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Building Management & Automation System

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ABSTRACT

Large Buildings are the main contributors to energy consumption approx one third of the energy consumed in the cities, this energy consumption due to the large buildings significantly decreased through the Building Management & Automation System. This solution is used to reduce the energy usage with the use of the system including sensors like PIR, Fire, Smoke, Temperature etc. This system will be central monitoring & controlling system which will manage the whole building's lighting and cooling system with safety features like Fire & Smoke detection. Based on the design, a prototype system with limited functions has been developed.

Keywords – *Efficiency, Energy Consumption, Energy Saving, Green Building, Security*

1. INTRODUCTION

In recent years, the commercial buildings become an important factor of saving energy of the world because it consumes roughly 23% of all electricity globally. Automation system that improve, measure & verify efficiency.

In Malaysia, the government has placed efforts to promote energy efficiency. They have introduced Energy Efficiency & Conservation program that aims to encourage industries and building owners to audit their energy usage for the purpose of reducing energy cost and increasing productivity. Also Government introduced incentive for EE&C program like tax exemption on equipment etc.

In Singapore, Building and Construction Authority (BCA) also introduced Energy Efficient Building awards to promote energy efficiency in the building.

Building Management & Automation System is the integrated system to control the different subsystems of the buildings, such as electricity, air-conditioning, lighting and security.
There are many different definitions for the intelligent buildings.

According to EIBG (European Intelligent Building Group): "One that maximizes the efficiency of its occupants and allows effective management of resource with minimum life costs. "

According to IBI (Intelligent Buildings Institute in Washington DC, US): "One that provide productive and cost-effective environment through optimization of its four basic components– structure, systems, services and management and the interrelationships between them."

Building Management & Automation System is a centralized, intelligent network of electronics devices designed to monitor and control cooling, lighting and security systems in a building. This system provides control of lighting based on occupancy in the rooms or corridors of the building. This system also provides control of cooling system based on the temperature in the specified area.

This system also comprises of the security features like Fire & Smoke Detection for the safety of the building. This system will provides notifications to the central unit of the building and according to that report the maintenance staff will be managed. It reduces the time, building energy consumption and maintenance costs when compared to non controlling building. By monitoring what we use, we can use energy more efficiently and become a green building.

2. LITERATURE SURVEY

Mineral Water Factory running twenty four hours a year, energy cost comprises a large portion of total manufacturing cost. Energy saving is done by Load Shift Concept in Korea without decrease of energy consumption. When partial load (10% , 30%) of peak load time zone was shifted to light load time zone (14 -17 hr → 6 - 9hr) Simulation results show that electricity fees in case of 10% shift saved 1.7% and in case of 30% shift ,its 5%.

It is also a very effective way to reduce energy consumption rate. In Korea there is price difference for different time zone, so there this system can be used but in India there is no such policy of different price at different time zone in the day. It's the same for whole day. So this concept can't be used in India. So proposing a solution to this to make building green, smarter & safe.

3. BUILDING MANAGEMENT & AUTOMATION SYSTEM

Building Management & Automation System is a combination of BMAS hardware and advanced software that control the facility in a more energy efficient way.

There are mainly two modules. One is for internal data acquisition individual for individual specified area which consist of controller and different sensors for parameter acquisition. Second is for central unit which consist of controller for central controlling of cooling system and PC with software. All the different Internal Modules which are individual for each area are connected to the Central Unit.

3.1 System Architecture

The basic function of BMAS is focus on minimizing energy consumption by means of catching up with unnecessary energy use through the monitoring of detail energy use in building. If comprehensive measures are taken to improve lighting and cooling system, power consumption of existing building might be reduced by 30-40%.

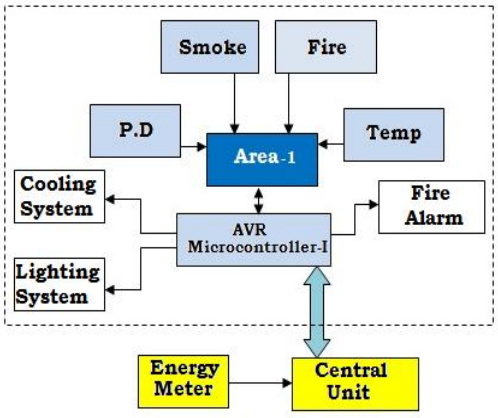

Fig.1 Block Diagram of BMAS

Fig.1 shows the concept of BMAS. Different sensors are there to sense the different parameters. Presence detector is used to detect presence in the specified area. If there will be no one present in that specified area then lighting system will be OFF in that specific area. In Corporate Houses or Large Buildings, there is so much wastage of energy due to lighting system remains ON though there is no present in that area. So energy saving will be there.

Temperature Sensor is used to measure the temperature of the specified area. If cooling will be enough in the room then vent of that room will be made OFF. So other parts of the building will be cooled faster than the normal condition. So energy will be saved and unnecessary usage can be avoided.

Fire & Smoke sensors are used to provide the safety features to the buildings. If fire will be detected then there will be a fire alarm for the indication. If Smoke will be there then there is direct indication in the software at the central unit computer. If fire will be there in a specific room then we can get the exact location of fire in the building that in which room fire is there by using central unit. The information will be available to the central unit and maintenance staff will be managed accordingly. So with this system we can effectively manage the maintenance staff as well as time saving and faster response to any disastrous situations.

Energy Meter plays a major role in the system. It is used for the continuous measurement of Energy Consumption every day and provide that data to the central unit. There will be certain limit for the usage of energy is given to any of the building if they will cross that limit then they have to pay the extra surcharge for that and that will be approx 15-20% extra then the actual bill. So to avoid that situation continuous measurement of energy consumption will be displayed in the central unit and we can manage the building energy consumption according to the limits given by controlling lighting and cooling system of the buildings.

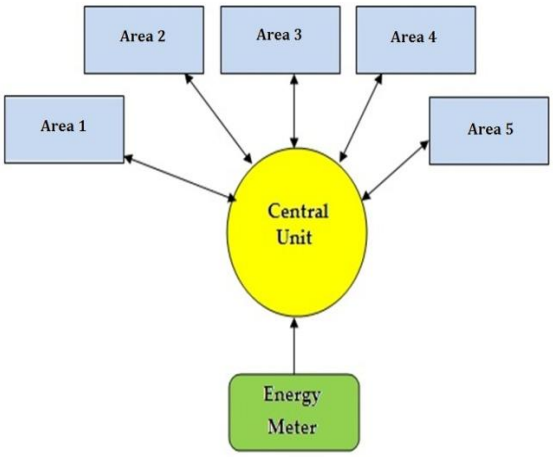

Fig.2 System View of BMAS

Fig.2 shows the actual system view of the BMAS. Here there will be a different internal controller as well as the sensors are allocated to the different area of the buildings. Central Unit will be continuously getting the data from every part of the building as well as from the energy meter. By taking all the data into consideration the decisions

are made by which means we can reduce the energy consumption of the building. Also for safety purpose we can have the details of fire and smoke in the specified area direct to the central unit.

3.2 Tools Used

Atmel Studio is the software used for developing and debugging Atmel AVR Microcontroller based applications. Easy to use environment to write, build and debug your applications written in C/C++ or assembly code.

Sinaprog is the software which is used to download the hex file of the programming into the controller.

Microsoft visual studio is an integrated development environment (IDE) from Microsoft. It is used to develop graphical user interface along with windows forms applications, websites, web applications etc. In this project it is used for C# programming to make GUI for Central Monitoring & Controlling Unit.

Microsoft SQL Server is a database management system developed by Microsoft. Its function is to store and retrieve the data.

4. CONCLUSION

In this paper, a building management & automation system for energy conservation & management in large public buildings are presented. BMAS System developed to improve operation of the equipment, promote the energy efficiency and cut down energy consumption in the large buildings.

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