Green Industrial Automation Based on IOT

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Abstract- *Due to advancement in technologies carbon footprint is increasing continuously due to continuous usage. designers are attracted towards energy efficiency in the internet of things(IOT) and this new area is named as green Iot. Lots of techniques have been used. Green automation is important in today's era. Study of different scrubbers is done to absorb carbon. after comparison efficient one is used for further processing.*

Keywords- Cloud Computing, Green Internet Of Things, Smart Phone, Android Application, Wireless Sensor Networks.

I. INTRODUCTION

Due to advancement in technologies carbon footprint is increasing continuously. designers are attracted towards energy efficiency in the internet of things(IOT) and this new area is named as green Iot. Carbon emission and green house gases emission is not desired but due to vehicles and different IT as well as manufacturing industries large amount of toxic gases are emitted. Different industries undergoes different techniques to reduce toxic gases emission. Controlling as well as reduction of gases are done in different manner as shown below. Also various methods are given to reduce consumption of energy and improve efficiency. Scrubbers are used to absorb carbon emission. Active charcoal is maximally used. For Industrial automation part, automation is done using controller, different sensors and devices are controlled using mobile application as given below. Devices, servers used, results are given below.

II. RELATED WORK

In [1] IOT is nowadays adopted to protect industry plants via control and surveillance, which in turn will introduce critical energy consumption issues. From the perspective of energy saving in industry, we adopted an architecture which is composed of sense entities domain, service hosted networks, a cloud server, and user applications. Also we presented a three-layer architecture that includes a sense layer(SN), a gateway layer(GN), and a control layer(CN). regarding the nodes, a sleep scheduling and wake up protocol has been proposed. By calculating the sleep interval of SNs, the GN can change the state of SNs for the purpose of efficient energy utilization. Meanwhile, the CN decides the allocation of SNs to GNs. It evaluates the effectiveness of our architecture in improving resource utilization and energy consumption.

In [2] the major challenges and its different solutions for efficient use of energy and carbon footprints in the IoT network have been discussed. Also a detailed taxonomy of methods to achieve Green IoT has been explained in this paper. The need of research for a generic architecture, recyclable material and policy making to achieve Green IoT has been highlighted. Green IoT can change the course of technological advancements if smart and dedicated work is put in the right direction.

In [3] A wireless sensor networks installation in factories is the key resourse so that information in machine stations is collected continuously and efficiently and instant decisions can be made. a production assembly line introduces the way to incorporate deployment and sleep scheduling time to achieve greenness. Since the number of sensors in GIWSNs is generally large, the theory of symmetries is employed to transform multiple groups into one group and another medium-size group.

In [4] Now a days air pollution is increased due to carbon dioxide generated by vehicles, factory etc. In this paper they have proposed wireless sensor network concept. There is n number of node which contains sensor related to air pollution. Sensor generating analog output and given to the transmitter here we use zigbee module. They transmit the analog value over the medium the receiver side there is receiver which can receive this information. Then information is uploaded over cloud, and this process is continue until air pollution is controlled.

In [5] In this paper various technologies and issues with respect to green IoT are discussed which plays a significant role in achieving a practical smart world. Especially , the overview regarding IoT and green IoT has been performed. with the summary of general green ICT principles. In addition, developments about sensor cloud have been shown along with future sensor cloud is also described .open problems regarding green IOT is explained.

In [6] To enhance safety in buildings and city and to reduce energy consumption IOT/CPS systems should be well designed.the challenging issues are how to federate computing services in different computation models. 1 Service impedance: public and private services 2 Federating public and private services.

In the last few years, the research communities and industrial partners started to study and investigate these two use scenarios Although many works have been conducted on these two applications, many challenges remain open.

In [7] This paper proposed a new quality-optimized sky camera multimedia information gathering scheme for IoTs based smart grid solar power estimation. In the proposed scheme, the transmission power control and relay node selection strategies were jointly optimized based on multimedia packet distortion reduction. Energy neutrality was also considered as an important constraint in the optimization problem. The simulation results showed that the joint control of power and relay selection strategy provided higher multimedia transmission quality in IoTs.

In [8] This article provides deep insights into design and implementation of end-to-end power-saving mechanisms covering both backend and frontend network segments. As energy efficiency is one of the primary hurdles for widespread adoption of IoT, The article then proposes power-saving modes to jointly deal with the M2M coexistence for two typical deployment scenarios. The obtained results show that more than 95 percent of energy can be saved by employing TDMA-based scheduling, whereas up to 5 years of battery life can be achieved in the large-scale LTE-based IoT scenario by employing the proposed DRX mechanism.

III. SYSTEM DEVELOPMENT

Figure 1 shows the basic IOT system developed. It shows live values of temperature , Co2 level present in the environment, fan and light ON-OFF monitoring and controlling as per given conditions. Components used are Node MCU, Air quality sensor, Light intensity sensor, temperature and humidity sensor , fan , light. Block diagram and prototype of the system is as shown below.

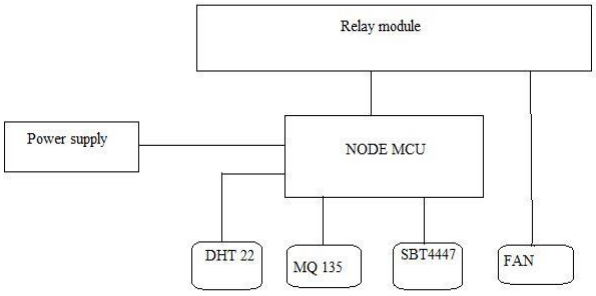

Fig 1: Block diagram of the system.

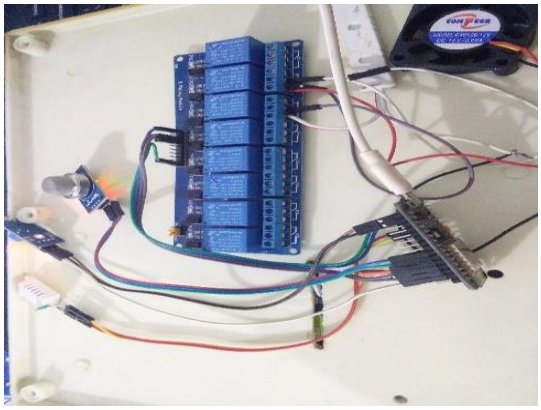

Fig 2: Prototype of the system.

Fan and light are connected to Node MCU through relay module. Temperature sensor DHT22 is used here it can sense temperature as well as humidity of the environment and gives its live values to the monitoring system. MQ135 air quality sensor is used to detect the amount of harmful gases or carbon dioxide in the environment. SBT4447 Light intensity sensor is used to control light depending upon light falling on it from environment. Carbon-di-oxide or carbon emitted by IOT is in very less amount the average annual contribution will be around 6 percent – 8 percent by 2020 which is not desired. Preventive measures are taken to reduce and monitor carbon emission.

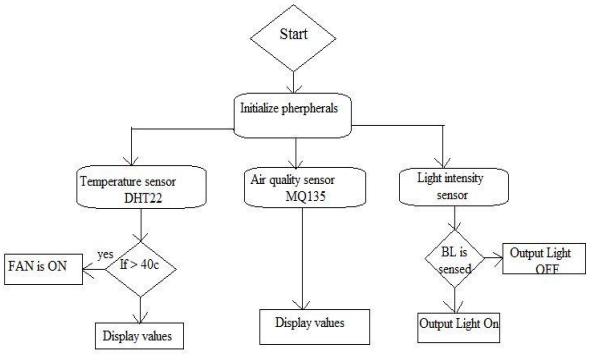

Fig 3: Flow chart of system

Figure 3 shows flow chart of the system given above, firstly initialize the peripherals then sensors will start working after desired supply input. Output of the sensors will be the input for Node MCU which controls output action based on stored programming actions.

IV. METHODOLOGY

Green Internet of Things focuses on the energy efficiency in the IoT principles. Green IoT is defined as the energy efficient way in IoT either to reduce the greenhouse effect caused by existing applications .IoT will help in eliminating or reducing the greenhouse effect. Few ways to eliminate green house effect or carbon emission is shown .

A. Green approaches techniques

There are many green approaches used , this techniques are used according to its application . There are theoretical as well as practical approaches used. This will not reduce toxic gases emission to large extent but will help to reduce in some amount. some of these techniques are mentioned below, they are:

- Green approach in ICT.

Reduces use of hardware devices or dematerialization , to improve manufacturing process, Virtualization , e-commerce.

- Green approach using RFID.

Organic , it has free energy management module , saves upto 60% of power , Energy efficient algorithm.

- Green approach to cloud computing.

Consolidation , Migration.

- Green approach using WSN.

Devices are bio-degradable, mainly focuses on energy efficiency.

B. Green technique using scrubber.

Figure 4 shows green technique using scrubber, CO2 will flow through the first pipe and there gas sensor is placed to know the quantity of co2 if it is over the limit gas will be directed towards an scrubber using actuator(motor) here active charcoal is used as scrubber . active charcoal absorbs the toxic gases like co2 from gas and gives pure gas as output. If quantity of co2 is below limit then no need to pass it through active charcoal it is directly given to output without any purification.

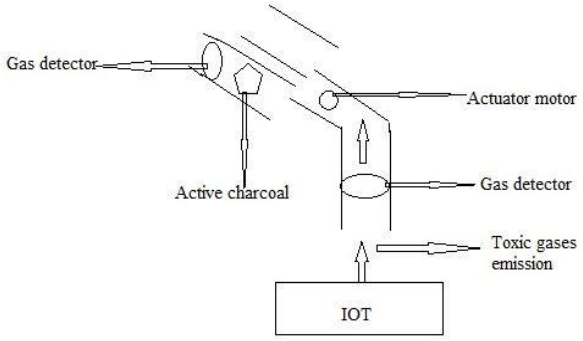

Fig 4: Green technique using charcoal

Figure 5 shows Flow chart for Green technique using scrubber. Correct live value of carbon emission is given by air quality sensor .Node MCU processes and further directs air to be flown in which pipe depending upon logic set. Active charcoal filters are placed in order to reduce carbon from air. If carbon level is below the predetermined level or desired level then air is directly given to the outlet.

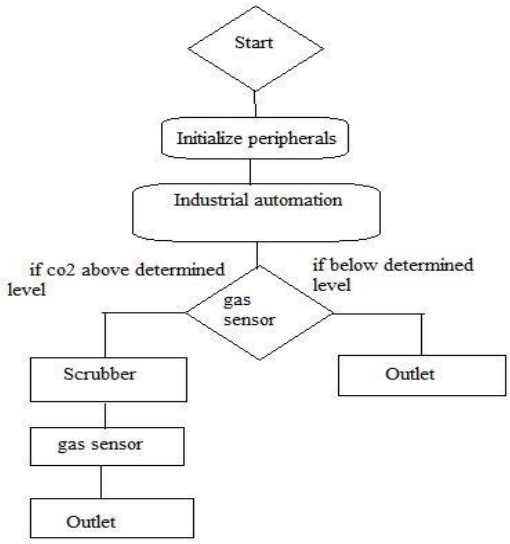

Fig 5: Flow chart for Green technique using scrubber.

V. RESULT

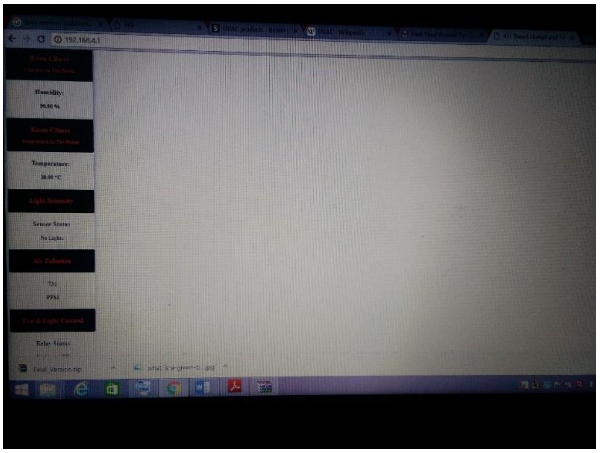

Fig 6: Live monitoring of output.

Here as shown in figure 6 live status of Temperature, humidity, Carbon emission , fan light ON-OFF status is shown. Fan and light are Switched ON or OFF based on sensor status.

Sr. no.	Value before filtration	Value after filtration
1	1200 PPM	1180.4PPM
2	1166.6PPM	1110PPM
3	1319PPM	1156PPM
4	1090PPM	920PPM
5	1268PPM	1093PPM
6	1176PPM	996PPM

Table 1: Carbon emission values.

Table 1 shows values of carbon emission present in the air before as well as after filtration process. Different filters are used and their corresponding values are calculated by comparing the values of different filters best one was selected and used in the system.

VI. CONCLUSION

Paper gives the idea of green industrial automation , in this few techniques are mentioned for reduction in carbon emission level and one practical method is shown by using activated charcoal filter and gas detector sensor as shown above. On the basis of air quality index given to detect the hazardous and normal values of co2 filters (scrubbers) are used accordingly.

VII. ACKNOWLEDGMENT

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REFERENCES

[1] Kun Wang, Yihui Wang, Yanfei Sun, Song Guo, and Jinsong Wu” Green Industrial Internet of Things Architecture: An Energy-Efficient Perspective ” 2016.

[2] Rushan Arshad, Saman Zahoor, Munam Ali Shah , Abdul Wahid1, Hongnian Yu (Senior Member, IEEE) “ Green IoT: An Investigation on Energy Saving Practices for 2020 and Beyond “DOI 10.1109/ACCESS.2017.2686092, IEEE Access.

[3] Chun-Cheng Lin, Der-Jiunn Deng, Zheng-Yu Chen, and Kwang-Cheng Chen “Key Design of Driving Industry 4.0: Joint Energy-Efficient Deployment and Scheduling in Group-Based Industrial Wireless Sensor Networks ” 2016.

[4] R. Nathiya, S.G. Santhi, "Energy Efficient Routing with Mobile Collector in Wireless Sensor Networks (WSNs)", International Journal of Computer Sciences and Engineering, Vol.2, Issue.2, pp.36-43, 2014.

[5] chunsheng zhu1, (student member, ieee),victor c. M. Leung1, (fellow, ieee), lei shu2, (member, ieee), and edith c.-h. Ngai3, (senior member, ieee) “green internet of things for smart world chunsheng ” received october 9, 2015, accepted october 17, 2015, date of publication november 3, 2015, date of current version november 16, 2015.

[6] Chi-Sheng Shih , Jyun-Jhe Chou , Niels Reijers , Tei-Wei Kuo “Designing CPS/IoT applications for smart buildings and cities” ISSN 2398-3396 Received on 21st October 2016 Revised on 4th November 2016 Accepted on 6th November 2016.

[7] Runan Yao, Student Member, IEEE, Wei Wang, Member, IEEE, Mahdi Farrokh-Baroughi, Member, IEEE, Honggang Wang, Senior Member, IEEE, Yi Qian, Senior Member, IEEE” Quality-Driven Energy-Neutralized Power and Relay Selection for Smart Grid Wireless Multimedia Sensor Based IoTs ” IEEE SENSORS JOURNAL, VOL. 13, NO. 10, OCTOBER 2013.

[8] Dung Pham Van, Bhaskar Prasad Rimal, Jiajia Chen, Paolo Monti, Lena Wosinska, and Martin Maier “Power-

Saving Methods for Internet of Things over Converged Fiber-Wireless Access Networks ”2016.

[9] Prof. C.R. Dongarsane,Mr. Patil Pranav Balasaheb ,Mr.Patil Nilesh Rangrao ,Mr. Patil Pranit Ramesh “ Green House Automation Using IoT ” Volume: 04 Issue: 01 | Jan -2017.

[10] Punit Rathore, Student Member, IEEE, Aravinda S. Rao, Member, IEEE, Sutharshan Rajasegarar, Elena Vanz, Jayavardhana Gubbi, Senior Member, IEEE, and Marimuthu Palaniswami, Fellow, IEEE “ Real-time Urban Microclimate Analysis Using Internet of Things” , IEEE Internet of Things Journal.

[11] Siva Chidambaram ,Sangeetha Annadurai, Chitra Vivekanandan Assistant Professor, Student Sri Muthukumaran Institute Of Technology, Chennai, Tamilnadu, India. “ A VIEW OF SMART WORLD BY USING GREEN IOT” International Journal of Technology in Computer Science & Engineering ISSN 2349-1582 Volume 4, No 1, March 2017.

[12] ted h. Szymanski “securing the industrial-tactile internet of things with deterministic silicon photonics switches” received september 1, 2016, accepted september 20, 2016, date of publication september 26, 2016, date of current version december 8, 2016.

[13] yan chen, member, ieee, feng han, member, ieee, yu-han yang, student member, ieee, hang ma, yi han, chunxiao jiang, member, ieee, hung-quoc lai, member, ieee, david claffey, zoltan safar, and k. J. Ray liu, fellow, ieee “time-reversal wireless paradigm for green internet of things: an overview ” ieee internet of things journal, vol. 1, no. 1, february 2014.

[14] marc barcelo, alejandro correa, jaime llorca, antonia m. Tulino, fellow, ieee, jose lopez vicario, and antoni morell “iot-cloud service optimization in next generation smart environments ” ieee journal on selected areas in communications, vol. 34, no. 12, december 2016.

[15] jun huang, member, ieee, yu meng, xuehong gong, yanbing liu, and qiang duan, member, ieee” a novel deployment scheme for green internet of things ” ieee internet of things journal, vol. 1, no. 2, april 2014.