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Analysis of Energy Management by Using IOT

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ABSTRACT: Inpresent scenario the energy is used at a wide range by all our appliances as well as in our industries the energy consumption is getting higher day by day. Therefore, the energy management done by "EMS" Energy management system to reduce energy consumption by using of smart technology and metering, control system in industries. By using of industry automation and PLC, MATLAB, SCADA controlling system we can interface the energy efficient system. The various opportunities are to control interconnected devices by a pre designed scenario human machine interfacing system is a big achievement in IOT. To support the digital transformation of enterprises and help in energy management the transparency is increases by using latest devices due to the need of systematic improvement and increasing the efficiency we used an industrial automation device and hence they consume less amount of energy. The operational cost is higher in any manufacturing and developing industry and it is also responsible for energy consumption, industrial sector is more uses of energy other than any sector it consumes 54% of the global delivered electricity and in addition, non-energy-intensive manufacturing such as pharmaceuticals and energy-intensive-manufacturing are posed make up 70% of the estimated 228 trillion gross output by 2040. So basically, regardless of energy cost fluctuations and an oil prices, the industrial sector is and will continue to be one of the largest contributors of electricity use.

KEYWORDS: Smart meters, Smart grids, Smart homes, Internet of Things, Energy Optimization

I. INTRODUCTION

Today's energy enterprises have a need to optimize their energy demands and drive a businessdevelopment without compromising of their eco system sustainability down and increasing energy prices with emissions targets. The operational cost and all those need to several compressions by using energy conversion are to be managed by IoT. However, we faced a various challenge in energy management in the form of scale and diversity of industrial energy, flexibility of system, as well as real time data generate from data actuation system.

Present digital technology can not only help in overcome to challenges comes from energy management and also developing the new idea generates the power of analytics and technology it makes a sustainable system and it can be identifying the problems and challenges.

The key of energy consumes and energy wastage gives you predictability of demand so we can achieve real saving. Only "IOT" makes a possible to build completely autonomous energy plants and industries automation by using of smart sensors we can monitor the system performance in a real time as a using of Iot based machine learning interface in a result of higher accuracy and efficient system it can minimized the equipment's and man power. In electric power generation also, it makes easier it reduces the waste and make plants efficient in coal power plant its increased efficiency up to 16%, while reducing a greenhouse emission of 3% this is achieved by optimizing fuel combustion and adjusting the process of fuel burning i.e., automatically regulating the oxygen flow in the boiler. That are helpful in increasing the efficiency of overall system.

II. BRIEF HISTORY OF INTERNET OF THINGS

The internet of things IoT's has only recently become an ingrained in our everyday life.it is surroundings of us everywhere where we go just find a smart applications devices and automation work like cars driving on the street, and home automation devices that are control home appliances in smart manner and smart sensors are enabled in offices that are track and monitoring the work properly altogether they create a massive eco system of 26.66 billion interconnected things. The concept of connected the devices in get from 1832 when the first electromagnetic telegraph was designed, that telegraph made a direct communication between two machines by using an electrical signal.

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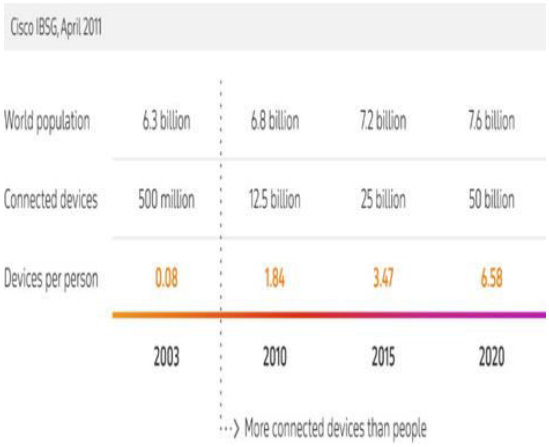
However real IoT history was started when the internet is invented a very essential component in the late 1960, after this developed rapidly over the next decade. The very first one the coca cola vending machine is established at Carnegie Melon University in 1980 and it operated by local programmers what they do they do integrate the micro switch with machine and used an early from the internet to see the cooling devices that enough to cold the drink if there were available coke cans. From this idea or invention fostered further studies in the field of development of interconnected machines of all over the world.

In the year of 1990s the Cambridge university scientist came up with the first web camera prototype for monitor. And the year was 1999 easily one of the most significant for the iot history as Kevin Ashton coined the term "The internet of Things" a visionary technologist he is giving a presentation for proctor and gameable where he describes that the iot is a technology that connected several devices with the help of RFID for supply chain management. While his idea of RFID based device, connectivity differs from today's IP based connection in IOT.

After this the very beginning of 21st century the term internet of things is wide spread by media and the first international conference were held at Switzerland in 2008 where participants from 23 discussed RFID, short range communication sensors networks, other than this the 2000 the LG electronics introduced first refrigerator connected to the internet and a small rabbit shaped robot named Nabaztag created in 2005 that was capable of telling to latest news, weather forecast and stocks market up and down. The table shown the interconnected devices surpassed that the number of people on earth.

Table 1. The table shown the interconnected devices surpassed that the number of people on earth.



The iot boom was supported in the very beginning year of 2011 by the Gartner hype cycle for emerging technology and in the same year a netwrok layer protocol that is central to iot is launched publically.

After this the interconnected devices are widely spread and common place in our daily life globel tech like Apple, samsung, googlr, cisco, and general motors that are facilating the effort of production of sensors and interconnected system. Iot has found its way into the almost every industry like medical, health care and transportation oil & energy retail and many more, as of today iot platform is maintaining the strong hold in their position among the top trends in future. The technology will reach its plateau of productivity in next 5-10years.

III. PEEK INTO THE FUTURE OF IOT

The rapid devlopment in Iot makes a huge change in the world in the field of automobiles industry the iot based sensors and other safety equipments not saves the life but also make easier the things iot markets grow to 5.8 billion end points in the year of 2022.

The some important crucial factors that are spurring this rapid iot expansion:

- Widely expanding the internet connectivity
- Increasing the computer power that are used in operating the system

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- The uses of smart phones and tablet penetration
- The data collection and cloud storage problems
- Falling the cost of sensors

No doubt that Iot growth will fundamentally takes a revolution in the world where we live in imagine how the Toyota introduce the driver less cars and their sensors and all things can communicate with collogues and tell them to if traffic jams hit the minutes of meetings that are comes under the way of work. The interconnected future will certainly bring a lot of value and many opportunities for people.

In future Iot mainly focuses on designing and solutions part for a particular industry and complete their general needs. For examples Iot solutions for patient care their aimed should be lower the cost and improving the quality. According to grand view research the year of 2026 the patient care expected rate is around $1.8 billion.

Various new area is also appearing at the intersections between the interconnected technology and various industry system like agriculture industry, smart cities and smart buildings, internet of medical things, automotive internet of things, industrial internet of things, and smart retails services.

IV. BLOCK CHAIN OF IOT WITH OTHER TECHNOLOGIES AND SECURITY CONSTRAINTS

IOT being powerful on its own, it provides a big opportunity when it meets with other technology such as artificial intelligence, AR/VR, machine learning, big data and cloud computing edge and the other things. Like higher security data has been transferred between two interconnected devices and more value is sure to emerge from blending of these two technologies.

In future IOT is linked with machine learning and artificial intelligence that are predictive and maintenance the interconnected devices and self-optimization of production process, as well connected with the home automation devices become smarter the things. Cloud and edge computing is integral the Iot with cloud edge that are helpful the data transferring and control all commands.

IOT security is main constraints because of many governmental bodies save their data on edge and cloud storage so IOT security regulations and improve the protection mechanism for interconnectivity, data security and privacy problems will never diminish. Cybercriminals are used more and more sophisticated results to find the vulnerabilities in connected devices; as a result, many of consumers and organizations are concerned about the Iot security and see it as the leading barrier to wide range of Iot adoption.

V. IOT IN THE ENERGY MANAGEMENT FIELD

Energy is generated from various ways and from various sources of energy but present scenario the energy sector is highly depends upon the renewable energy sources constituting nearly 80% of final energy globally. The excessive extraction and combustion of fossil fuels are adverse the environment, health and economic impact because of air pollution and climate change.

Energy efficiency means the consuming the less energy and more efficient system that are made system healthier and reliable. in the operation and maintenance (O&M) energy getting assets and in Transmission and Distribution (T&D) the end use of energy Iot can play a important role in minimizing the losses and lowering carbon emissions. This energy management system based on Iot can monitor and control the real time energy consumption and increase the performance level of energy.

The various project run on Iot like smart cities and which is a top roof of any sub system like smart grid, smart building, smart factories and intelligence transportation that are helpful is managed the things easily. The year of 1990 the supervisory control data acquisition system (SCADA) plays an important role in system monitoring and control of equipment and process this makes system less power failure and blackouts.

By applying Iot Sensors various internet connected devices are able to distinguish any failure in operation and abnormal decreases in power efficiency. These increase the efficiency and reliability of system as well as it reduces the operational and maintenance cost.

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VI. MATLAB AND SIMULINK FOR IOT APPLICATIONS

The power simulation and smart automation is done with the very of MATLAB and Simulation this can be help in build and design an model prototype and various IOT applications like monitoring and control, predictive maintenance, supervising control and many more. The various preprocess and access of streaming and archiving the data and algorithms make interface with systems.

And by using of built-in interface to cloud storage, relational and non-relational data base such as REST, MQTT and OPC are introducing the new phase in IOT.

For design purpose custom Iot analytics and data algorithms are quickly response the prebuilt functions for topic such as data cleaning, machine and deep learning, and computer vision control, optimization of existing functions and create new for your own that are more helpful in IOT based system.

VII. RESULT & DISCUSSION

In our study We are focusing on various applications of IOTs. In result and discussion, we are trying to discuss the various fields where energy management is very much required. We are not only working in one simulation or a software. We try to come out the more section in energy management of IOT. First, we are taking about the automatic home light control or industrial purpose. It is very important parts when talking about energy management by IOT.

1. Automatic Home Light Control By PLC:

For PLC we are using the Zeliosoft 2 software for programming it. The results show no error until any type of disturbances or short circuit will not be occurred. If any individual want to switch on or switch off.

The light then it is very much time consuming and it is not done very properly. So some times for controlling many lights by single man it is very complex. And most probably in industrial there is a big opportunity to use this result. In this program here is scope to control the light for both outdoor and indoor lights.

1.1 Program Features:

1.1.1 Outdoor Lighting: The circuit is activated at night by a twilight switch. Here is a motion Sensor which detects any motion and activates the outdoor lighting for 30 sec.

1.1.2 Indoor Lighting: Here is two pushbuttons are located in the stairwell. One in the entrance and other at the top of the stairs. Their function is Identical. It is also be connected with timer (one pulse one shot timer) It is also helping to on the light for 15 sec or how much time to cover the stair depending on that

Table 2. Input Table.

A. INPUT	*B.* Description
C. I1	*D.* Motion Sensor
E. I2	*F.* Twilight Switch
G. I3	*H.* Pushbutton 1
I. I4	*J.* Pushbutton 2

Table 3. Output Table.

K. OUTPUT	*L.* Description
M. Q1	*N.* Outdoor lighting
O. Q2	*P.* Indoor stair lighting
Q. TIMER 1	*R.* Off delay (15 sec)
S. TIMER 2	*T.* One pulse on shot (15 sec)

In case of industrial there are heavy loads so domestic plc can't use for that there is needed backup also. because emergency features should be run on. so there also manual backup is needed. For looking out on this matter here is also added this feature for manual controlling.

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And 24DC supply is needed for running on the PLC module.

1.3 Mainly advantages are that;

- Errorless
- Saving time
- Automatic
- Less human interaction

Table 4. Input Table.

INPUT	Description
I1	Vehicle entry sensor
I2	Vehicle exit sensor
Z1	Manually increment number of the car
Z3	Manually decrement number of the car
Clock1	Clock sensor with real time

2. Automatic Car Parking Control:

Presently in India most of the car parking is used by manually. It is not possible every time to see that the parking is full by a single gate man. So, it is consuming time also and every car get receipt from gate man so long queue will be created. India is a 1.3 billon population country.

After looking on this, we are thinking about automatic car parking control with errorless and also economic.

2.1 Program Features:

2.1.1 Vehicle Entrance/Exit Control: Every car is allowed by an automatic barrier Users. Can take also their car receipt by themselves. Car parking during the working hours and also office areas is too much rushed. So, clock is taken a very important role. It has been categorized Monday to Friday is set from 08:30 to 17:30 & Saturday, Sunday is set from 09:30 to 12:00.

However, any time power will be cut off or any disturbances will be occurred then what will be going on? So, we also are focusing for this kind of issues by manual control to inhibit the closing the gate by pressing Z3 and also it is to be functioned as manually decrement the number of cars and Z1 is also functioned for increment car number when any car wants to entrance and open the gate There is also be used a counter, which has main role to perform this event.

For an example we already are presetting value 10 for the counter. Means car parking capacity is 10. When 10 cars all are in parking then display will be indicated “FULL PARKING”. After that any one of the cars will exit then automatically displayed will be off. It is continuous process.

Table 5. Output Table.

OUTPUT	Description
Q1	Display “FULL PARKING”
Counter up	Count up to 10
Counter down	Count down from 10

Mainly car parking is making in underground. So, we are also thinking about gas leakage so we will come to the point in next simulation we will merge PLC to thinker cad software.

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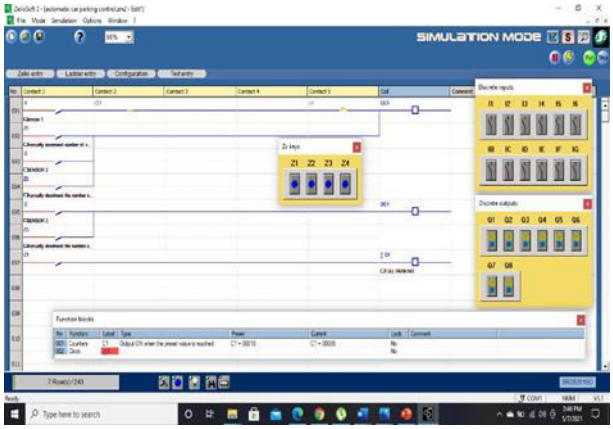

FIG 1. AUTOMATIC CAR PARKING (LADDER DIAGRAM)

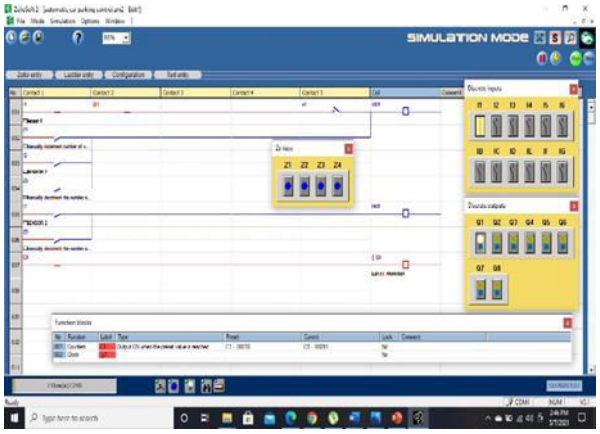

FIG 2. WHEN PARKING IS FULL

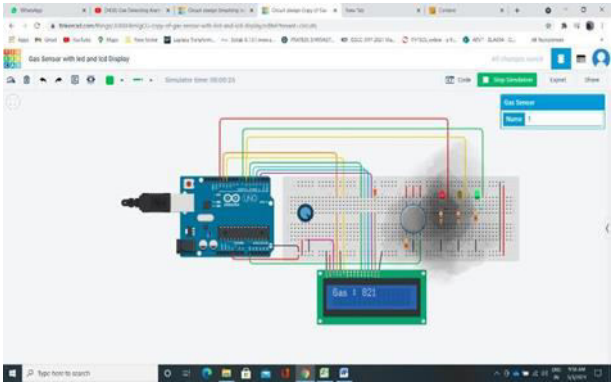

Fig 3. Red light is blinking (DANGER).

2.3 Advantages of this model are:

- Save time
- Less human interaction
- Effortless
- Time saving

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3. To Control and monitor the Gas leakage:
In above section we have discussed that at underground there is a chance of any time gas leakage from the pipe so when we are thinking on this, then we design the automatic gas leakage monitor.

3.1 Component used:

Table 6. Table shows Component Used.

Name	Quantity	Component
U1	1	Arduino Uno R3
U2	1	LCD 16 x 2
Rpot1	1	250 kΩ Potentiometer
R1	1	220 Ω Resistor
GAS1	1	Gas Sensor
D1	1	Red LED
R4, R3, R5	3	100 Ω Resistor
R2	1	20 kΩ Resistor
D2	1	Yellow LED
D3	1	Green LED

It has programmed as per sequence when gas level is under 600 PSI then it is a 'SAFE' zone and continuously glowing on 'GREEN 'light. When by any chance gas will be leaked and it crossed the level 600, between 600-700 or >700 PSI it will give "WARNING" bell and blink on 'YELLOW' light. But it crossed the level 800 or above 800 PSI then it will be danger and give the bell for evacuation and blink the "RED" light

4. To Monitor the Real Time Temperature, Control Lighting and Provide Fire Protection System:
The real time connection of Arduino with MATLAB is shown in figure 6.1and 6.2.Here we use MATLAB live script to continuously monitor the Arduino. The Arduino is connected to the laptop via com 3 port. The PIR sensor is continuously monitoring the room and the output of PIR sensor in connected to analog port(A1) of the Arduino. The MATLAB is continuously monitoring the Arduino and as soon as PIR sensor senses motion it gives an output which updates the variable (motion) in MATLAB. As motion variable in MATLAB changes, it sends a digital high pulse to digital port(D8) of the Arduino. The D8 pin is connected to relay channel 1 and as relay gets signal, it turns on the light as shown in figure

The analog port (A0) is connected to a potentiometer to provide variable voltage between 0 to 5V. It is simulating temperature sensor since analog temperature sensor also provides 0 to 5V. The potentiometer input is converted to temperature by multiplying the input voltage at port A1 by 10 (considering that our temperature sensor measures temperature from 0 degree to 50degree Celsius. The incoming data from the analog port 1 is stored in variable (x) in MATLAB and further by using plot command it is plotted for every cycle.

The result of variation of temperature in 1 min is shown in figure 6.4. The second part of code calculate the average temperature of the given time period whose output is shown in figure 6.5. Whenever the input from potentiometer is greater than 4volts (40 degree Celsius), it sends digital high signal via D7 pin to relay module which intern turns on the warning light as shown in figure 6.3.

Similarly, flame detection module is continuously monitoring for any fire within its range and as soon as it detects any fire. It gives high output to the digital port (D3) which updates the variable (flame) in MATLAB. As variable (flame) updates, it sends digital high signal via D2 port to buzzer module.

1.1 Component Used:

Table 7. Table shows Component Used.

Software/Hardware	Quantity/Version
MATLAB	R2020a.
Arduino Uno	1
5 volt 2 channel relay	1

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Flame detection sensor module	1
HC-SR501 Infrared Motion sensor	1
Buzzer Alarm Sensor Module	1
5V LED	1
1 K resistor	1
Potentiometer	1
Breadboard	1
Connecting wires	few

4.3 Advantage of this model are:

- Life-saving
- Effortless
- No human interaction
- Economical

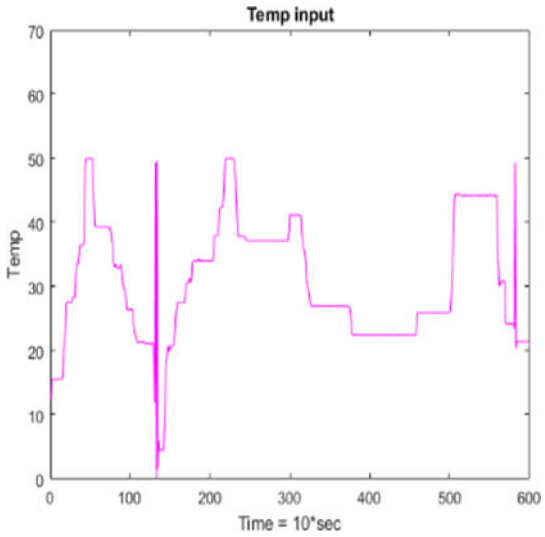

Fig 11. Graph for Temp. o/p with time

VIII. FUTURE SCOPE

We are trying to confirm that in every sector should be modified day by day. In present situation PLC or any automation module not so much use in real time except industrial area. So, we want to propose that also home or domestic should be used same. We are using motion sensors in our project so how we can stop light type of motion in future, that's we will focus on that. Because any animal is passing through this sensor then also be light will be on but only for 15 sec. Because our main aim is that Energy management by IOTs. How we can reduce energy as much as possible that should be our aim. So later we will want to work with this. If any modification is needed definitely, we will be done by ourself.

IX. CONCLUSION

In this paper from the starting, we are only focusing that how do you can manage the energy by hook or crook. By various application we have attached our paper for easier to apply in real time. First, we show that how to control automatic car parking and home lighting there have a chance to leak gas in case of underground parking. Then what is the solution? we also add on this paper how we can monitor the gas leakage and there also be a possibility to get fire due to heavy gas leakage then also fire alarming system should be developed. Last but not list we also develop a fire protection system and very sensitive PIR sensor to detect the fire and sprinkler will be on. It is help to evacuate easily and very earlier. So many live wills be saved. Last, we have concluded that it is not the only solution to get full proof

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protection so we should more aware from preventing with this. Challenge cannot be ended. So, in future any modification is needed then definitely we will do it.

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