HEAT DISSIPATION SYSTEM BY A REMOTELY INSTALLED RADIATOR

FIG.1

The present invention relates to a heat dissipation system for large generator sets by a remotely installed radiator. The present invention applies to a heat dissipation and ventilation system for a plant room having large chillers and generator sets. Further, the invention relates to heat dissipation and ventilation system for a large plant room configurable with remotely placed radiator, wherein the said system is adapted to exhaile the heated air towards proximity of the distant exhaust shaft for efficient heat dissipation. Remotely placed radiators are without their conventional ventilation fans. However heat dissipation in the radiator and hence ventilation required for the same is addressed by a separate set of centrifugal blowers. The configuration, capacity and the layout of the blowers in the plant room enable it to ventilate the air cooled chillers installed in the same plant room.
The present invention relates to a heat dissipation and ventilation system for cooling a plant room having large chillers and generator sets. More particularly, the invention relates to cooling and ventilation system for a large plant room configurable with remotely placed radiator, wherein the said system is adapted to exhale the heated air towards proximity of the distant exhaust shaft for efficient heat dissipation.

Ventilation is equally important for generator sets as for human beings. For the proper functioning and safe operation of the generator sets, ventilation is indispensable. On an average 10% of the total amount of fuel consumed by generator sets is dissipated as heat into the surrounding atmosphere. The heat dissipated by the internal combustion engine of the generator set needs to be removed for maintaining proper and safe operation. The dissipated heat needs to be removed from plant room to prevent over heating of the generator and temperature rise in generator room.

To boost the performance of the generator sets, generator rooms are fitted with a large number of fans and blowers. Different fans are installed for different functions, like to throw out the heat dissipated in the generator room exhaust fans are used. For the supply of fresh air, which is used for the combustion and efficient generator performance, supply fans/blowers are used. Various factors like air volume, room size, space limitations and mounting capabilities determine the exact number and type of fan or blower required to maintain the generator room temperature.

Different generator sets work on different principles and technologies, their mode of action are different. Three main types of generator sets are:
1. Air-Cooled Generators
2. Hydrogen-Cooled Generators
3. Liquid-Cooled Generators

Air-Cooled generators use fans to throw force air across the engine for cooling. Air-Cooled generators work on two different mechanism, one is open-loop while the other is closed-loop. In open-loop mechanism, surrounding air is used by generator to cool its active components, which is then finally exhausted back to the atmosphere while in closed-loop mechanism there is complete recirculation of cooled air through the generator and air-to-water heat exchangers remove heat from the air.

In Hydrogen-Cooled generators there is circulation of hydrogen gas in a closed loop within the generator to remove heat from its active parts and then it is cooled by gas-to-water heat exchangers.

Liquid-cooled generators use enclosed radiator systems for cooling, similar to an automobile. Cool, deionized water, supplied by a closed-loop auxiliary system, flows through hollow copper strands located in the stator winding and then the warm water is discharged at the turbine end of the generator.

As is readily apparent, if equipment is not effectively cooled, the internal temperature of the components in the equipment substantially increases, thereby leading to significantly reduced system performance and, in some cases, total system failure. If a cooling system inefficiently cools the equipment, either the equipment may fail due to increased operating temperature or the costs for cooling the equipment may be unnecessarily high. Therefore, what is needed a quicker heat dissipation system from the plant room by remotely installed radiator and a configuration of the entire system having its cooling characteristics by quick dissipation of heat from the equipment to be cooled.
The main object of this invention is to allow installation of air-cooled D.G. sets and chillers in a same plant room due to the space constraint in an underground installation. The concept addresses the said object through installation of remote radiators for D.G. sets but without their conventional fans. Heat transfer from the D.G.'s radiator and air-cooled chillers was thus enabled by installation of dedicated set of centrifugal blowers of designed capacity, configuration and strategic layout in the context of temperature rise due to heat dissipation by the D.G.'s body and chillers.

Yet another object of this invention is to provide a heat transfer system that allows heat transfer only by placing remotely installed thermal radiator or other dissipating apparatus.

Yet another object of this invention is to provide large generator room cooling and ventilating system which provides an improved individual and equipment conditioning.

Yet another object of this invention is to quickly dissipate the heated air coming from the chillers and generator sets in a close environment.

Yet another object of this invention is to provide a heat exhaustion configuration for a heat dissipating environment that may transfer the heat radiated from the heat dissipating device continuously to a heat exhaust shaft by using remotely installed radiator and various blowers.

Yet another object of this invention is to improve the thermal efficiency of the equipments working in a large generator room.
Yet another object of this invention is to improve the heat dissipating capacity of a large generator or heating room.

Yet another object of this invention is to provide an improved configuration and arrangement of heat exchanger devices.

Still another object of this invention is to reduce heat dissipation difficulties in large plant room in an economic manner.

SUMMARY OF THE INVENTION

The present invention relates to a heat dissipation system for large generator sets by a remotely installed radiator. The present invention applies to a heat dissipation and ventilation system for a plant room having large chillers and generator sets. Further, the invention relates to heat dissipation and ventilation system for a large plant room configurable with remotely placed radiator, wherein the said system is adapted to exhale the heated air towards proximity of the distant exhaust shaft for efficient heat dissipation.

The present invention significantly improves the heat dissipation process from one or more cooling system for cooling a plant room having one or more heat generating objects. The said system includes at least one heat radiator installed remotely from the heat generating objects and to allow customized heated air flow in proximity to the exhaust shaft for the final heat dissipation. One or more blower units are disposed between the heat generating objects and the radiator. The said cooling system is selectively positioned along the radiator in such a manner so as to draw air between and blow the drawn air outside the plant room or to a room portion having heat dissipation problems. Positioning of blower unit along the remotely installed
radiator enables heated airflow from the heat generating objects to the remotely installed radiator. The present invention provides a reconfigurable heat dissipation and ventilation system that is selectively customized to particular room size, air volume, number of chiller units and generator requirements.

10 BRIEF DESCRIPTION OF THE DRAWINGS

A more complete understanding of the system and method of the present invention may be obtained by reference to the following drawing:

FIG. 1 is a schematic representation of the cooling and ventilation system of the present invention.

FIG. 2 is another schematic representation of cooling and ventilation system of the present invention with indication of temperature in various parts of the system.

DETAILED DESCRIPTION OF THE INVENTION

The present invention will now be described more particularly hereinafter with reference to the accompanying drawing in which a preferred embodiment of the invention is shown. This invention may, however, be embodied in many different forms and should not be construed as being limited to the embodiment set forth herein. Rather, the embodiment is provided so that this disclosure will be thorough, and will fully convey the scope of the invention to those skilled in the art.

Referring to FIG. 1, there is shown one or more chillers 1 having high capacity. Chillers 1 are adapted to provide heated air back to a plant room, such as a room having one or more generator 2 having larpp ranacitv has been installed ideally away
from the chillers. The heated air generated from the chillers 1 and generator set's skin 2 are drawn by various blowers 3 installed ideally away from the generator sets 2. In this way, heated air is capable of passing in a direction through or in proximity to the radiator 4 remotely installed approximately 40-75m away from the generator sets. Further, the air exhaled from the radiator 4 drawn by exhaust shaft 5 for final heat dissipation from the plant room. The heated air volume and air flow rate within the system can be controlled manually or automatically, as is understood in the art.

Referring to Fig. 2, all the temperatures have been indicated with ambient temperature as 43°C. When the air at 43°C enters the basement, it first comes in contact with the air cooler which brings down its temperature to approximately 34°C. The air cooled chillers add heat to the surroundings and raise its temperature to 43°C. The air now comes in contact with DG sets which in-turn raises its temperature to 46°C. The blowers intake this air and force it through the radiators. It can be noted that the temperature after the radiators near the ventilation shaft is 58°C which is well above the equipment d-rating factor, therefore the radiators are remotely placed in this arrangement. The distances are not the only criteria for heat rejection; the minimum distances indicated are only to ease the operation and maintenance of the equipment. The air flow requirement is critical because it determines the capacities of the blowers, which is total of air flow required of all equipments. The distance can be easily manipulated and varies from one manufacturer to another.

The invention relates to a heat dissipation system for large generator sets by a remotely installed radiator. The present invention applies to a heat dissipation and ventilation system for a plant room having large chillers and generator sets. Further, the invention relates to heat dissipation and ventilation system for a large plant room configurable with remotely placed radiator, wherein the said system is adapted to
exhale the heated air towards proximity of the distant exhaust shaft for efficient heat dissipation.

The present invention significantly improves the heat dissipation process from one or more cooling system for cooling a plant room having one or more heat generating objects. The said system includes at least one heat radiator installed remotely from the heat generating objects and to exhale customized heated air towards proximity of the distant exhaust shaft for the final heat dissipation. One or more blower units disposed between the heat generating objects and the radiator. The said cooling system is selectively positioned along the radiator in such a manner so as to draw air there between and blow the drawn air outside the plant room or to a room portion having heat dissipation problems. Positioning of blower unit along the remotely installed radiator enables heated airflow from the heat generating objects to the remotely installed radiator. The present invention provides a reconfigurable heat dissipation and ventilation system that is selectively customized to particular room size, air volume, number of chiller units and generator requirements.

The present invention comprises of various components that include air coolers, air cooled chillers, diesel generators, water circulation pumps for air cooler, blowers and remotely mounted radiators. The air cooler cools the ambient air to enhance the system performance. A set of pumps are installed to circulate the water in air cooler: The air cooled chillers operate to cater the air condition loads of the building. Diesel generators are installed as standby power backup to be used in times of power failure. Blowers work as a heat extracting device exhausting all the surrounding heat to the atmosphere. Remotely mounted radiators for diesel generators are installed at a far proximity of the plant room which does not add heat to the surrounding working area, hence maintaining favourable conditions for manpower and equipment.
Each chiller, generator and blower unit preferably includes one or more individual units as per the requirement of particular plant room. The operating speed and number of the blowers may be fixed, manually varied or automatically varied as heated air volume of the plant room. The installation of particular equipment between or in proximity with other equipments may be varied according to the capacity of plant room and requirements.

The heat rejected by air-conditioning plant and standby diesel generator is exhausted using blowers of adequate size. The size of the basement is kept in consideration while selecting the blowers. The purpose is achieved by exhausting out heat from the air-conditioning plant, diesel generators body and diesel generators engine. Since the engine heat makes up the major part of the heat generated, therefore the radiators are shifted to a location with minimum manpower movement. The blowers are installed in the basement to throw the heat rejected by equipment through a ventilation shaft constructed at the end of the room. The air cooler is provided in case the ambient temperatures are too high; the air cooler brings down the temperature of the air entering into the basement. The air cooler is a simple arrangement of wet cooling pads; the cooler has a tank filled with water. Adequate sizes of pumps are installed with the cooler to circulate water for the purpose of keeping the pads wet and hence achieving cooling effect.

The present invention further provides for the method of installation of the equipment to be placed on vibration pads to reduce the vibrations and is anchored to the floor. The outlet of the blowers is connected to the wall using a duct enclosure; the duct enclosure on one side is bolted to blower and on the other end is anchored to the RCC functioning as a duct plenum.
The heat generated by DG body (internal heat) is catered by the recirculating coolant in the engine jackets. The heated coolant is then pumped by the engine into the remote radiator for heat dissipation through the adequate size of pipe running between the DGs and their respective radiators.

The proposed invention is result dependent on the variables. The size of the room is an important parameter. Larger the room size more volume will be required to be exhausted, thus larger sizes of blowers will be required. Also the same is applicable for the equipment; the larger the sizes of equipment the more heat it will generate & thus larger sizes of blowers will be required. The room sizes calculation is entirely a function of heat generated by the equipment, this data is variable depending on manufacturer. Before assessing the room size and sizes of the blowers the manufacturer's data for heat dissipation are to be considered. Variables temperature versus capacity of the blower, with the available room size balance has to be arrived between temperature and CFM to optimize the performance output of the chillers and diesel generators.

This system is workable without the air cooler due to configuration of the equipment. Through this arrangement the user is able to utilize the basement as equipment room; the conditions are maintained for comfortable manpower movement and also the equipment d-rating is not taking place since the temperature of the surrounding are well within the limits for equipment temperature operating limit.

The state of the art describes various heat exchanging modes using various configuration of heat exchangers. The present invention obviates the use of any customized heat exchanging devices. For high rise buildings the basement can be utilized as plant room, diesel generators can be kept in basements as the engine heat is exhausted through rpmfplv mn,ntph radiator installed at an knlatpH Inratinn in
the plant room. The said invention helps avoid keeping the diesel generators outside in ambient, which reduces the efficiency in extreme cold or hot conditions and also avoids creating additional space for diesel generators installation. The patent claimed also confirms the possibility of placing the air cooled chillers in basements. In another embodiment of the present invention the radiator has no fan for heat dissipation, separately installed blower away from diesel generators dissipate the heat. Placement of equipment in the basement gives rise to the requirement of having blowers which increases the initial cost of machinery, but later saves cost by operating the equipment in most favourable surrounding conditions. The equipment is arranged in such a manner that they liberate heat to the surroundings and this heat is taken away by inflow and outflow of air to maintain optimum levels of temperatures in the surroundings. The sequential placement of the equipment and selection of blowers is done in a manner that the surrounding air temperatures are in the comfortable limits for staff as well as within limits of equipment d-rating factors. The radiators are mounted remotely at the end of the sequence and radiator heat is rejected through forced ventilation using the blowers. In yet another advantage of the invention, the location where the radiators are installed has no requirement of manpower movement at the time of operation. A cooler is installed at the inlet of the air stream; this is required at the places where ambient temperatures are high. This arrangement can be used in basements to utilize basement space.

It will thus be seen that the objects set forth above, among those made apparent from the preceding description, are efficiently attained and, since certain changes may be made in above system set forth without departing from the spirit and scope of the invention is intended that all matter contained in the above description and shown in the accompanying drawings shall be interpreted as illustrated and not in a limiting sense.
It is also to be understood that the following claims are intended to cover all of the
generic and specific features of the invention herein described and all statements of
the scope of the invention in which, as a matter of language might be said to fall there
between.
We claim:

1. A heat dissipation system comprising of:
   a. at least one air cooling means,
   b. at least one cold generating means,
   c. at least one cooling fluid circulating means,
   d. at least one ventilating means,
   e. at least one radiator, and
   f. at least one source of power backup;

wherein,

the said air cooling means and cold generating means are situated at an end, the said source of power is situated centrally and the said ventilating means being adapted for allowing air to flow to radiator;

the said radiator is devoid of any conventional fan attached to it;

the said radiator is mounted at a remote distance;

the arrangement of the said components is such that the air flow dynamics enables efficient ventilation and cooling; and

the said system is adapted to exhale the heated air towards proximity of the distant exhaust shaft for efficient heat dissipation.

2. The heat dissipating system as claimed in claim 1, wherein the said air cooling means is an air cooler.

3. The heat dissipating system as claimed in claim 1, wherein the said cold generating means is an air cooled chiller.

4. The heat dissipating system as claimed in claim 1, wherein the said cooling fluid is water and the said cooling fluid circulating means is a water pump.
5. The heat dissipating system as claimed in claim 1, wherein the said ventilating means is a blower.

6. A heat dissipation system comprising of:
   a. plurality of air cooling means,
   b. plurality of cold generating means,
   c. plurality of cooling fluid circulating means,
   d. plurality of ventilating means,
   e. plurality of radiators, and
   f. at least one source of power backup;

   wherein,

   the said air cooling means and cold generating means are situated at an end, the said source of power is situated centrally and the said ventilating means being adapted for allowing air to flow to radiator;

   the said radiator is devoid of any conventional fan attached to it;

   the said radiator is mounted at a remote distance;

   the arrangement of the said components is such that the air flow dynamics enables efficient ventilation and cooling; and

   the said system is adapted to exhale the heated air towards proximity of the distant exhaust shaft for efficient heat dissipation.

7. The heat dissipating system as claimed in claim 6, wherein the said air cooling means is an air cooler.

8. The heat dissipating system as claimed in claim 6, wherein the said cold generating means is an air cooled chiller.

9. The heat dissipating system as claimed in claim 6, wherein the said cooling fluid is water and the said cooling fluid circulating means is a water pump.
10. The heat dissipating system as claimed in claim 6, wherein the said ventilating means is a blower to provide adequate air flow for ventilation of air-cooled chillers and D.G. sets.

11. The heat dissipating system as claimed in claim 6, wherein the distance among the said components is variable and dependent on the size of plant room.