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Energy Monitoring Using Industrial Iot

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Abstract - This project relates the digitization of load energy usage readings over the internet. The proposed system design eliminates the involvement of human in electricity maintenance by giving information of consumption throughout the industry. The user can monitor energy consumption in kilo watts from a web page by providing a channel id for the load. The webpage is mindsphere (an open iot) which analyse the energy usage to give more detailed description and visualization of the energy usage statistics. in the proposed system, the industry can do power management by knowing energy usage and various parameters time to time. this proposed system utilizes an sentron pacmeter.The unit which is generated can be displayed on the webpage through mindsphere.

Keywords:- *Internet of Things (IoT), Sentron pacmeter , Energymonitoring system, Mindsphere.*

I.INTRODUCTION

The Internet of Things (IOT) concept allows us to connect normal everyday devices to each other via the Internet. Devices connected through the Internet of Things concept can perform remote analysis. The concept of the Internet of Things provides the basic infrastructure and opportunities to establish connections between the physical world and computer-based systems. The Internet of Things is widely used in the automotive industry, logistics, healthcare, smart grids, and smart cities. Mindconnect nano is used in the system to provide a connection to the Internet in the system. The cost of doing business will not be cheap, especially for energy-intensive industrial enterprises. In order to remain competitive in the environment or with every additional operating cost, factories are looking for new ways to do more with less. Therefore, there is an urgent need to save electricity as much as possible. As the new generation of people's demand for electricity continues to increase, so technology needs to be improved. The proposed system provides a technical improvement for ordinary electricity meters using IOT technology. In addition, we must also solve other problems, such as monitoring the machine by monitoring the status and operation of all machines at any time, so that faults can be found faster. Different types of sensors, such as temperature and vibration sensors, can monitor the status and operating conditions of machine components. Monitoring, optimizing power usage and reducing power waste are the main goals for achieving a better system.

II.RELATED WORKS

Many studies have proposed the design of smart meters, which are based on the GSM network and use database management to provide customers with energy usage information. A system combining ZigBees and GSM is proposed. In this system, the meter node uses ZigBees to communicate with the central node and send data to the central computer via GSM.

In this work, we have developed a high-cost energy monitoring system for the Industrial Internet of Things, which uses HTTP and MQTT (Message Queuing Telemetry Transmission) protocols, while supporting various device protocols, such as S7, modbus, CoAP, Xmpp, LWM2M and others. The developed system can provide detailed measurements of energy usage and energy consumption patterns. Therefore, users can understand their electricity consumption patterns and then adjust their behavior according to our needs to reduce their energy distribution.

III.SYSTEM OVERVIEW

The system consists of energy monitoring nodes that use the sent on pac3200, high cost powerful compact power monitoring device which is suitable for use in large scale industries, government and commercial application where precise measurement of voltage, current, active power, accumulative power consumption and of others advance parameters can be measured. The measured data will then be sent to iot device. Thus, users can access to get information of their energy consumption and other parameters along with graphical view via web application locally or via Internet.

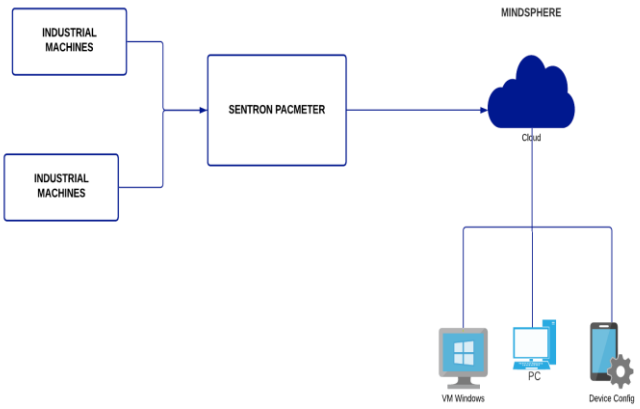

Fig1- system overview

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IV.ENERGY MONITORING NODES

To monitor energy usage, we use sentron pac3200; manufactured by Siemens. Its operation is based on the transformer principle. Pacmeter3200 uses Modbus Rtu/Tcp, Profinet and Profibus-dp protocol to provide open communication, which can be easily integrated into any local or remote monitoring system. The simple configuration of the meter can be operated through the front panel display, or it can be completed using a PC with the sentron power config setting software that comes with the meter. sentron pac3200 provides Rms voltage, Rms current, and calculates active power and total energy consumption over time or cumulative power consumption. It can perform single-phase, two-phase or three-phase measurement, and can be used in two-wire, three-wire, four-wire, TN, TT and IT systems. For device versions with ultra-low voltage power supplies, direct connection to systems up to 500 V is allowed. A voltage transformer can be used to measure higher voltages. To measure current, you can use x / 1 A or x / 5 A current transformers. There is an RJ45 socket on the top of Sentron Pac3200. The device can be connected to the Ethernet through an RJ45 connector (type T-568B).

Fig 2- sentron pacmeter 3200

V.ENERGY CALCULATION

Energy consumed per day can be determined by given formula below. the energy E in kilowatt-hours(kWh) per day is equal to power in watts(W) times the number of usage hours per day t divided by 1000 watts per kilowatt:
E(kWh/day) = P(W) × t(h/day) / 1000(W/kW)

This energy can be calculated in a cost by multiplying with a certain amount which differs from country to country for eg. In india the cost of per unit of energy consumption is 10rupees ie. 0.14$.

I. Local server

The sentron pacmeter 3200 report all the vital variables and sends the information to the mindconnect nano.MindConnect Nano is a device for transferring data and allows connectivity to MindSphere. Different protocols are supported in order to collect data. The device supports transmission of data through a secure Internet connection to MindSphere to enable cloud-based applications and services.The device is connected through a secure internet to MindSphere to enable cloud- based applications and servers.

VI.COMMUNICATION PROTOCOL

The sentron pacmeter3200 is accoutred with an Ethernet interface as a standard. Therefore, there is no need of additional hardware, this saves space and costs. The device can thus be configured and measured data transmitted via LAN networks. The Modbus TCP is available for selection. An Ethernet interface put up in a device of this performance class is a very peculiar and groundbreaking feature. The free SENTRON powerconfig software is enclosed with the device for configuration. A direct connection is established between the configuration PC and the measuring device. With the help of the software, the various parameters can be sent to power monitoring devices. This is particularly advantageous if many devices are connected and various parameteres are connected simultaneously

VII.SOFTWARE

All data recorded by sentron pacmeter 3200 are further sent to mindsphere, which is an IoT software developed by Siemens that connects your products, factories, systems and machines, enabling you to take advantage of the massive data generated by the Internet of Things (IoT). analysis. We can set custom dashboards, alarms and notifications based on data set. The web front end of mindsphere is very responsive and accurate. We can create aspects, variables, types and new assets in MindSphere according to the machines used for different purposes in the industry.

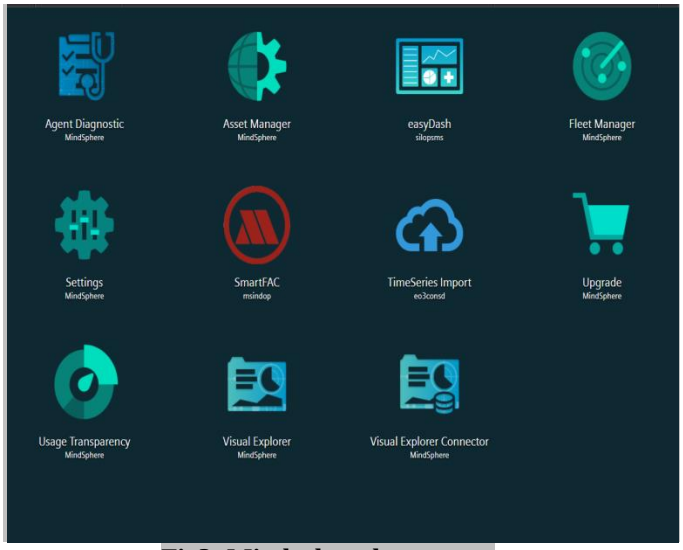

Fig3- Mindsphere home page

In this section, we illustrate the working operation of the developed IoT meter. Above fig indicates the home page of the iot system mindsphere. All the information from the sentron pacmeter is sent to mindsphere. As It is implemented in an industry. Figure(3) describes the user interface dashboard; Mindsphere has many options according to our requirements. We can create asset according to the departments in the industry, add aspects and comapare them accordingly.

The graph shows the measured energy data as a function of time;captures energy from the energy sensor node and sends it to server. Each sensor has a unique ID and sends data every second throughout the day, so multiple sensor nodes can be deployed and data can be shown on the sensor at the same time. We can also see the energy consumption data over a period of time, as shown in the lower figure of Figure (4)

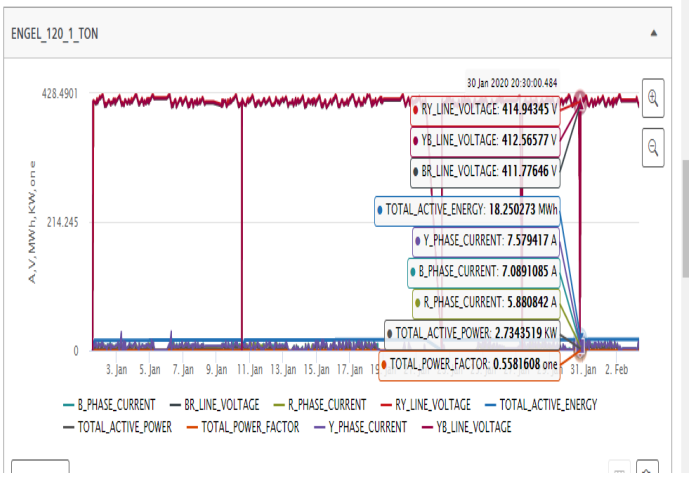

Fig4-different parameters sent from pacmeter to mindsphere

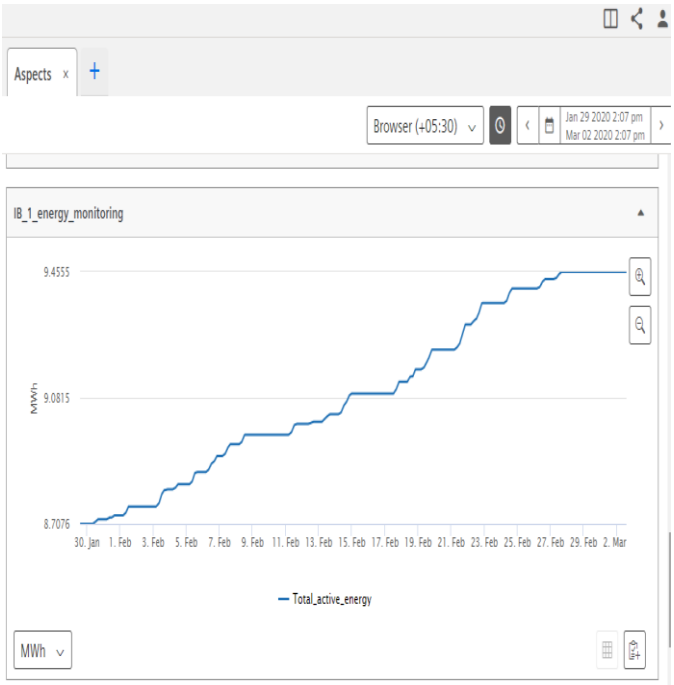

Fig5- energy monitoring of ENGEL 120 ton injection moulding machines

It can be seen that in Fig.(5), The energy curve of the ENGEL 120 TON injection molding machine has been successfully recorded in Database systems. According to the graph, from January 29 to March 2, 2020, it consumed approximately 0.7479 Mwh (i.e, 9.4555Mwh-87076Mwh) of electrical energy. Therefore, this energy tracking can be used as a very useful tool to understand energy consumption behavior of electrical appliances or motors. As mentioned earlier, we can adjust the date and time, and can get the data of any parameter.

VIII.CONCLUSION

Energy monitoring using the Internet of Things is aningenious application of the IOTs, and its development purpose is to remotely control industrial machines from all over the world through the cloud. In the proposed project, pacmeter is used to sense the current and display it on the Internet using the Internet of Things. The system uses Mindsphere to update information on the Internet every 1-2 seconds Experimental results show that the developed energy monitoring system can successfully monitor voltage, current, active power and cumulative power consumption.

In more advance work, we can use this technology to detect faults in our machines and avoid further damages using vibration sensor connectec via iot, which will increase the usable life of the machinery.

REFERENCES

[1]. Siemens, Sentron, Power monitoring device SENTRON PAC3200, Manual, Industrial support Siemens
[2]. Darshan Iyer N, Dr. KA Radhakrishnan Rao, "IoT Based Energy Meter Reading, Theft Detection & disconnection using PLC modem and Power optimization ",IRJET, (2015)
[3]. Siemens, Mindsphere.io/en
[4]. G. R. Tan, C. H. Lee, and V. H. Mok, "Automatic power meter reading system using GSM network," in 2007 International Power Engineering Conference (IPEC 2007).
[5]. E. Taktak and I. B. Rodriguez, "Energy Consumption Adaptation Approach for Smart Buildings," in 2017 IEEE conference.
[6]. Simatic Energy Monitoring software, Products and services/siemens.com