Technical Notes on Building Management System of Data Centre

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ABSTRACT: Data centre Building Management System (BMS) is as important as server. Because it protects servers and increase reliability of Data Centre. Simply Data centre BMS is a separation of BMS system only for Data centre from common building. This paper introduces Data centre BMS through notes on sub systems which can be used in Data Centre BMS.

KEYWORDS: Building Management System, Data Centre, PAC.

I.INTRODUCTION

Data centre is subjected to IT but BMS of Data centre is subjected to Electrical & Instrumentation. BMS of Data centre is a point where IT interacts with Electrical & Instrumentation. Purposes of Data centre BMS are to provide security from unauthorized access, to prevent power cut out, to maintain temperature of server and provide protection against dust and rats. Data centre is modification of server room. Server room contains only server racks where as Data centre contains server room as well as Electrical Room and BMS control room. Previously Server room was controlled through building common systems where today's Data centre BMS is controlled by its individual control room and its power requirement overcomes through its individual electrical room.

Generally, Data Centre contains three rooms.
1. Server Room: Server room is regarded as Heart of Data Centre. Servers which contain data get mounted in server room racks.
2. Electrical Room: To provide power supply electrical room contains electrical panels, battery banks and ups systems.
3. BMS Control Room: All control panels of BMS systems get located in this area. In many Data Centres whole BMS system gets controlled through control panels as well as computer in control room.

Some Data centre also contains other rooms but BMS of Data centre mostly relates with above three rooms.

II. BUILDING MANAGEMENT SYSTEMS IN DATA CENTRES

A. Fire System:-
To protect server from fire three types of fire systems can be used in Data centre

a) Fire Alarm System:-
This system can alert that which portion of Data centre has been affected by fire. Detectors get mounted in all area under this system. All detectors of this system get connected with Fire Alarm Panel through connecting cable. When any detector has detected smoke than fire alarm panel give alert about fire affected area.

If fire alarm panel is connected to computer and programmed it, than map of all detectors can be seen on computer screen and this system can be operated by computer.

b) VESDA System:-
Fire Alarm System and VESDA System both detect smoke but Fire Alarm Panel detects smoke after fire and VESDA can alert before fire. Mean that VESDA detects smoke much early than that of Fire Alarm Panel.
Full name of VESDA is Very Early Smoke Detector Alarm. Pipeline gets mounted on area under VESDA and this pipeline has holes having distance of a foot. There is pump in VESDA panel which sucks air from pipeline holes and

releases air from other side of VESDA panel. By this act VESDA panel can continuously monitor smoke and dust particles of a particular area.

When level of smoke and dust exceed from normal, than VESDA Panel will alert. If this panel is connected with computer and programmed than pipelines map of VESDA can be seen through screen of computer and this system can be controlled through computer.

c) Gas Release Panel:-

To extinguish fire, gas cylinders can be used in Data centre. Gas filled in these cylinders can be release in Data centre through Gas release nozzles, which get connected with cylinders through pipelines. Amount of nozzles and cylinders are decided on the basis of an area of server room and electrical room.

d) Fire Extinguisher:-

To release Gas from Gas Release Panel for any small fire may proves extremely costly and it's not used for control room. So in order to handle small size fire and control room fire, medium size carbon dioxide fire extinguishers should placed in control room.

B. Cooling System:-

a) PAC:-

Full form of PAC is Precision Air Condition. Normal air conditions is used for maintaining temperature for humans but PAC is used for equipment cooling because PAC can effectively control both temperature as well as humidity.

Use of PAC in server room is for cooling of servers. PAC inserts cool air from bottom side of rack and suck hot air from above side of rack. It is known both as cold aisle and hot aisle, respectively. PAC represents status of temperature, humidity and error on its display. Status of PAC can also monitor by computer, if PAC gets connected to computer and programmed.

Simple air condition like cassette ac and splint ac are used to control temperature of BMS control room and small size Electrical room.

C. Water Leakage detector Systems:-

In server room, servers get placed on false floor, so that server room true floor is not visible. If water seep from PAC or any other place in server room, than it may result into short circuit or water damage. Water Leakage detector system can be used to prevent this type of condition. Water detector cable gets connected with Water Leakage Detector System Panel. When water will touch detector cable than Water Leakage detector panel will alert that which portion of server room gets affected by water.

This system also gets controlled and monitored through computer, if water leakage detector panel gets connected to computer and programmed.

D. Power Supply System:-

a) Electrical Panel:-

This Panel is LT Panel but there should be more than one incomer. If one incomer is failed, than server load can be transferred on other. It may become more reliable, if incomers are from difference service providers or one incomer from private DG system. Reading of this panel can be visible on computer screen, if panel is connected to computer and programmed.

b) UPS:-

Full form of UPS is Uninterrupted Power Supply. As its name, it simply helps in prevention of interruption power supply during power cut-off. There should be two types UPS used in Data Centre.

1. UPS for BMS Systems
    If in case of power cut off, this ups can be used, to fed power to BMS systems and lights of Data Centre.
2. UPS for Servers
    Use of this UPS is only to supply power to servers. Generally, for servers more than one UPS should be used and all UPS should be get synchronized. By chance, if one UPS fails than other UPS can take load of faulty UPS, with help of this synchronization. UPS capacity should be twice than server power requirement.

UPS can operate on three modes:-

1. Bypass Mode
    In Bypass Mode UPS feeds power directly to load without any control.
2. Inverter Mode
    In inverter mode when mains is available, than UPS feeds to load without fluctuate in frequency. This pre set frequency is called Inverter frequency.
3. Battery Mode
    In battery mode, in case of power cut off, UPS feeds power to load after invert DC power of battery into AC.

Display of UPS represents load on ups, battery charging, error and other parameters of UPS. These parameters can also get monitored by computer if UPS is connected to computer and programmed.

c) Server Distribution Box:-

This is one type of junction box which gets used between ups and servers. Each server should get power through two server distribution boxes.

E. Security System:-

a) CCTV:-

Full form of CCTV is Close Circuit Television. CCTV can be used to record every operation and to monitor all Data centre continuously. CCTV can be operated both on continuous mode as well as motion mode. In continuous mode camera continuously displays and records but in motion mode camera continuously displays but records only, when it sense motion.

There are two types of CCTV system. One is Analogue CCTV system in which all cameras gets connected with Digital Video Recorder (DVR). Operator can monitor and control through this DVR and its screen. Other type of CCTV system is IP based CCTV in which all cameras gets connected with Network Video Recorder (NVR). NVR needs internet connection than operator can monitor and control through Internet from any part of the world.

b) Access Control System:-

Data centre is counted highly restricted area, so Access Control System can be used to prevent entry of unauthorised person. Only authorised persons, who has authority to access, can open this door by his card. Access Control System gets connected to computer and its software can be used to make card history report, to issue new card, to change card holder details and to change access level etc.

c) Rodent Repellent System:-

Rodent repellent system works as electronic pest control. To prevent servers and wires from rat, this system can be used in Data centre. These transducers transmit ultra sonic waves by which rats cannot live there. Level of ultra sonic frequency can be changed by control panel of Rodent repellent system.

F. Other Systems:-

a) Motion Sensor Switch for Lighting:-

Simple switch light control may cause increase power consumption. To reduce power consumption, motion sensor switch can be used. When motion sensor senses motion, than it puts ON lights.

b) Emergency Exit:-

Server room is counted as fire hazard area and it gets fully sealed, so for this safety purpose emergency exit door can be used in data centre.

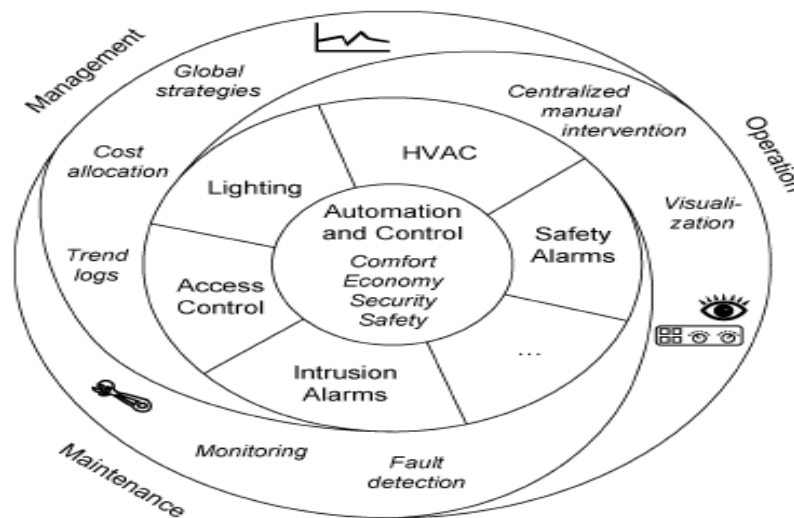### G. Building Management Systems (BMS):-

Fig. 1 Functional Aspects of BMS [12]

Above all systems are part of BMS. But final BMS is that which integrates above all systems and gets connected with the computer. BMS Controller and BMS software are major part of it.

It is controller which integrates above all systems and connects them to computer. Software of this controller gets installed in that computer. Programmer can program as per requirement of operator, with help of this software.

This system can make all BMS operation easy by Data centre animation on computer. Monitor and Control of all Data centre BMS is possible by this animation.

Some BMS softwares are capable to record all BMS data of particular time span. This may help in records maintain.

Previously BMS was controlled only through panels, but now, with help of controller and software, system gets controlled through computer but in latest scenario it can also be monitored and controlled through mobile internet service. Many researches are on going to design Green Data centre in future.

III. CONCLUSION

This paper provides technical notes on Building Management System of Data Centre. Building Management system is fully customized system as per requirement so it may differ in different Data Centres. But over all requirement of server is remains same everywhere, so this paper may help to understand BMS of Data Centre.

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