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REVIEW ON IOT BASED INDUSTRIAL PARAMETERS MONITORING AND CONTROLING SYSTEM

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Abstract: Real-Time monitoring is the effective way to observe factual data. Internet of things based online monitoring is useful to access data remotely. IoT is the network of physical objects embedded with electronics, software and sensors that enable to collect and exchange data. IoT enables the flexibility and liberty to access the machine placed in a remote area access to keep a continuous track of the machine behavior in real time. Application of this technology in electrical engineering is beneficial to observe different parameters which are not easy to access. Electrical equipment performance can be monitored on a real time basis to improve the operating span. This is carried out using online monitoring system. IoT is used to observe different parameters on real time scale. This helps to measure and sense various parameters like energy, voltage, current, temperature, power factor and frequency of any given electrical equipment. This paper reviews suitability of IoT based online monitoring system for electrical equipment.

Index Terms **- Online monitoring, IOT**

I. INTRODUCTION

Electrical power systems are widely divided into manufacturing, transmission, distribution and utilization. In every field of power system, there is a use of electrical machine, so proper monitoring of electrical machine must be done. Electrical Machines have transformed the industrial growth from their inception. Every part of a power system from generation of power to its final utilization at the consumer end requires extensive use of various electrical machines, especially Induction Motors which form the backbone of all industrial processes. As a result, proper monitoring and its maintenance has been a topic of great interest for industries around the world. It is imperative that importance that must be given to the proper monitoring of the operation of those machines are not just from technical perspective, but also from commercial perspective, as it will reduce the losses. Furthermore, proper monitoring of machines helps to determine the performance of the and thus, proper maintenance can be done as and when required. This demands for a system capable of making those necessary observations for monitoring machine parameters and making the data accessible remotely.

Because of the increasing advances in technology, smart systems are increasingly being used. These systems allow technicians, administrators, and managers to monitor and control the performance of devices from a safe distance. The monitoring system is very important when working in the field of three phase systems; some users and companies use smart monitoring software programs. These programs are installed on the user's smartphone or company computers to allow employers to make decisions if there is an error.

The proper monitoring of the electrical machine helps us to determine the performance of the machine and thus proper maintenance can be determined. So, there is a necessity of measuring the electrical parameters of electrical machine. The paper composes a system that is capable to perform various tasks at a time. The proposed system is a bridge between the sensing of electrical parameters and IOT cloud computing. The hardware prototype includes sensing of electrical parameters like current, voltage, temperature, power factor and frequency. Measurement of current is done using non-invasive current sensor and voltage through using a step-down transformer. Only phase voltages are sensed and then using a level shifter, a dc shift is given to output of sensing circuit which will be fed to the MSP430 controller. By using algorithm, the frequency and power factor are calculated and obtained data is transferred to node MCU by serial communication through MSP430. This data is stored in cloud and it helps to fetch data from cloud to any device.

The Term Industry 4.0 stands for fourth Industrial Revolution which is nothing but Smart Industry that adapts cyber-physical changes and improves the Productivity.

- The Main reason why Industries can see considerable growth is because Data Driven Approach towards business systematic analysis of data proves beneficial in many ways such as predictive maintenance, achieving goals as per the targets etc.
- We chose this topic as we can clearly see the industry adapting and evolving successfully to industry 4.0 and there is a lot of scope of expansion that we can contribute as emerging engineers.
- We are focused on Energy efficiency part and production monitoring part which naturally reflects in the top line and bottom line of balance sheet i.e., turnover and profits of the industry
- Our Focus is to minimize the Power Consumption and Machinery Damage and Monitor the Production rate which directly contributes to Profit of the Company.

The aim of this work was to design and implement a low cost and safe three phase measuring system and to design a smartphone application to monitor the data received from the three-phase measuring system. The Project has been designed to measure three phase voltages and currents for all three phase systems that have a line to ground voltage of less than 250 VAC with a current value of less than 30 A. The rest of the is organized as follows: Literature review, project definition, objectives, proposed methodology, working of the project, software and hardware used, implementation, conclusion, reference.

II. NEED FOR INDUTRIAL MONITORING AND CONTROLLING

In present industrial processes are manually monitored. It leads to the accidents due to excessive temperature, current and voltage. Thus, there is need of industrial monitoring and controlling system.

So, proper controlling and monitoring system have following steps.

1. Sensors controlling monitors voltage, current etc.
2. Compare this value with threshold value.
3. Avoids manual interface.

This system also gives an alert signal using SMS and emails.

III. BLOCK DIAGRAM

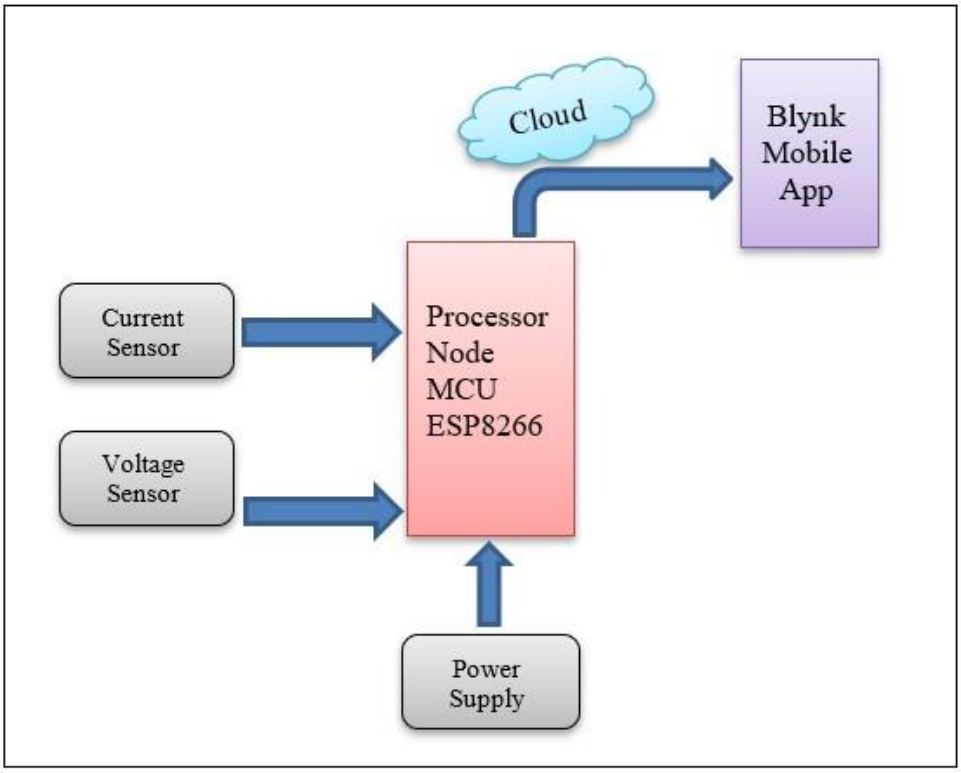

Figure 1: Block Diagram

The IOT based industrial monitoring and controlling system is divided into three units

1. Sensing and monitoring unit
2. Controlling unit
3. Alert unit

The sensing and monitoring unit consist of sensor module which includes current, Voltage sensors. These sensors are interfaced with microcontroller. The current and voltage sensor continually measures the industrial parameter at regular intervals. These measured values are sent to the microcontroller. The microcontroller is programed such that it checks measured value of sensor with threshold values. Whenever the measured value exceeds the threshold limit an alert system is activated and the controlling action is performed.

The controlling unit comes into action when the measured sensor value is greater than the threshold values. Here, the threshold value is set according to industrial safety measures. In this system, current is monitored as well as controlled. An alert unit gives an alert msg. in the form of SMS and e-mail to the user when the measured value exceeds the threshold limits.

IV. ALGORITHM

Algorithm: - Industrial monitoring and controlling operation.

Inputs: - Measured sensor values

O/P: - Alert msg. to the workers.

V. LITURATURE SURVEY

1. Shashank Kumar, the term of Industry 4.0 (German Industry 4.0), commonly recognized nowadays, occurred in the public domain in 2011 at the Hanover Trade Fair as the name for the common initiative of the representatives of business, policy and science promoting the idea of strengthening the competitiveness of the German industry (Müller et al., 2018; Rao and Prasad,
   2018). The German federal government liked the idea so much that they decided to make Industry 4.0 an integral part of the government initiative "High-Tech Strategy for Germany 2020", whose objective is to promote Germany as a global leader of technological innovation (Pereira and Romero, 2017; Zhou et al., 2015; Jabber et al., 2018; Androdiecious, 2017a).

2. Beata Ślusarczyk., Paper selected for this section has discussed the production process and some advanced design of shop floor in the manufacturing industry by using cyber-physical system (CPS) and smart object. Majority of papers discussed about the internet of things (IoT) and their implication part. S. Wang et al., (2015) in his paper explained smart object-based shop floor. Shop floor with the smart agent and the advanced tool that converted the simple system into the self-organizing system has discussed. IoT and CPS are used to make all the machines and tools smart. CPS and IoT enabled various agents are then classified into different agents for the easiness of collecting the big data feedback and facilitate coordination among them. For better coordination, an intelligent negotiation mechanism has presented by Wang et al. To get the significant visualization of co-ordination of smart objects, virtual engineering object (VEO) technology has introduced by S. Shafiq et al., (2015).

3. Bozena Gajdzik 1, Sandra Grabowska 2, and Sebastian Saniuk 3, The first step of literature review was used the bibliometric analysis [36]. The following keywords were selected in the bibliographic analysis: "Pathway to Industry 4.0", "Implementation of Industry 4.0", "Application of Industry 4.0", "Roadmap (to) for Industry 4.0" and "For Industry 4.0". framework".The choice of keywords was consistent with the adoption research objective, which was to find the answer to the question: Industry 4.0, how to implement step-by-step? The period of analysis was 2011–2020. From 2011 on, the popularization of industry 4.0 begins and continues for years to come. Analyzing the results of a scientific database review of adopted keywords, it was found that most of the publications were in the database for keywords: "Implementation of Industry 4.0

4. Priyanka Verma, Priyanka Verma, Jyoti Kushwaha, Cyber-Physical Systems: The Cyber-Physical System (CPS) concept is defined as a technique where artificial and biological systems for processing, information exchange and feedback processing are integrated into physical and cyberspace (Bagheri et al. al. 2015). Network systems control and monitor physical processes with the help of embedded (cyber) subsystems through network systems. Various devices such as sensing, computing and communication (often wireless) capabilities are used to create a physical system. These physical devices can be identified with the help of physical characteristics or data sensing systems, for example, radio frequency identification (RFID) or (infrared sensors), and can then be connected with networking systems, mostly the Internet.

5. Eren KAMBER, Gulin Idil SONMEZTURK BOLATAN, announcing its name at the Hannover Fair in Germany for the first time in 2011, Industry 4.0 has been a considered subject. Kagermann (2013) defines Industry 4.0 as a new trend for automation and data transfer in manufacturing technologies. Cyber physical systems (CPS), internet of things (IoT), cloud systems and smart factories are the main components that make up the concept of Industry 4.0. To summarize the industry 4.0 system briefly; by using cyber physical systems in smart factories, digital copies of real objects are created in the virtual world. Also, they are coordinated.

6. Haradhan Kumar Mahajan, Jaime Ventura and Hans-Joachim Voth had shown that Britain's borrowing boom during IR was beneficial to agricultural reform, the growth of the textile and iron industries, which triggered a structural change of trade and large-scale social change. Vijaya Singh has enlightened on technological advances through machines during the IR [69]. Robert C. He said wages were remarkably high and energy was cheaper in Britain than in other continents. Living standards of Britain rose generally due to economic developments.

VI. LITRATURE REVIEW

The survey includes a number of monitoring devices for electrical machines that already exist. It was noticed that the meter based on IoT is being implemented. A noninvasive current sensor was used because it had the advantage of small size and ability to be used wherever the power is being consumed. It was understood that there are some algorithms that can be implemented to calculate the power factor and frequency in a microcontroller. From this it was realized that MSP430 is low power consuming microcontroller of Texas instruments which can be used for long time running. Also, the mentioned algorithm could be applied on this controller as its sampling rate is high. Here, use GSM module is made for electric machine monitoring but it was realized that the it has some disadvantage which can be overcome by IoT system. From it was realized that ESP8266 is a low cost IoT Wi-Fi module which has a full TCP/IP stack and also possess an onboard microcontroller. We are using Node MCU module which has a Wi-Fi module as well as a microcontroller which help in programming such device easily. For data capture we can use Thing speak, IBM, azure amazon web services etc.

The major challenge in the project lies in proper integration of multiple subsystems and their successful simultaneous operation. All the subsystems like sensors, microcontroller, communication with Wi-Fi module and upload to the cloud, should work in synchronization and should provide the expected result, with a fair and tolerable accuracy. Developing a familiarity with programming of MSP430 microcontrollers is of paramount importance for successful implementation of necessary algorithms and communication.

VII. CONCLUSION

Title of Paper	Publisher	Year of Publishing	Methodology	Conclusion
IOT Based Machine monitoring System	Prof. Puneshkumar Tembhare, Atharva Punde, Arpit Rewatkar, Anshul Raut	2021	1. Sensor Data 2. Node MCU 3. Blynk Cloud 4. Blynk App	The concept of "Industrial parameter Surveillance and fault detection" was chosen with the goal of learning about the many industry variables, tracking their changes, and determining the threshold for the same using Node MCU and sensors.
Smart Factory of Industry 4.0: Key Technologies, Application Case, and Challenges	Baotong Chen; Jiafu Wan; Lei Shu; Peng Li; Mithun Mukherjee; Boxing Yin	2017	1. Device Domain 2. Network Domain 3. Data Domain Application Domain	Industry4.0, as a representative of the future of the Fourth Industrial Revolution, evolved from embedded system to the Cyber Physical System (CPS). Manufacturing will be via the Internet, to achieve Internal and external network integration, toward the

				intelligent direction. Layer, and the data application layer in the smart factory are analysed, and some application cases were discussed to explore potential solutions for key technologies.
INDUSTRY 4.0: TOWARDS FUTURE INDUSTRIAL OPPORTUNITIES AND CHALLENGES	Keliang Zhou; Taigang Liu; Lifeng Zhou	2015	1. Physical Layer 2. Network Layer 3. Data Layer 4. Cloud Layer 5. Application Layer 6. Enterprise Layer	Industry 4.0 (the fourth industrial revolution) encapsulates future industry development trends to achieve more intelligent manufacturing processes, including reliance on Cyber-Physical Systems (CPS), construction of Cyber-Physical Production Systems (CPPS), and implementation and operation of smart factories.
Industry 4.0 Development and Application of Intelligent Manufacturing	Guo-Jian Cheng; Li-Ting Liu; Xin-Jian Qiang	2016		Industry4.0, as a representative of the future of the Fourth Industrial Revolution, evolved from embedded system to the Cyber Physical System (CPS). Manufacturing will be via the Internet, to achieve Internal and external network integration, toward the intelligent direction.

Table 1: Comparison of Review Paper

VIII. REFERENCES

1. Thakare, A. Shriyan, V. Thale, P. Yasarp and K. Unni, "Implementation of an energy monitoring and control device based on IoT," 2016 IEEE Annual India Conference (INDICON), Bangalore, 2016.

2. S. Karakana and N. R. Namburi, "Design and prototype development of a digital instrument for measuring single phase power

3. quality parameters," 2014 6th IEEE Power India International Conference (PIICON), Delhi, 2014.

4. X. Yyuhua and W. Ru, "Remote CO Measurement Based on MSP430 Processor Used with GSM module," 2010 International Conference on Electrical and Control Engineering, Wuhan, 2010, pp. 5439-5442.

5. P. Sharmila, S. Shobhana, M. Abirami, and U. Eswaran, "Realizing Internet of Things Using Arduino, ESP8266 & Iis Server and Mysql Db for Real-Time Monitoring & Controlling Multiple Fire Alarm Systems Over a Wireless Tcp/Ip Network," Journal on Software Engineering, vol. 11, 2016.

6. Alessandro Ferrero, Massimo Lazzaroni, and Simona Salicone “A Calibration Procedure for a Digital Instrument for Electric Power Quality Measurement” IEEE Transactions on Instrumentation and Measurement, Vol. 51, No. 4, August 2002.

7. A. Kulkarni and M. Amlekar, "Intelligent Power Monitoring Switch using MSP430," 2015 International Conference on Pervasive Computing (ICPC), Pune, 2015, pp. 1-4.

8. A. I. Abdul-Rahman and C. A. Graves, "Internet of Things Application Using Tethered MSP430 to Thing speak Cloud," 2016 IEEE Symposium on Service-Oriented System Engineering (SOSE), Oxford, 2016, pp. 352- 357