International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 08 Issue: 01 | Jan 2021 www.irjet.net p-ISSN: 2395-0072

IOT BASED ENERGY MONITORING AND CONTROL AUTOMATION SYSTEM

Sornalakshmi s

M.E, Communication & networking, Rrase College of Engineering, Chennai, Tamil Nadu, India

---

Abstract - Automation can easily increase the efficiency of the Industries the main aim of our concept is to monitor and control the Industrial substation by using IOT. In earlier stage industries, power grids were monitored manually and now instead of that, here we using Internet. Main functions of IOT based automation is accurate fault location which prevent false tripping and reduce fault location. We can access information and data securely from any part of the world by using internet of things. IOT based automation system increase performance of electrical protection, reliability, advanced disturbance and event recording capabilities is possible. The changes in load and stability affect the operation of a power system. The increases in power conception lead to the construction of many substations. This lead to the automation of substation for reducing the complexity of power transmission.

***Key Words*: IOT, Automation, monitor, detector, corrector**

1. INTRODUCTION

Nowadays the electricity and power supply problems are impacting the productivity and efficiency of the industry. This can be avoided by automating the industrial stations. Main functions of IOT based automation is accurate fault location which prevent false tripping and reduce fault location. We can access information and data securely from any part of the world by using internet of things. IOT based automation system increase performance of electrical protection, reliability, advanced disturbance and event recording capabilities is possible. The change in load and stability affects the operation of a power system. The increase in power conception leads to the construction of many substations. This lead to the automation of substation for reducing the complexity of power transmission

The proposed system intends to assist an automation system for distribution feeders and the ring bus connected to them will be implemented and demonstrated. The proposed system covers various aspects both these sections of a grid like optimum utilization, safety, protection and switching to ensure best delivery of available power to the industries. A prototype of a two feeders connected to a ring bus will be implemented and the automation of the same will be demonstrated using an IOT systems and wireless communication, between the IOT system and the grid system. Using this system the protection from faults can be implemented. Also automatic identification of the faulty circuit can be implemented. Automatic intimation to ground staff can also be sent, instantaneously so immediate action can be taken to fix the problem once identified.

1.1 EXISTING SYSTEM

We propose and implement a system that has an automation system for distribution feeders and ring bus connected to it in order to reduce the failure of continuity of supply

BLOCK DIAGRAM

While doing a survey we found that the existing system is Electrical machinery with one – way communication and the generation is the centralized power generation and there is need of sensor to detect the failures and its almost manual monitoring and recovery. And also there are failures and power outages. And when it comes for users only few users can utilize the existing system.

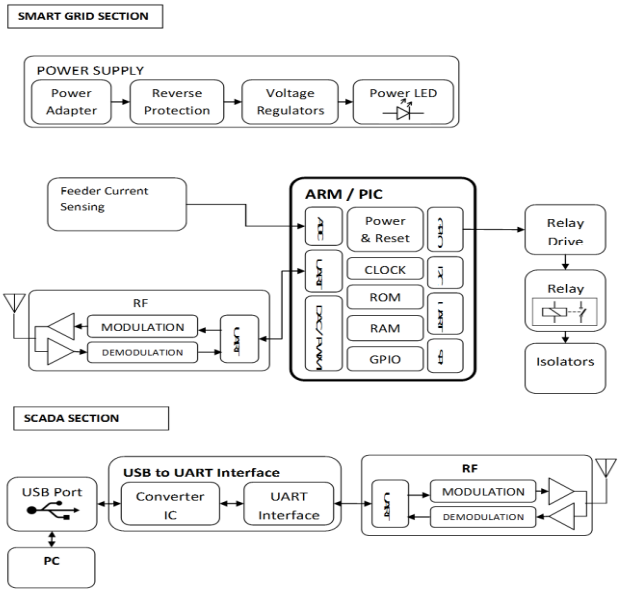

Figure 1: Existing system

DISADVANTAGES OF EXISTING SYSTEM

- Completely Manual operation
- Requires human attention and intervention at every stage and prone to human errors.
- Time consuming.

- Controlling and monitoring is done in a single place.

1.2 PROPOSED SYSTEM

BLOCK DIAGRAM

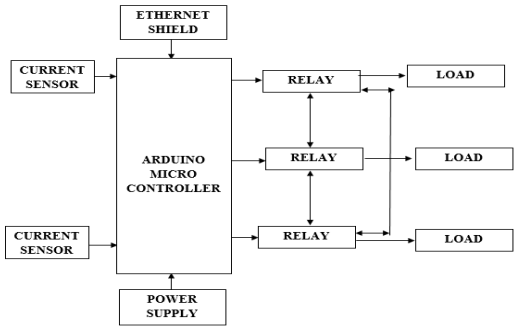

Figure 2: proposed system

EXPLANATION

The grid section consists of Feeder current sensing unit, Signal conditioning unit, Microcontroller and Relay.

Feeder current sensing unit will sense the amount of input current flowing through the feeder. Current transformer is used for sensing current taken by the load. It is connected in series with the load. The interfacing circuit converts ac current into ac voltage .Therefore then the AC voltage is converted into dc voltage using bridge rectifier and filter. The DC voltage is then given to ADC.

Then the value is send to the signal conditioning unit which manipulates an analog signal in such a way that it meets the requirements of the next stage for further processing. Most common use is in analog-to-digital converters.

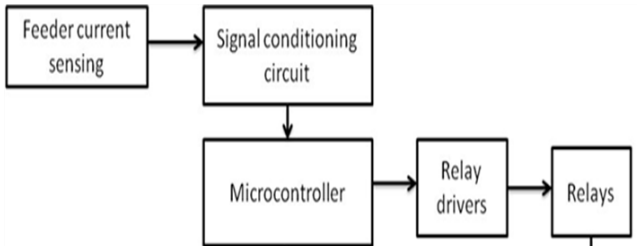

Figure 3: Block Diagram of Grid Section.

Operational amplifiers (op-amps) are commonly used to carry out the amplification of the signal. Then the signal is given to the ARDUINO microcontroller which is used in this project. It is used for getting information from sensors and process it for automation of ring bus feeder and isolator is used for fault identification and isolating the faulted part from the circuit. After the fault is cleared or identified the information are sent to the IOT Section.

1.3 MODE OF OPERATION

There are two mode of operations,

- Under Normal Condition
- Under Fault Condition

Under normal condition

During Normal Condition the load is fed by the feeder 1 and relay for the feeder 1 is closed.

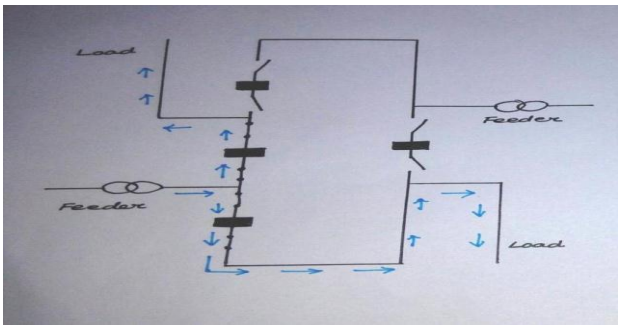

Figure 4: Normal Condition

Under Fault Condition

Under fault condition, if there is any fault at the feeder the load is fed by feeder 2 and the relay 1 is opened therefore the feeder 1 is also opened. The fault may be due to environment conditions, current fluctuations etc.

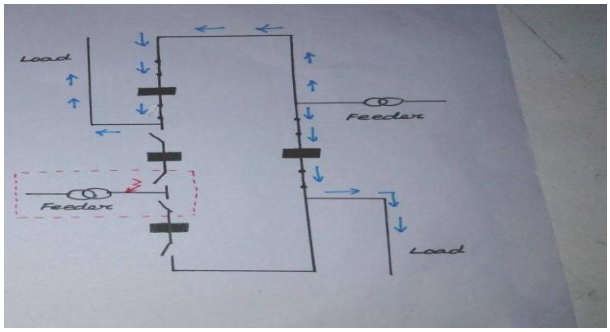

Figure 5: Fault Condition

Output table

FEEDER 1	FEEDER 2	FEEDER 3	FEEDER 1 LOADS		FEEDER 2 LOADS		FEEDER 3 LOADS	
			NORMAL	CRITICAL	NORMAL	CRITICAL	NORMAL	CRITICAL
ON	ON	ON	ON	ON	ON	ON	ON	ON
OFF	ON	ON	OFF	ON	OFF	ON	ON	ON
ON	OFF	ON	ON	ON	OFF	ON	OFF	ON
ON	ON	OFF	OFF	ON	ON	ON	OFF	ON

Table 1: Output Table

2. WORKING PRINCIPLE:

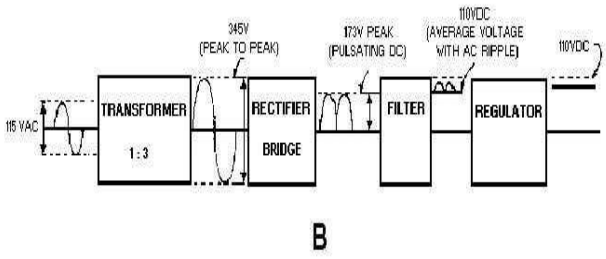

Figure 6: Block Diagram of Working Principle

The first section is the TRANSFORMER. The transformer steps up or steps down the input line voltage and isolates the power supply from the power line. The RECTIFIER section converts the alternating current input signal to a pulsating direct current. And the pulsating dc is not desirable. For this reason a FILTER section is used to convert pulsating dc to a purer, more desirable form of dc voltage. The final section, the REGULATOR, does just what the name implies. It maintains the output of the power supply at a constant level in spite of large changes in load current or input line voltages.

3. SIMULATION RESULTS

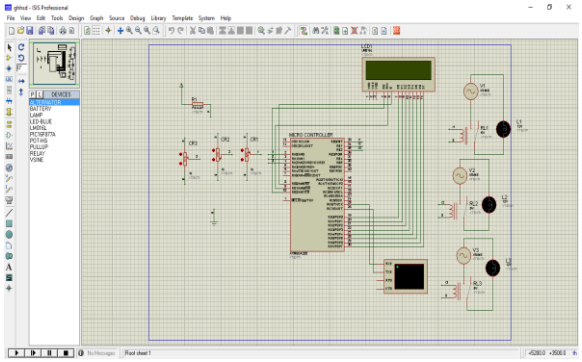

Figure 7: Simulation block diagram

As you can see in the above picture, the devices like relay, microcontroller, power supply, bulb, current sensor and lcd moniter have been picked from the proteus software library and their connections have been given according to our requirements and our required circuit is created.

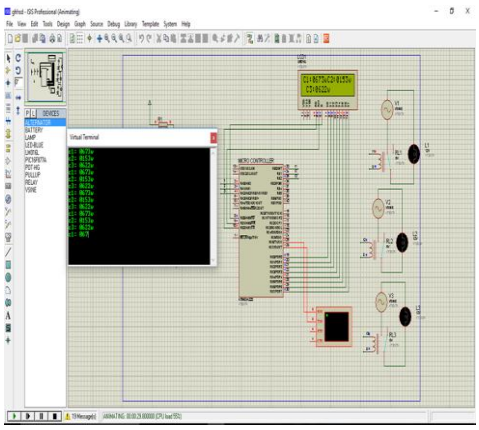

Figure 8: Relay 1 is ON

Now the simulation tool is made to run by clicking the play button in the bottom of the screen and you can see the virtual terminal gets opened and the LCD display starts to show the current values.

The Relay 1 is turned ON by giving command to the microprocessor by Pressing the key on the number 1 and the same will be followed to the balance realays.

4. APPLICATION AND FUTURE DEVELOPMENT

Application

The bulk of smart grid technologies are already used in other applications such as manufacturing and telecommunication and are being adapted for use in grid operations such as

- Integrated communication.
- Sensing and Measurement.
- Smart metersPhasor measurement units.
- Distributed power flow control.
- Power system automation

Future Development

- More feeders can be utilized for smart power distribution.
- And many other parameters other than voltage and current can detected.
- Self-Healing capability can be improved.
- Efficiency of the smart grid technology therefore can be improved.

CONCLUSIONS

Thus we have developed IOT based distribution feeder system for automated distribution of power according the power required by the load and also the fault isolating in the circuit. The ring bus system improves the quality and reliability of power supply and also reduces the power losses. The fault detection, isolation and restoration process is very fast in the grid distribution system. The management

system is the subsystem in grid that provides advanced management and control services. Most of the existing works aim to improve energy efficiency, demand profile, utility, cost and emission, more and more new management services and applications are expected to emerge and eventually revolutionize customer's daily lives. The protection system is the subsystem provides advanced grid reliability analysis, failure protection, and security and privacy protection services. Overall, the approach is found to be accurate, simple to implement and results in quick reaction to sudden changes of load especially when there is power fluctuations. Thus by making the grids smarter the power loss can be minimized, the components can be prevented from damage and all other components can receive power except the component causing overload.

REFERENCES

1. A .Kwasinski and P. Krein, "A microgrid-based telecom power system using modular multiple-input DC-DC converters," in IEEE International Telecommunications Conference, vol. 2, September 2005.

2. D. Salomonsson, L. Soder, and A. Sannino, —Protection of low-voltage DC microgrids,IEEE Trans. Power Del., vol. 24, no. 3, Jul. 2009.

3. M. Saeedifard, M. Graovac, R. Dias, and R. Iravani, —DC power systems: Challenges and opportunities,‖ in Proc. IEEEPower and Energy Society Gen. Meeting, July 2010.

4. N. Flourentzou, V. Agelidis, and G. Demetriades, "VSC-based HVDC power transmission systems: An overview," IEEE Transactions on Power Electronics, vol. 24, no. 3, pp. 592-602, March 2009.

5. R. Cuzner and G. Venkataramanan, —The status of DC micro-grid protection,‖ in Proc.IEEE Ind. App. Soc. Annu. Meeting, October 2008.

6. R. H. Lasseter, "MicroGrids," Power Engineering Society Winter Meeting, 2002. IEEE, vol.1, no., pp. 305-308 vol.1, 2002.

7. Z. Huang, B. Ooi, L. Dessaint, and F. Galiana, "Exploiting voltage support of voltage-source HVDC," IEE Proc. Generation, Transmission and Distribution, vol. 150, no. 2, pp. 252-256, March 2003.

8. Z. Jogi Jose, P. Christy Varghese and A. Koilraj —Substation Automation System for Energy Monitoring and Control Using SCADA, vol. 03,no 4,pp. 108-112,April 2017.