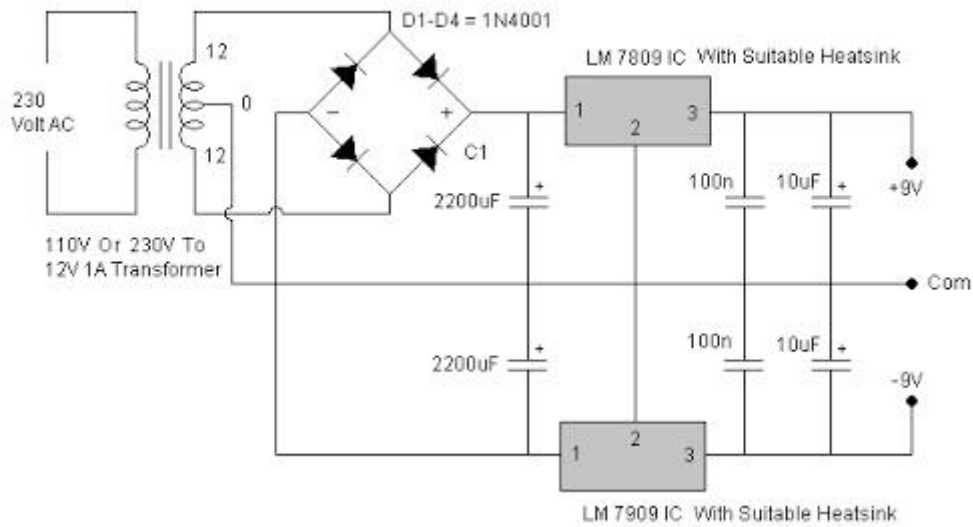
7805 Voltage Regulator Circuit Diagram: -

Fig. 4.7 7805 Voltage Regulator Circuit Diagram

When AC power supply is given from mains, first it is converted into unregulated DC, and finally, constant regulated DC can be generated like the output from this circuit. Mainly the circuit is designed with a bridge rectifier which is made up of diodes, transformer, capacitors, and linear 7805 voltage regulator.

It takes place in two steps, on the first step AC power supply is converted into unregulated DC and in the second step, this unregulated DC is converted into regulated DC. We will see the process now.

The primary step-down transformer is connected to the mains supply. The secondary of a step-down transformer is connected with a bridge rectifier, here it is a combination of 4IN 4001 diodes.

In between the bridge rectifier and the transformer, a 1A fuse is placed. It is used for current limitation i.e to limit current to 1A drawn the circuit. The rectified DC which is given by the bridge rectifier is smoothened by the capacitor. So, the output is unregulated DC about 12 V DC. Then the voltage regulator IC receives this unregulated Dc as input and this regulator converts the unregulated DC to regulated DC about 5V and finally, output terminals receive this regulated DC.

Application of 7805 Voltage regulator: -

1) Regulated dual supply

2) Current regulator

3) Fixed output regulator

4) Reverse bias projection circuit

5) Adjustable DC voltage regulator etc

6) This 7805 IC is used in building circuits for a phone charger, infrared remote control extension, UPS power supply, and even portable CD player

4.8 7812 Voltage Regulator: -

7812 Voltage regulators is a type of self-contained fixed linear voltage regulator integrated circuit. The IC belongs to ic 78xx voltage regulator family.

The 7812-voltage regulator IC is ease-of-use and available in very low cost. The last two digits of 7812 indicates the output voltage that is 12 The ic 7812 is a positive voltage regulator which means that it generates the positive voltage with respect to the common ground.
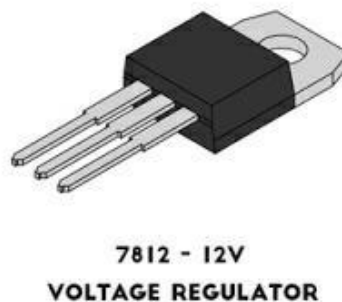

7812 - 12V
VOLTAGE REGULATOR

Fig. 4.8 7812 Voltage Regulator

In case if both the positive and negative voltage supply is needed in the same circuit. The voltage regulator ic 7812 is combined with its corresponding 79XX family IC that is 7912 IC.

The voltage regulator 7812 is available most commonly in TO-220 packageas well as TO-3, TO-92 and surface mount Packages.

The IC 7812 Voltage regulators do operate at their optimal capability, if the input voltage is at least 2.5 volt greater than the output voltage (i.e. 14.5 V min.) and the current is 1 or 1.5Amperes more. Though the voltage and current difference is different for other IC Packages.
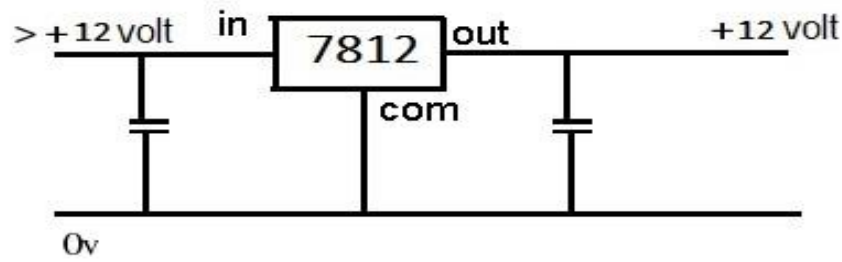
Fig. 4.9 Circuit of 7812 Voltage Regulator

The 7812 IC have 3 pins: -

1) The positive input is at pin 1.

2) The Pin 2 is common between both input as well as output voltage

3) Pin 3 is a positive output

Advantages of 7812: -

1) 7812 voltage regulator ic does not require any component to balance or saturate their output voltage.

2) The 7812 ic has a built-in protection from the high current. It has a heat-sink with the common ground connected with it. The heat sink prevents our regulator ic from overheating and short-circuits.

4.9 Buzzer 24V: -

There are many ways to communicate between the user and a product. One of the best ways is audio communication using a buzzer IC. So during the design process, understanding some technologies with configurations is very helpful. So, this article discusses an overview of an audio signaling device like a beeper or a buzzer and its working with applications.

An audio signaling device like a beeper or buzzer may be electromechanical or piezoelectric or mechanical type. The main function of this is to convert the signal from audio to sound. Generally, it is powered through DC voltage and used in timers, alarm devices, printers, alarms, computers, etc. Based on the various designs, it can generate different sounds like alarm, music, bell & siren.

Fig. 4.10 Buzzer 24V

The pin configuration of the buzzer is shown below. It includes two pins namely positive and negative. The positive terminal of this is represented with the '+' symbol or a longer terminal. This terminal is powered through 6Volts whereas the negative terminal is represented with the '-'symbol or short terminal and it is connected to the GND terminal.

Working of Buzzer: -

A buzzer is an efficient component to include the features of sound in our system or project. It is an extremely small & solid two-pin device thus it can be simply

utilized on breadboard or PCB. So, in most applications, this component is widely used.

There are two kinds of buzzers commonly available like simple and readymade. Once a simple type is power-driven then it will generate a beep sound continuously. A readymade type looks heavier & generates a Beep. Beep. Beep. This sound is because of the internal oscillating circuit within it.

This buzzer uses a DC power supply that ranges from 4V – 9V. To operate this, a 9V battery is used but it is suggested to utilize a regulated +5V/+6V DC supply. Generally, it is connected through a switching circuit to switch ON/OFF the buzzer at the necessary time interval.

Advantages of Buzzer: -

The advantages of a buzzer include the following
1) Simply Compatible
2) Frequency Response is Good
3) Size is small
4) Energy Consumption is less
5) The Range of Voltage usage is Large
6) Sound Pressure is high

Disadvantages of Buzzer: -

The disadvantages of the buzzer include the following.

1) Controlling is a little hard.

2) Generates Annoying Sound.

3) Training is necessary to know how to repair the condition without just turning off.

Application of Buzzer: -

The applications of the buzzer include the following

1) Communication Devices

2) Electronics used in Automobiles

3) Alarm Circuits

4) Portable Devices

5) Security Systems

6) Timers

7) Household Appliances

8) Electronic Metronomes

9) Sporting Events

10) Annunciator Panels

11) Game Shows

Chapter 5
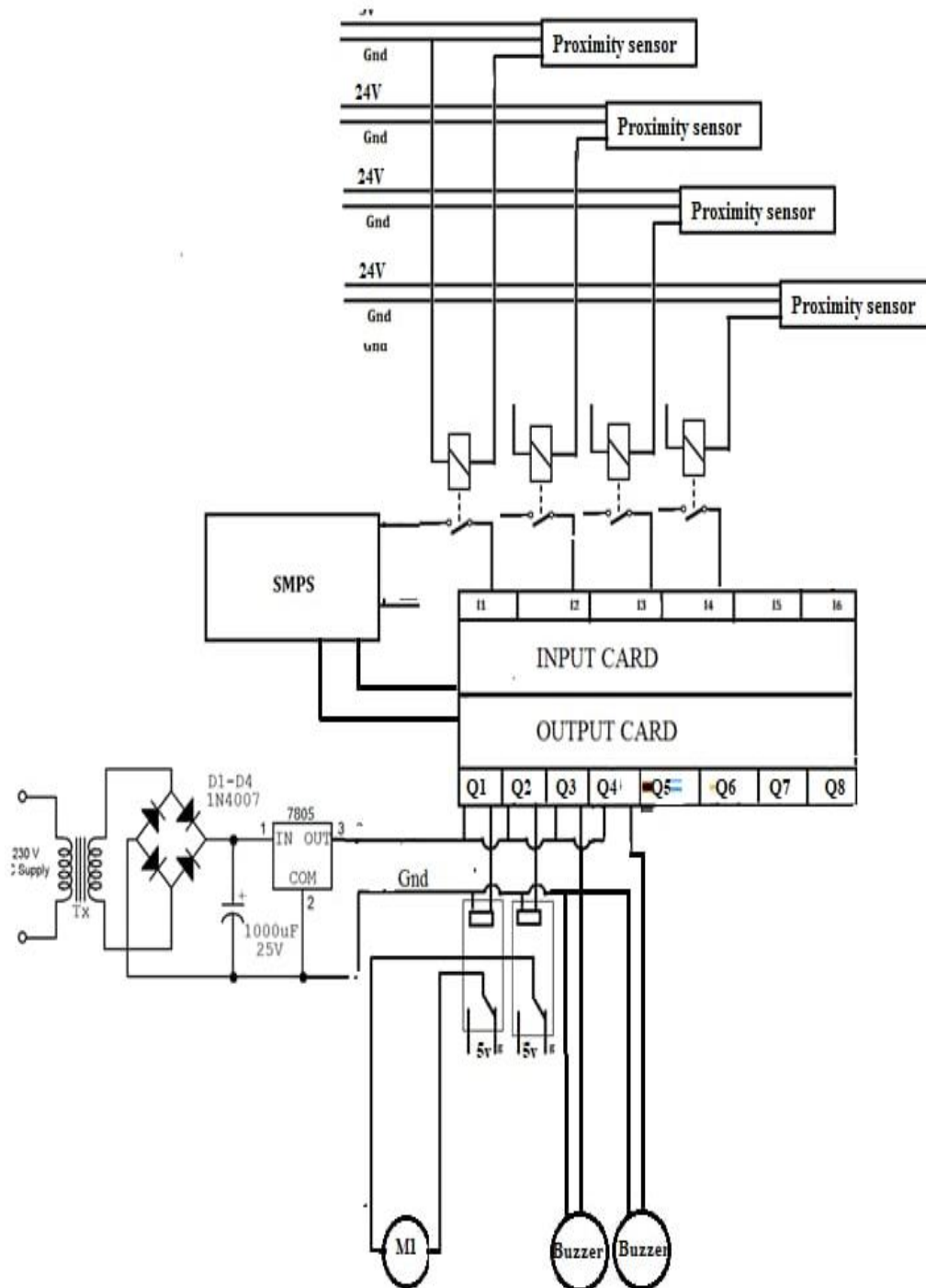
Circuit Diagram: -

Fig. 5.1 Circuit Diagram of System

5.1 Explanation of Circuit Diagram: -

As the proximity detects the object it starts working as Input source and PLC receive the signal from proximity.it getting starts operating. With this the SMPS (SWITCH MODE POWER SUPPLY) is also connected to the plc to step down the voltages and converts ac source in dc. Proximity sensor 1 is connected to input 1(I1), Proximity sensor 2 (I2), proximity sensor 3(I3), proximity sensor 4(I4), as an input to plc However, the output is also connected to the respective operating devices.

As the input gives the command to their respective output. Output (Q1&Q2) is connected, to operated motor and output Q3 for the Indication. output Q4 for the Indication For the output source another SMPS (SWITCH MODE POWER SUPPLY) is connected in SMPS, the step-down transformer is there to overcome the voltage and the rectifier is connected to convert ac source into dc and polarized capacitor is used to purify the voltages.

The main reason to use SMPS is that the space require is less But in SMPS (switched mode power supply) the efficiency is high than traditional circuit for the motor control relays are used for which is of 5v supply to on or off the motor with the help of plc Proximity sensor gives command to input I1 and output (Q2) receives the command to ON the motor.

Proximity sensor 2 gives the command to input I2 and the output Q2 receives the command to of the motor proximity sensor 3 gives the command to input 3and output Q3 receives the command for indication for the output SMPS works to regulate dc supply For the High voltage machine like motor. As the proximity sensor detects of the object the command goes to PLC and it starts working to operate motors and indication for a particular cycle 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) 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. Ideally, a switched-mode power supply dissipates no power.

Voltage regulation is achieved by varying the ratio of onto-off time. In contrast, a linear power supply regulates the output voltage by continually dissipating power in the pass transistor. This higher power conversion efficiency is an important advantage of a switched-mode power supply. Switched-mode power supplies may also be substantially smaller and lighter than a linear supply due to the smaller transformer size and weight.

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Chapter 6

Programming

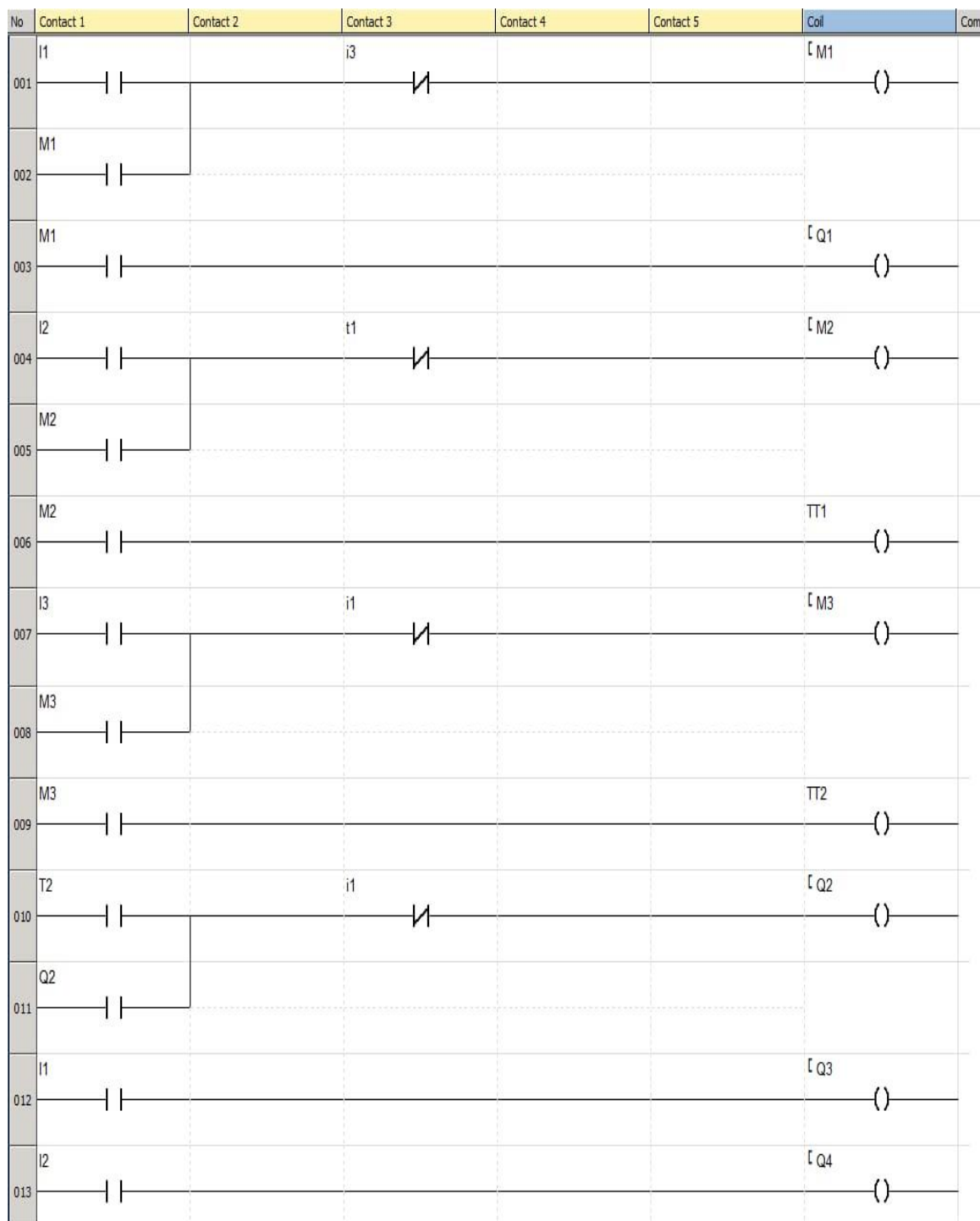| No	Contact 1	Contact 2	Contact 3	Contact 4	Contact 5	Coil	Comm
001	I1		i3			[M1 ( )	
002	M1						
003	M1					[Q1 ( )	
004	I2		t1			[M2 ( )	
005	M2						
006	M2					TT1 ( )	
007	I3		i1			[M3 ( )	
008	M3						
009	M3					TT2 ( )	
010	T2		i1			[Q2 ( )	
011	Q2						
012	I1					[Q3 ( )	
013	I2					[Q4 ( )	

Fig 6.1 Ladder Diagram

6.1 Ladder Diagram Explanation: -

Step 1: -

First we take I1 that is our sensor 1 actually we use here three sensors I1, I2,I3.

Step 2: -

 when I1 is high it will ON M1 also latch M1,

here M1 remains continuously ON.

Step 3: -

Then we ON Q1 by M1(here Q1=first motor).

Step 4: -

when second sensor I2 will ON then it will ON M2.

 Step 5: -

When M2 of 6th line will ON it will ON Timer 1.

Step 6: -

After that I3 from 7th line will ON then it will ON M3 and latch M3 of line 8.

Step 7: -

After that from line 9 with M3 we take a timer to stop that trolley sometime to collect the garbage.

Step 8: -

After that from 10th line we take Timer 2 i.e., T2 from T2 we on Q2 (here Q2= motor reverse).

Step 9: -

When T2 ON next we take I1 and I2 when these both sensor will ON, on that time Q3 & Q4 will ON (here Q3= Buzzer 1 & Q4 = buzzer2).

Chapter 7

Case Study: -

Since smart cities are becoming center of attraction for the advancement of developing countries and without the removal or solution to the garbage problem these cities will be not that attractive.

Therefore, large number of projects and research is going on in the area of smart dustbins for smart cities and to implement such projects typically use microcontroller based real time bin monitoring system, RFID technology, GPS, GSM, RF module etc.

Yusof et al, presented an Arduino Uno micro controller based smart garbage monitoring system to ascertain the level of waste in the garbage bin in real time and before there is overflow in garbage bin the system senses out and alert through SMS municipality for the bin to be emptied a garbage to be collected immediately.

IR sensor is used to estimate the level of waste while the GSM module is used for sending SMS and Arduino UNO is used to control the system operation.

Issacs and Akshai, proposed a system called SVASTHA (a Sanskrit word, meaning- be healthy and hygienic), to effectively control the municipal solid waste. This system is based on RFID and GPS in which data is gathered using the RFID reader via Bluetooth and this data is stored on the central server.

The main objective of GREENBIN is the segregation of waste at source so that useful electricity can be produced from the individual components of waste. Sensors like capacitive based moisture sensor, inductive based metal sensor, methane sensor and odour sensor are used to achieve this goal.

The world's first waste suction plant was inaugurated in 1961 at the newly built and ultramodern Sollefteå hospital. Nobody thought that the central vacuum cleaner, which was also to suction waste from the hospital was to become one of Sweden's most well-known environmental technology products 50 years later. Somebody had to blaze a trail. Somebody had to take the risks of introducing a new technology.

Chapter 8

8.1 Advantages: -

1) Proper management of garbage.

2) It will reduce the efforts and man power.

3) Reduce service time.

4) 24/7 hours service availability.

5) Not affected by any traffic issue as it is underground.

6) Using this system, we can adopt the healthy lifestyle.

7) This system is helps in pollution free and odour free environment.

8.2 Disadvantages: -

1) High investment cost.
2) Skilled man power required for installation.

8.3 Applications: -

1) Applicable in flat system to collect waste.

2) It can be used in commercial buildings such as shopping mall, hospital, large shops.

3) It can also be used in local areas such as colony of bungalows and row houses.

4) It can be used in all over the area where peoples are situated like slum area too.

Chapter 9

9.1 Result and Discussion: -

Underground waste management using PLC is the system in which the method of collecting garbage from area to another area is get effortless and faster. As we know, garbage can hazardous health issues and it will create complication at the administrative level. When we burnt garbage in the open area it will increase air pollution.

Thus, this system is the solution for all the problems caused by garbage. By adopting this system, we can survive in garbage pollution free atmosphere because it will avoid the direct contact of garbage with environment.

The utilization of subsurface space is nowadays a key issue towards attaining an environmental friendly and sustainable development, especially in urban areas. Thus, activities or infrastructures that are difficult, impossible, environmentally undesirable or even less profitable to be installed above ground can be relocated underground releasing valuable surface space for other uses and enhancing urban living conditions.

Hence, the management of waste through underground developed infrastructure can be looked as an important evolution which would allow for the efficient and cost-effective tackling of one of the more pressing needs of modern society.

This report aims at presenting the solutions offered by such infrastructure, at identifying their operational characteristics and specific advantages as well as at providing insight regarding their cost data, benchmarked against traditional management schemes.

Furthermore, through selected case studies the applicability of such schemes and the decision process that led to their adoption is analysed. Finally, future issues which can further enhance the efficiency of the underground waste management schemes are identified and analysed.

9.2 Future Scope: -

1) It helps in Reduction of gaseous emissions, solid residues, and pollution, contributing to the protection of climate and environment.

2) Recovery of materials from waste mediums and then turning them into reusable resources; and reducing the need for landfills.

3) It will help in our environment, safeguarding public health, and providing economic benefit through jobs and new industries.

4) The separation of bio-degradable & Non bio-degradable in which separated bio-degradable waste can be used for making compost.

5) Proper sorting and segregation, which later decreases greenhouse gases, also decreases risk to human health and environment.

6) This technology is evolving rapidly and very soon there will be an advanced and flawless waste segregation machine which will separate waste with unmatched efficiency.

7) It also provides economic benefit through jobs and new industries in waste management.

8) By using this proposed scheme will be helpful to easily achieve our mission clean India by decreasing soil pollution, water pollution & reduce carbon emissions which may also results in decreasing global warming issue.

Chapter 10

Photo-Gallery: -
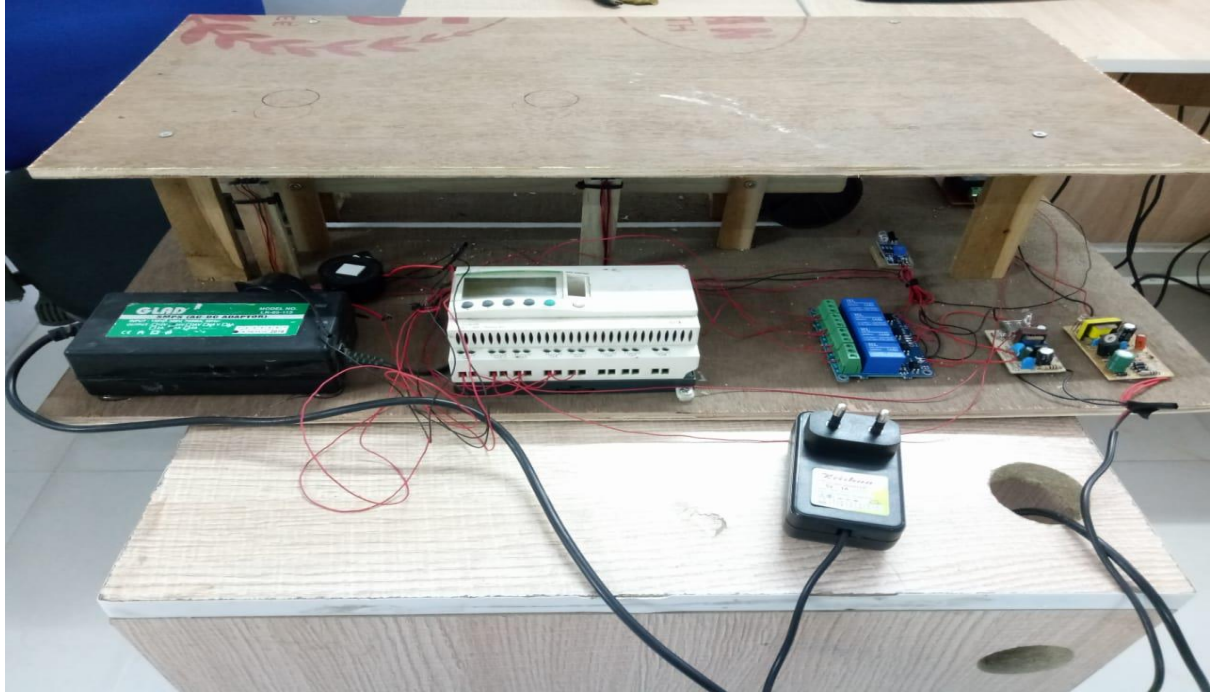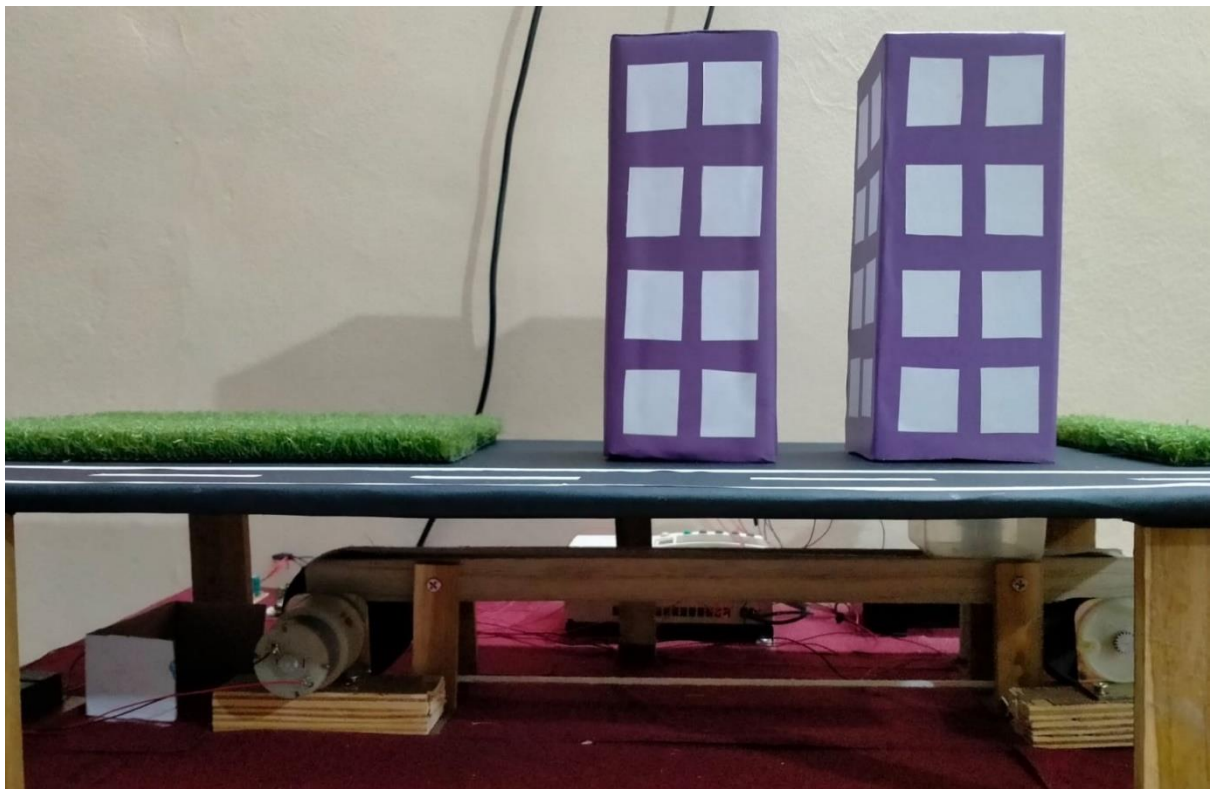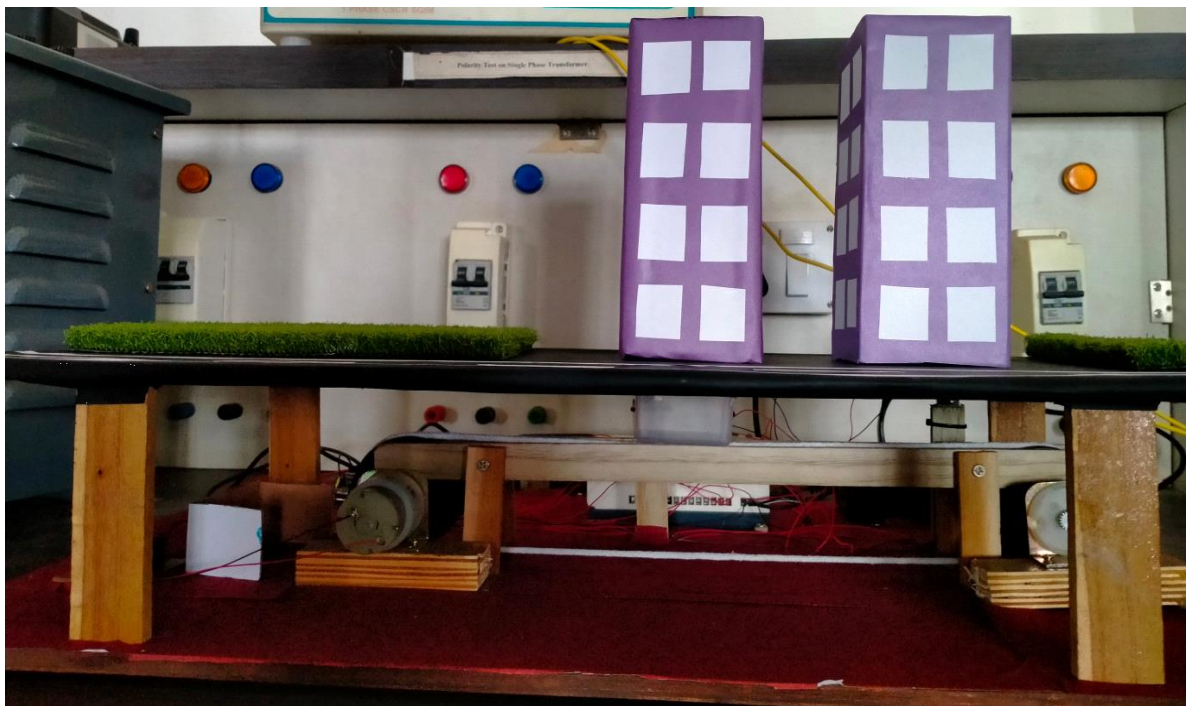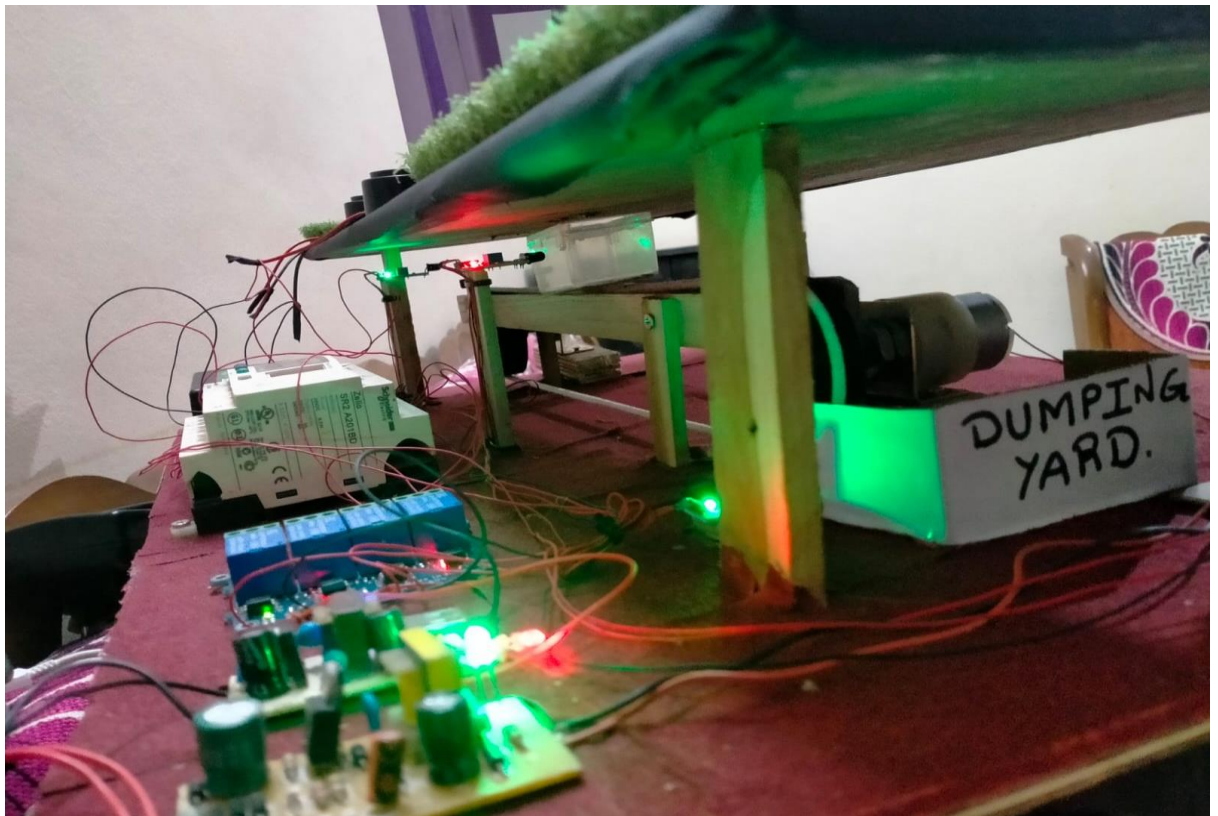
Chapter 11

11.1 Conclusion: -

Waste management can be defined as the "collection, removal, processing, and disposal of materials considered waste" (Ecolife Dictionary). Waste can be put into landfills, recycled, or composted. The best and most sustainable way to manage waste is by recycle and compost.

The separation and onsite effective utilization off waste using PLC is separate the Waste into bio-degradable waste and non-biodegradable waste. The bio-degradable waste is utilized for making compost, and Non-biodegradable waste is use for recycling. The tiny particles of glass and pebbles are not easily removed. The separation of waste can be achieving 70-80%.

Thus, we have performed the project on "Underground Waste Management Using PLC" under the guidance of one of the best project guide Mr. Sunil More Sir.

11.2 Reference: -

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