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PLC BASED ENERGY MANAGEMENT SYSTEM WITH AUOTMATIC PLATFORM ALLOCATION

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Abstract: This paper describes the PLC based energy management system with automatic platform allocation. Two sensors placed in the platform on either side which detects the train entering from any one of the sides, all the lights gets ON. When the train departs, 80% of the total lights gets off and only 20% of the lights will be glowing. Here a comparator is used to compare the preset value and the weather condition, for this purpose LDR(Light Dependent Resistance) is used. If it is a day time, all the lights will be OFF and if it is a cloudy day or night time 20% of the lights will be glowing irrespective of the presents of train. Also we are using automatic system by placing sensors and motor on either side of the platform. When the train is detected by using the sensor, the motor automatically changes the track position. If the train is already available in any one of the tracks then the point of the track is changed and the next train is allocated in some other track. We have combined the above two problems, the solutions can be obtained using a single plc based system. SOLAR supply is used when the EB supply is less than a preset value. This project will enhance the energy management and platform allocation system.

Keywords: energy management systems, platform allocation system, comparator, sensor, solar supply.

I. INTRODUCTION

Recently excessive energy consumption has caused numerous problems in the world such as global warming ,climatic changes, high energy cost,etc.Indian railways is the second largest networking system under Central government as single management in the world. Whenever a train is arriving or departing, all lights in the platform are glowing unnecessarily, leading to maximum energy consumption which leads to electrical energy wastage and life of those electrical lights and appliances will be reduced. In the existing system , platform allocation is done by Manual operation and Electrical operation

Manual operation requires human intervention. Each and every time, the points man changes the point(liver) according to the instruction given by the station master. If the lever is changed twice unknowingly in the same direction , collision of trains may occur. In electrical operation , the station master controls the lever from the control room where there is also possibility of human error .Hence any failure occurring in the switching over of track rails may not be known to him.

To conserve the energy and overcome these problems Energy Management System and Platform Allocation System has been developed using ***"Programmable Logical Controller (PLC) ",***where Functional Block Diagram Logic is used to implement the system.

If the train enters or leaves the platform, it is sensed by the sensor and sends signal to the PLC which controls the glowing of lights and allocation of platform. During night

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and in the absence of the train, in the platform only 20 % of the lights will be ON. When the train enters ,both sides of the platform, all the lights will be ON and automatically free platform is allocated to the train.

A. *Abbreviations and Acronyms*

PLC-Programmable logical controller

LDR-light dependent resistance.

B. *Units*

1. 230 Volts/ 24 Volts/ 1 AMP- TRANSFORMER
2. 230 Volts/ 12 Volts /1 AMP -TRANSFORMER
3. 1 Amp- Bridge Rectifier
4. 7824 VOLTAGE REGULATOR
5. 7812VOLTAGE REGULATOR
6. 1000 µF /50 V -CAPACITOR
7. 100 µF /50 V - CAPACITOR
8. 0.1 µF- CAPACITOR
9. 12V - relay
10. 10 KV - Potentiometer
11. 10k Ω- LDR
12. 12V- 3 LED Strip
13. 12 volt/1 AMP/10HP- DC shunt motor
14. 12 volt / 500 µA- Solar Cell.

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II. SYSTEM ARCHITECHTURE

As shown in fig1, a permanent magnet is placed in the front panel of the train,two magnetic sensors are placed on either side of the railway track to sense the arrival of the train in the opposite directions. Two dc shunt motors (12 v/1amp,10 hp) which has constant speed at no load condition, are also placed adjacent to the sensors. When the train arrives, the sensor senses the arrival of the train, closes the reed which is present inside the sensor and the current flows through the circuit and makes the led to glow.
A light depending resister (ldr-10 k ohm) and a comparator play a major role in energy management.

As the intensity of the light decreases, the increase in the resistance of ldr block the current flow. As the brightness increases, the decrease in the resistance of ldr leads to increase in the current. Potential comparator is used to compare the preset value with the ldr output. If the ldr output (day light) is greater than preset value, then all the lights in the platform are switch off. If the ldr output is less than preset value, only 20% of the total lights will glow. Cube relay (12v/ 200 ohm) is connected externally to control the plc.

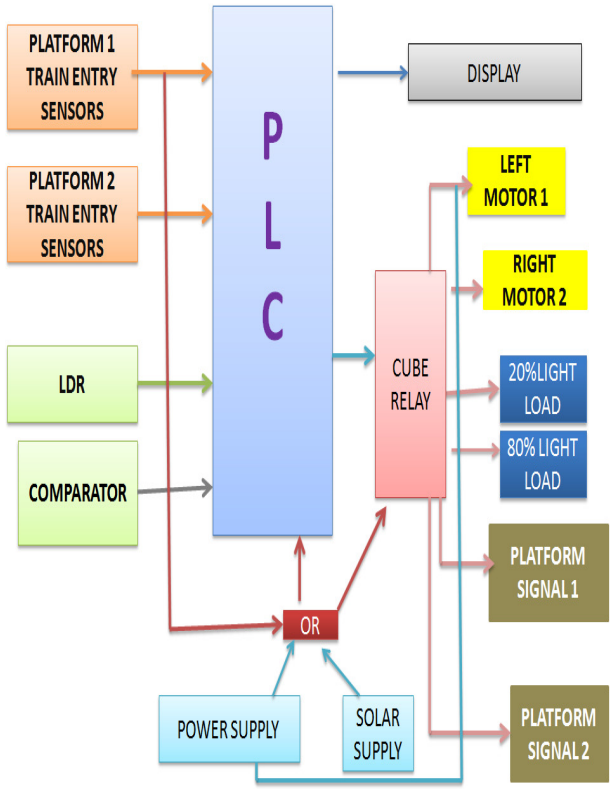

Fig 1. Block Diagram

III. WORKING

1) Energy management:
The sensors which are placed on either side of the platform detects the entry of train from either side, at this time all lights of the platform will be glowing. When the train leaves the platform, 80% of the lights are OFF. If it is a day time then there is no need for lightings therefore all the lights in the platform are OFF. If it is a cloudy day/night then comparator will compare the cloud condition with pre set value of LDR.

2)platform allocation:
The sensors which are placed on either side of the platform. The entry and exit of the train is counted. If the train is already present in one track then plc automatically allocates and gives signals to the motor to change the point in order to sent another train in the next track. The following figures, fig2, fig3represents the simulation required for the project.

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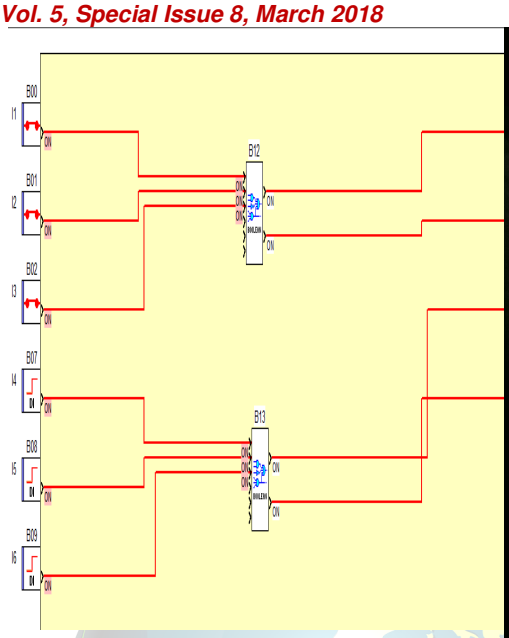

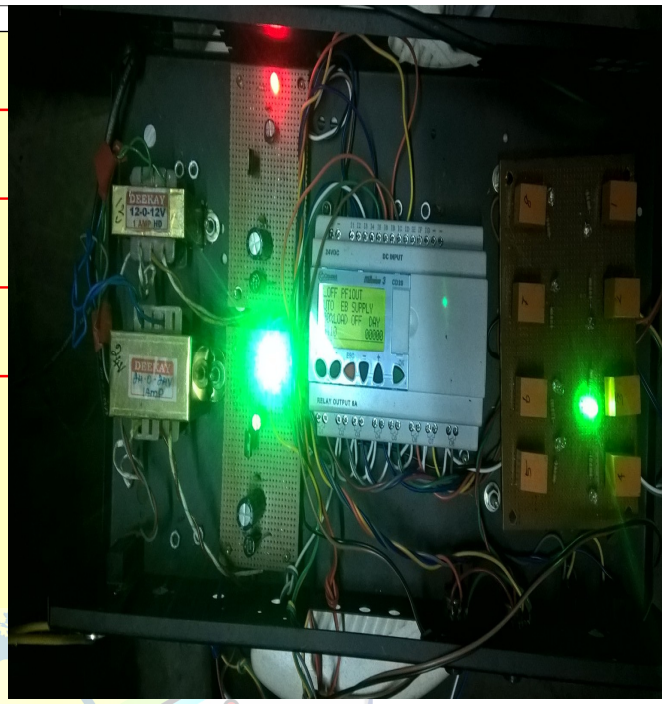

Fig2:Simulation Of Platform Allocation.

Fig 4: PLC connections and PLC display

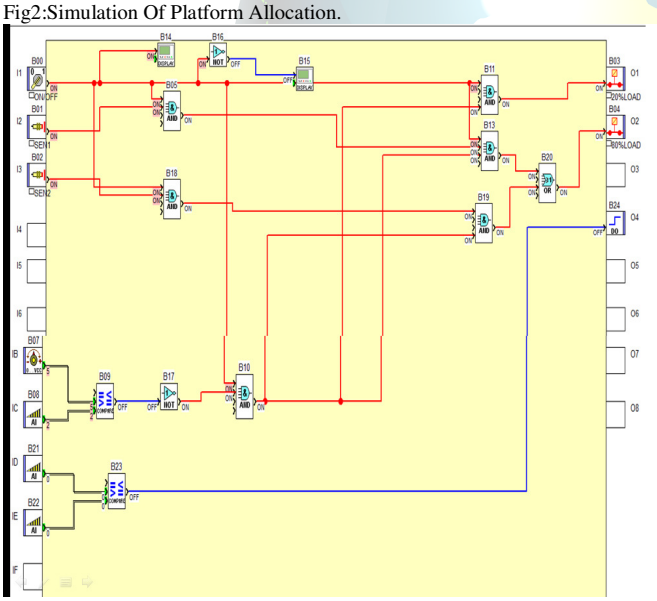

Fig 3: Simulation For Energy Management System

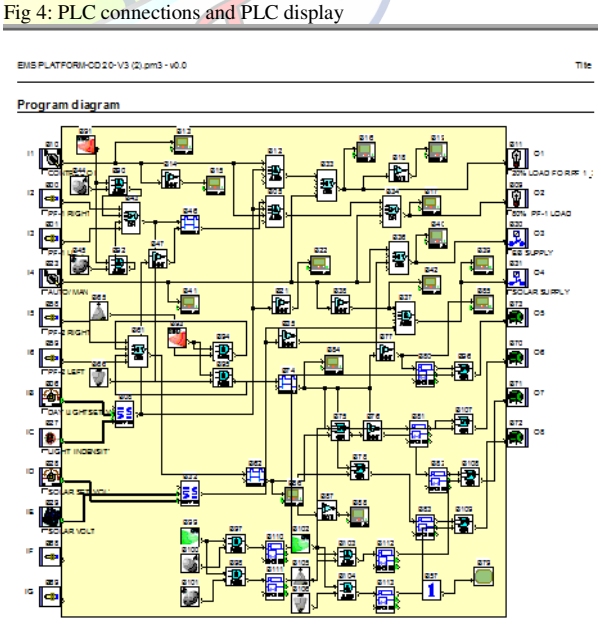

Fig 5: Simulation For Energy Management And Platform Allocation

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IV. CONCLUSION

We proposed a PLC based automatic system to enhance energy management and platform allocation. The inputs communicates with the PLC and corresponding outputs are obtained. This system enables easy and efficient usage of PLC based automatic system. the fig4, fig 5, are the final outputs of the project and also the PLC which displays the commands is shown.

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