Energy Efficient Industrial Automation System: A Survey

[1]Prachita Wange, [2] S.M. Rajbhoj

[1]Student, [2]Professor

[1]Electonics and Telecommunication,

[1]Bharati Vidyapeeth's College of Engineering for Women, Pune, India

Abstract: Automation is a technology which provides better service to the customers by eliminating the labour work. The advancement in automation techniques increases the industrial productivity by remotely controlling the industrial device and monitoring employee works with the help of different methodologies.

The main aim of such energy efficient system is to diminish the power usage and alert the labours regarding any hazardous situation. The use of a solar panel makes the system as energy efficient. This paper presents a survey on various automation technologies for monitoring and controlling an industrial process.

Index Terms – **Automation, Energy efficiency, Threshold Value, Video Streaming, Gas Leakage Detection, Temperature sensor**

I. INTRODUCTION

Big industries adopted different automation techniques depending upon the requirement and the company type to make their processes more efficient. It is the key to innovation and has been conceptually understood as a technique to raise the competence and to get better productivity. The main purpose of automation is the combination of a variety of aspects of manufacturing operations to decrease manual effort cost, to improve productivity or efficiency, to get better quality, To reduce human participation consequently, human error, to reduce work piece damage that manual handling caused, to increase the safety level.

Automation is the process which increases the energy efficiency, mobility, and security by providing outstanding consistency & strength, excellent quality, and leading-edge modernization. Rich functionality and wide incorporation capabilities [1] make sure easy design-in and fast time-to-market. The safety of the industries can be increased by alerting the labors about any dangerous condition and maintaining the temperature at the specific level comfortable for the industry.

II. LITERATURE REVIEW

The techniques of automation are used in industries, smart homes to autonomous functioning, monitoring and control of various devices by conserving energy [1].

The automation with the initiation of the microprocessor number of new tools as PLC's, SCADA, and DCS are used to increase exactness, precision, and efficiency [2].

The energy efficient system with the use of a solar panel is explained in [3]. In addition, gas leakage is identified and the system plays an alarm used for alert the workers regarding risky condition. The boiler temperature can also be measured with the help of sensors. This is embedded Linux based system implemented in System and also increases the efficiency of the process by raspberry.

Gas leakage is the main distress with suburban, commercial premises, the system in [4] monitors liquid petroleum gas (LPG) leakage to avoid fire accidents providing security characteristic where security is an essential concern. The system utilizes the AT89C51Microcontroller and a simple alarm system. When the system detect the LPG in the air go beyond the threshold value then it instantly alerts the consumer by activating the alarm.

 Bhosale Kiran et al. [5] proposed a system which will automatically monitor the industrial applications and generate Alerts/Alarms or take some crucial decision from any point of the world inside the internet network. The system can check the sensor data and upload it over the internet and take a crucial decision within industries using the IoT.

The Raspberry Pi based Industrial Automation system by means of IoT is explained in [6]. This method uses the raspberry pi as controller in system, and raspberry pi support only python language. All sensor data are gather from raspberry pi. All the use full information are accessible remotely through the internet of thing platform and Xively is the internet of things platform used in [13].

M. Subhashini et al. [7] gives Sensor Networking and Automation based system on Raspberry Pi 2 developing on python editor & cortex processor. The system mainly contains two parts i.e. the server part for manage and control the system and the second one is hardware interfacing to the sensor of smart homes.

The WirelessHART (Highly Addressable Remote Transducer) procedure by planning the network infrastructure of the wireless embedded Internet for industrial computerization is explained in [8].

Monitoring a different industrial parameter such a temperature, pressure, air moisture using Raspberry Pi with the operation of master and slave mode. IOT is used to control the monitored the parameters using the PIC microcontroller. In IOT getting a data from Raspberry Pi and send it into PIC using INTERNET gateway [9].

The agro-based industry automation system using Wireless Sensor Network is explained in [10]. This system will monitor the parameter such as PH, Temperature, and Humidity with the help of sensors The ARM-based computer named Raspberry-Pi accept these values and evaluate these values with the fixed values and if they go beyond the set points, The ARM controller will drive commands for controlling the devices which will lower the exceeded values to normal.

The increasing importance of industrial automation systems overstrains the user to control and analyze the tasks. One prospect to handle these challenges consists of using smart assistance systems [11] that automatically monitor and optimize processes such as self-diagnosis and self-operation, and shows how these assistance functions can be integrated into unusual industrial environments.

One of the secured and energy proficient wireless industrial automation system to maintained the industrial devices and managing the power utilities is explained in [12]. These are all done through Wi-Fi network with help of server pc. It will reduce the power usage and alert the people using the corresponding sensors about the critical situations in the industry.
Smart Way of Energy Utilization and Measurement in Industry with the help of LabVIEW software is proposed in [14] can also act as the security guard of the Industries.

A smart LED lighting system [15] that adjust the minimum light intensity value to improve both energy efficiency and user fulfillment without human intervention. Solar Panel based LED lighting system design with IESNA (Illumination Engineering Society of North America) standards calculation gives good visual clarity and comfort.

III. SYSTEM DESCRIPTION

Energy is most misused resources on Earth. This fact is caused due to the ongoing technological expansion in various areas such as building automation, oil & power, industry and further areas where energy consumption is extremely high. So there is a need to develop an energy consumption and energy efficient systems.
Industrial automation is an area where energy efficiency can be reached by innovating automation and control systems with the use of the solar panel. The solar panels give an enhanced ratio of energy utilization in relation to production using photovoltaic cells. A photovoltaic cell, generally labeled as solar cell or PV, is the technology used to convert solar energy directly into electrical power [16]. PV modules, and a range of other system components that may include an AC/DC inverter, backup source of energy, battery to store the electricity until it is important needed.
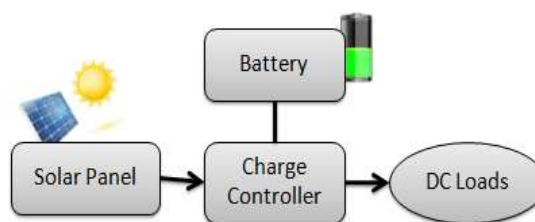

Fig.1. Sunlight into Electricity conversion

PV panels can generate sufficient power to meet all or part of, the electricity demand. Here we propose an automation system for the industry. Gas leakage is the main anxiety with housing, marketable areas. The proposed system gives precautionary actions to keep away from the danger associated with gas leakage and increasing in temperature.
The whole system can be operated with the battery charged with the solar panel which makes this system as an energy efficient system.
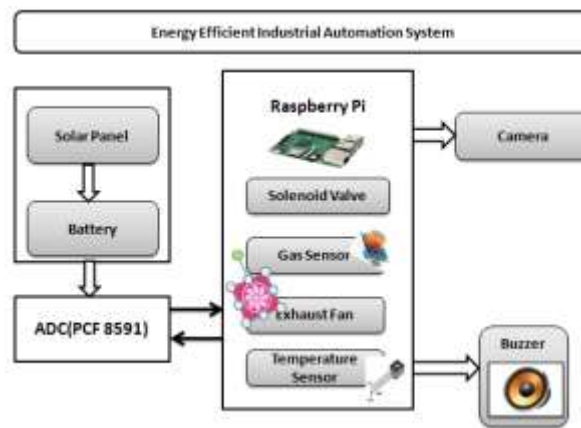
Fig.2. System Architecture

Raspberry Pi is the main component that operates and controls all the sensors like leakage detection sensor, temperature sensor. If gas leakage is found in the premises of the industries with the solenoid valve then automatically buzzer interfaced with the Pi gives the alert to the worker. After getting the alert sound workers to leave the space so that most of the lives can be saved. Again the temperature of the surrounding environment s increases beyond the threshold value then automatically exhaust fan is on to keep the atmosphere in stable condition. The ADC PCF8591 is used to convert the energy obtained from the battery into digital form as raspberry pi can only read the digital values to actuate the solenoid valve or fan. The live video streaming is done with the help of camera interfaced with the raspberry pi.

IV. CONCLUSION

In this paper, a review of different methods of energy efficient industrial automation system is given. Such type of systems will help the industries to control the manufacturing devices, managing the power utilities and also for the supervision of the employee works. Use of solar panel along with raspberry pi makes the system as energy efficient because the raspberry pi consumes less power along with doing the complex process of data collection.
The system automates all the controlling and monitoring work through the camera interfacing. It will help to maintain the temperature at the required level and gives a sound to alert the people about any dangerous condition like gas leakage which can cause loss of human lives.

REFERENCES

[1] M.Anto Bennet, 2 B.Thamilvalluvan, 2 C.A.Hema Priya, 2 B.Bhavani, 2 M. Shalini"android based home automation and energy conservation",international journal on smart sensing and intelligent systems special issue, september 2017.

[2] K. Madhanamohan!, R.K. Praveen*, T.R. Nirmalraja*, H. Goutham*, R. Sabarinathan and A. Logeesan"Industrial Automation System",Advance in Electronic and Electric Engineering. ISSN 2231-1297, Volume 3, Number 6 (2013), pp. 717-726.

[3] Dr. V. Ramya,G. Thirumalai Rajan"Raspberry Pi Based En e r g y Efficient Industrial Automation System",International Journal of Innovative Research in Computer Science and Engineering (IJIRCSE) www.ioirp.com ISSN: 2394 - 6364, Volume – 2 , Issue – 1. January 2016.

[4] D.Patel et.al Gas and Temperature Dectection System using Microcontroller journal of control and Instrumentation.vol.4, Issue 2, 2013.

[5] saleKiran Uttam 1 ,Galande Abhijeet Baspusaheb 2 ,Jadhav Pappu Shivaji 3 , Prof. Pisal.R.S. 4"Industrial Automation using IoT".© 20 1 7 , IRJET .

[6] H . K . Merchant, .D.D .Ahire"Industrial Automation using IoT with Raspberry P"International Journal of Computer Applications (0975 – 8887) Volume 168 – No.1, June 2017.

[7] Subhashini.M, A.Venkateswara Rao "Internet Based Sensor Networking & Home Automation Using Cortex Processor On Linux Platform (Raspberry Pi2)" IEEE International conference on Signal Processing, Communication, Power and Embedded Systems (SCOPES)-2016.

[8] Gowrishankar.S, Madhu.N and T.G.Basavaraju, Role of BLE in Proximity Based Automation of IoT:A Practical Approach,2015 IEEE Recent Advances in Intelligent Computational Systems (RAICS) | 10- 12 December 2015.

[9] Raagavi. G , G. Ramani. ME (Ph. D).,"Raspberry Pi Based Global Industrial Process Monitoring And Controlling Through Iot",International Journal of Science and Engineering Research (IJ0SER), Vol 4 Issue 10 October – 2016.

[10] Mrs. Reena P. Shinde, Mr. Yogesh N.Gatlawar"Automated Environment monitoring and control system For agro-based industries using Wireless Sensor Networks,International Journal of Research in Advent Technology (E-ISSN: 2321-9637) Special Issue National Conference "ACGT 2015", 13-14 February 2015 ".

[11] Stefan Windmann, Oliver Niggemann,"Data-Driven Assistance Functions for Industrial Automation Systems",Journal of Physics: Conference Series 659 (2015) 012045. 12.

[12] J.Geetha Ramani , R.Sangeetha , V.Ajith Kannan , S.Vishali "Internet of Things Based Global Industrial Process Monitoring and Controlling Through Wireless Communication"International Journal of Engineering and Technical Research (IJETR) ISSN: 2321 - 0869 (O) 2454 - 4698 (P) Volume - 8 , Issue - 3 , March 2018.

[13] Mohammad Ibrahim, Abdelghafor Elgamri and Ahmed Mohamed, Internet of Things based Smart Environmental Monitoring using the Raspberry-Pi Computer,ISBN: 978-1-4673-6832-22015 IEEE.Ding, W. and Marchionini, G. 1997 A Study on Video Browsing Strategies. Technical Report. University of Maryland at College Park.

[14] Deepthi C , Kusuma C , Manushree R , Niru V Gowda , Jagadhisha N"Smart Way of Energy Utilization a nd Measurement i n Industry Using Labview",ational conference on Engineering Innovations and Solutions (NCEIS – 2018) International Journal of Scientific Research in Computer Science, Engineering and Information Technology © 201 8 IJSRCSEIT | Volume 4 | Issue 6 | ISSN : 2456 – 3307

[15] P. Sathya and R. Natarajan "Solar PV Powered Energy Efficient LED Lighting System for a Class Room",Journal of Engineering Science and Technology Review 7 (4) (2014) 34 – 39.

[16] Karim, Kesseiba, "Solar Panels as an Efficient Energy Saving Tool in New Housing Districts in Cairo",Sustainable Vital Technologies in Engineering & Informatics 8-10 Nov 2016.