



A Review on Studies and Research on Insulation

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ABSTRACT

Energy efficient plant operation is the most important research area in the industrial energy sector. The use of various methods such as pinch technology, reduction of frictional losses can reduce energy consumption to a considerable extent. The use of nonconventional energy is also becoming more and more important. Proper insulating material in construction and industrial sector can avoid energy losses to considerable extent. Current review summarizes research and studies on insulation.

Key words: Energy saving, heat losses, insulating materials.

INTRODUCTION

Sustainable development is becoming the important and most widely used terminology in modern day engineering. Energy and environment are two pillars of sustainable development. The research carried out in environmental engineering sector strives for treatment of industrial wastewater to removal various pollutants from it such as organic matter, heavy metals and biological impurities. [1-5] Also water treatment includes the reuse and recycling of water. [6-8] Energy is required for all the industrial operations in manufacturing and nonmanufacturing sector. Major industrial equipments such as boiler, cooling tower, refrigerators, heat exchanger need energy. Attempts have been made to optimize the energy requirement in these equipments. [9-12] Use of non conventional energy such as wind, tidal and

solar energy is being explored with moderate to high success. [13,14] Other measures such as application of pinch technology, reduction of friction losses can add energy effectiveness of a plant. [15,16] Nonconventional energy resources are becoming important day by day. [17] Proper insulation can prevent the wastage of energy and render economy to the plant operation. The current review summarizes research carried out on types and applications of insulation.

RESEARCH AND STUDIES ON INSULATION

Zach et.al. carried out studies on development of thermal insulation plasters. [18] They used this insulation for insulating and sanitation of building constructions. According to them, thermal insulation of outer structures of buildings is an issue that is often closely associated with moisture sanitation and recovery. In their paper, they described the results of research that is oriented toward the development of ultra-light thermal insulation plasters on silicate base. They observed that lightweight plaster mixtures which are based on lightweight aggregate of obsidian and lime hydrate show a very good ratio of thermal insulating and mechanical properties. It was also proved during the investigation that fly-ash is a suitable alternative substitution for metakaolin. Inorganic heat insulation panel based on sepiolite nanofibers was studied with respect to preparation and performance by Wang et.al. [19] They developed energy saving panel materials containing sepiolite

nanofibers by means of the synergistic action of inorganic adhesive, curing agent, and hydrogen peroxide. They used sodium fluorosilicate as curing material and sodium silicate as inorganic adhesive. They observed that the synergistic action of inorganic adhesive, curing agent, and hydrogen peroxide enhanced performance of thermal insulation energy saving panel materials. Heat transmission and external forces were effectively arrested by these materials. Swinton et. al. studied performance of thermal insulation on the exterior of basement walls. [20] They observed that only small differences were found among the different products in their ability to provide sustained thermal performance. According to these studies, it is very important to avoid even limited contact with another thermally conductive element, such as concrete. It can have a significant impact on the thermal performance of the entire basement wall system. According to them, exterior insulation can provide a first line of defence for the basement envelope system if it has sufficient water management capability. Hopper evaluated the installation of retrofitted external wall insulation. [21] He presented an overview of an evaluation of the installation of retrofitted external wall insulation (EWI) at existing dwellings in Swansea. Their studies were concentrated on identifying the occurrence of potential thermal bridges as these can undermine the overall effectiveness of the EWI. According to them, thermal bridging can lead to internal condensation on the walls and ceilings. This can pose health problems for occupants. Garber-Slaght and Craven studied window insulation for cold climates. [22] According to them, it is necessary upgrade or insulate windows in order to improve the thermal envelope of a home. In the area of long summer season, it becomes uneconomical to change the window. It is always envisaged to have an insulation system which is cheaper and convenient. Ability of homeowners to frequently move or maintain window insulation plays

important role in windows insulation system. Hebner studied electrical machines in electric ships with respect to insulation. [23] The standards provided, according to them cannot guide the effective insulation system. According to them, there is a need to specify the electrical, thermal and mechanical environment that a ship power system will experience. Zach et.al. studied alternative thermal insulations based on sheep wool. [24] According to them ship wool has many advantages such as no health risk, easy to renew, easy to recycle, high hygroscopic nature etc. They carried out tests under frequently occurring and strict climatic conditions. They concluded that sheep wool is an excellent acoustic insulating material.

CONCLUSION

Proper insulating material can make the construction and operational activities energy efficient. Heat losses can be minimized by using proper insulating materials. Thermal insulation of outer structures of buildings is an issue that is often closely associated with moisture sanitation and recovery. The synergistic action of inorganic adhesive, curing agent and hydrogen peroxide enhance performance of thermal insulation energy saving panel materials.

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