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Simulation and Analysis of PLC based home automation

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ABSTRACT

Home automation is most advanced technology over worldwide. This concept includes assembly, simulation and analysis, assembly makes use of DVP-SS2 Delta PLC, smoke sensor, temperature sensor, SMPS, and limit switch. Programming part is carried by Ladder diagram. The analysis has been carried out to know the amount of power and energy wasted as the motor light and AC runs unnecessarily, and we have also made the attempt to calculate the amount of power saved by using PLC. Simulation is an application helps people to visualize the working of sensors, timers, counters and outputs (fan, AC, gas, and motor).

Keywords: Automation, PLC, Energy

I. INTRODUCTION

Automation and smart home concept was introduced in 1980's by using the latest technologies such as PLC. The concept of the home automation is not new, but the concept is advancing day by day. This home automation has many advantages; it is very much useful for the handicapped people and old age people who can't walk fast. Using different methods such as web service and android app, wireless sensors based on mobile technology, Bluetooth based using Adriano etc. These incur high improvement costs, high furnishing costs, experienced person, complicated network and large sizes of components etc. Bluetooth based automation using Adriano use components as cell phone, C+ program, microcontroller etc. This project attempts at atomizing any house old instruments. As the functioning of house old instruments are combined with functioning of PLC, the project confirms to be concrete, reliable and more effective than the present available controllers.

II. LITERATURE SURVEY

Ashwini.R, Mrs. Pooja Mohnani [1] has presented an international journal on Application of Wireless Sensor Network in Home Automation. Bluetooth based home automation using Adriano [2] is a concept evolved after the Wi-Fi, here they make use of Bluetooth to make connection between cell phone and microcontroller Bluetooth module. Home Automation using PLC and SCADA [3], controlling is carried out by PLC and SCADA where the SCADA is very complicated network. it is used to control the HVDC lighting system in home The appliances are to be controlled automatically by DVP-SS2 Series is Delta Electronics' PLC.

2.1 PLC in industry

Hydraulic system turnover of work piece by PLC [4]: Work piece turnover is automatic control and maintenance of automation production, assembly, and output lines in the industry. Process control loop for bottle washing machine in industry by PLC [5]: PLC based bottle washing technology is used in Pepsi, coco-cola, beer, slice, beverages industries'. The washing work should be carried out with high speed and accurate manner

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2.2 PLC in agriculture

Moisture and nutrient precise governing system by PLC [6]: First we have checked the content of soil, for better growth of a plant it mainly needs water and nutrients. So this project has integrated with PLC to provide the water and nutrients in correct and sufficient manner.

2.3 PLC in Medical science

PLC is used to determine the content of antigens named by listeriolysin and phosphatidyl-inositol phospholipase [7] which was found in the body of goats, bovines, pigs. ELISA is an antigen which is considered as recombination of above 2 antigens. PLC and SCADA for control of LN2 system for SST [8]: SST(steady state superconducting), where liquid nitrogen is used to control temperature of SST.

2.4 PLC in Electrical Engineering

PLC and fuzzy PID Simulink combined circuit for AVR system [9]: The main objective is to control the voltage below the given range. Fuzzy and PLC are combined to betterment of the control. Communication of power line and HVDC bus in renewable energy system by PLC [10]: The power generated by renewable source's such as wind, solar, hydro, etc. are transferred to HVDC bus, from here the power is supplied to all local stations.

2.5 PLC in Mechanical Engineering

PLC governed single cylinder diesel engine [11], the concept is evolved to covert mechanical injection engine into electrically controlled 2-port system. Here from one port is provided with injector and other port with diesel. All injectors (port) are controlled by PLC.

III. BLOCK DIAGRAM

PLC: The DVP-SS2 Series PLC is Delta Electronics' second generation PLC of slim line industries. The DVP-14SS211R features are high processed counters, flexile serial port, real-time monitoring and an expansion bus. Module which matches is mounted on the right side of the PLC without external wiring.

Smoke sensor: It is a device which senses the smoke as acts as indicator of fire. We have set the minimum level of fire and it is sensed by the sensor, when the fire level in home extends the minimum level automatically the gas solenoid valve gets off.

Water probes: Water probes measures the level of liquids and other fluids such as petrol, diesel (in petrol pumps) etc. The inspection in the water probes either continuous sensor (CS) or discrete sensor. CS (continuous sensor) measures the water within a given range and, while discrete sensors (point sensor) only gives indication whether water is above or below given point.

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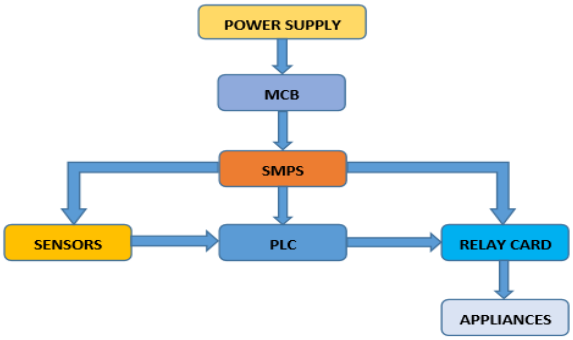

Fig. 1: Block diagram

Temperature sensor: Mainly temperature sensors are of 2 type mechanical temperature sensor, and electrical temperature sensor. These electrical sensors are again classified based on materials used, nickel-alloy thermocouples, platinum-rhodium-alloy, thermocouple, tungsten-rhenium alloy thermocouple.

Gas solenoid valve: Gas solenoid valve is an electromechanically functioning valve. Gas solenoid valves are used to control the flow of air, gas, water oil, and steam in many industries. The 2-way, 3-way, 4-way control most fluid and gas application. It is 24V DC solenoid valve will gets ON when smoke sensor gets off.

3.1 PLC Program

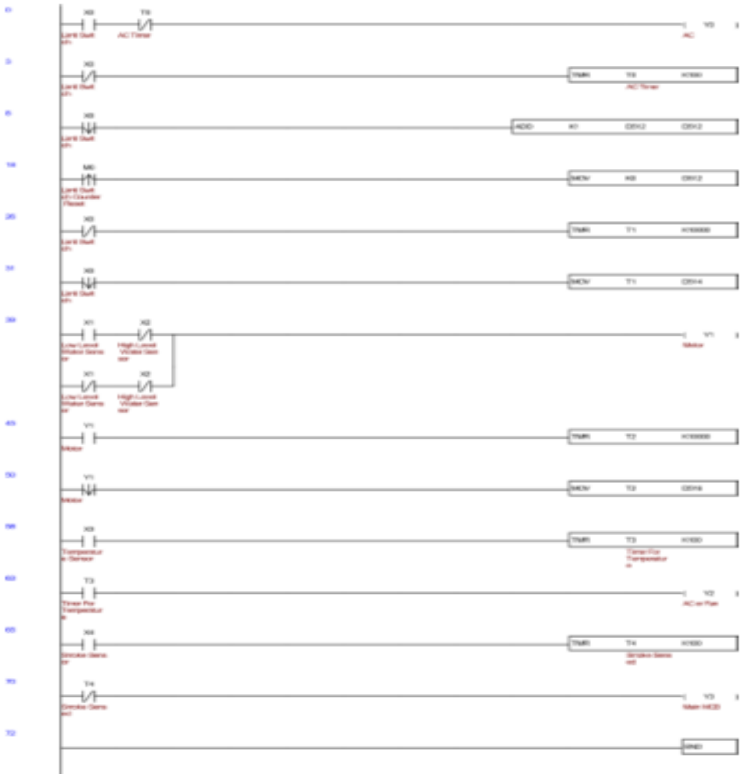

Fig. 2: Ladder diagram

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3.2 Simulation

Fig. 3: Simulation figures

3.3 Circuit Diagram

Fig. 4: Circuit diagram

IV. ANALYSIS

4.1 Calculation of energy saving per year

Table 1. Energy saving in time for 1 HP motor

Minutes	Duration in Hour	One HP Motor
1	0.016666667	4.532083333
10	0.166666667	45.32083333
15	0.25	67.98125
20	0.333333333	90.64166667
30	0.5	135.9625

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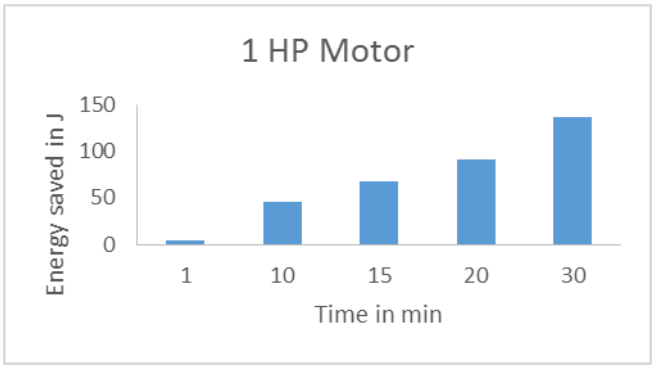

Fig. 5: Amount of energy saved per year

Calculation:

1 HP Motor =year × energy in kWh

= 365 × 0.0124

= 4.532 J

4.2 Wastage of water for 1 year

Table 2. Wastage of water for different size motor

Minutes	Half HP Motor	One HP Motor
1	7300	14600
10	73000	146000
15	109500	219000
20	146000	292000
30	219000	438000

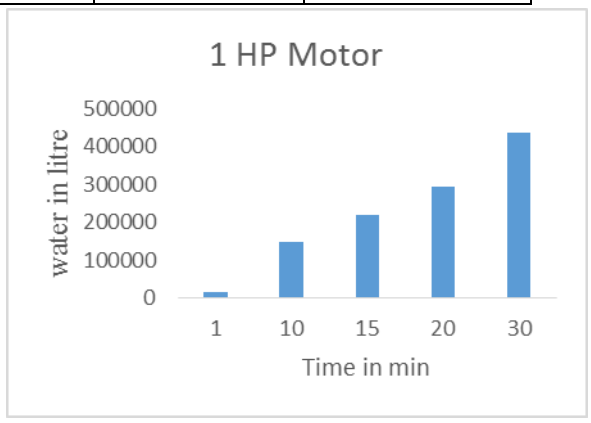

Fig. 6: Amount of water saved per year

Calculation:

1 HP Motor = days of year × wastage of water in litre

= 365 × 40

= 14600 L

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4.3 Calculation of power saved in a year

Table 3. Power saved in a year

Minutes	Duration in Hour	1 Ton= 1.2kW
1	0.016666667	7.3
10	0.166666667	73
15	0.25	109.5
20	0.333333333	146
30	0.5	219

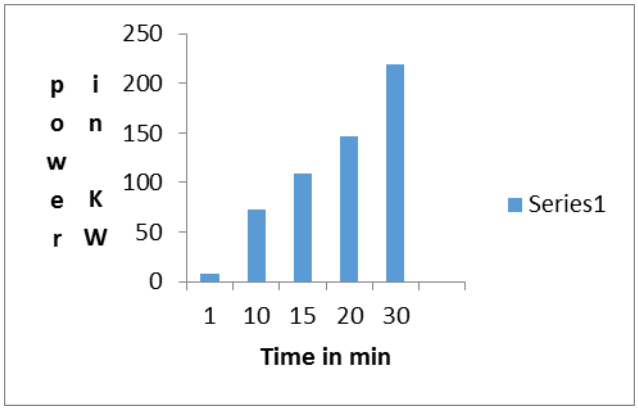

Fig. 7: Graph of amount of power saved

V. RESULTS

In this project we have accomplished the assembly of PLC based home automation with objectives of economically inexpensive, reliable and compatible. Simulation is carried out in WPL software by which we can visualise the actual working of all sensors, timers, counters and outputs (fan, AC, motor, and gas) The analysis was carried out to calculate the amount of energy saved (in Joules), amount of water saved and amount of electricity saved. To make understand easily to everyone graphs has been plotted.

VI. CONCLUSION

Graphs has been plotted to easily understand the amount of energy saved as the time decreases, even water and electricity can be saved. PLC program has been written using the ladder diagram, which makes the programming part easy. Compared to C programming the PLC programming is so easy, as it in terms of diagram. Debugging the PLC program is not as complicated as C programming. We can save 135J energy and 219kW by using PLC based automation, As the electricity is going on diminishing constantly. If we save electricity for next generation then it will be good work of life time. By this project we can save 135J of energy and 438000 lit of water per year, as water level in India is decreasing day by day. So this makes us essential to save the water. The analysis what we have made in chapter 6 is much more useful for to save the water, energy in Joules and power in kW.

IJARSE
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REFERENCES

[1] Ashwini.R, Mrs. Pooja Mohnani, Application of Wireless Sensor Network in Home Automation, Vol 9, Number 1 – Jun 2014.

[2] Bluetooth based home automation using Arduino PDF by Wikipedia.

[3] Vijay S. Deshpande, Amit S, Vibhute K.Choure, Prof. Smitha, Home Automation using PLC and SCADA, Vol 1, Issue 1 (April 2014) Pg. 111-118.

[4] Wang Hong, Hydraulic system turnover of work piece by PLC, Vol 15, 2011, Page 1-5.

[5] Jaykumar Patel, Alpesh kumar Patel, Ravi Prakash Singh, Process control loop for bottle washing machine in industry by PLC, Vol 14, 2014.

[6] Liu xin, Yu Ming, Moisture and nutrient precise governing system by PLC, Vol 33, 2012, Page 5.

[7] Rahul D, Suryawanshia, Satya Veer Singh Malika, Bhushan Jayaraob, Sandeep P. Chaudharic, Emily Savageb, Jess Vergisa, Nitin Kurkurec, Sukhadeo B. Barbuddhed, Deepak B. Rawool, PLC is used to determine the content of antigens named by listeriolysin and phosphatidyl-inositol phospholipase, Vol 137, Issue 5, May 2017.

[8] Pradip Panchal, Gaurang Mahesuria, Rohit Panchal, Rakesh Patel, Dashrath Sonara, Dipen Pitroda, Hiren Nimavat, Vipul Tanna, Subrata Pradhan, PLC and SCADA for control of LN2 system for SST, Vol 5, 2015.

[9] Abdullah J.H, Al Gizia, b, M.W. Mustafaa, Kaml, M.A. Zaidib, Mahmoud K.J, Al-Zai, PLC and fuzzy PID Simulink combined circuit for AVR system, Vol 132, 2014.

[10] Vinh Nguyen, Pierre Petit, Fabrice Maufay, Michel Aillerie, Jean-Pierr Communication of power line and HVDC bus, Vol 36, 2013, Page 1-4.

[11] PLC based tutorials for assembly and analysis.