Design And Modification of Electric Snow Melting System

Danej Bhavin[1], Sharma Vasudev[2], Narendra Dalia[3]
[1, 2, 3] Dept of Mechanical Engineering
[1, 2, 3] Bhagwan Mahavir College of Engineering and Technology.

Abstract- *The Snow melting system for roads including a heating coil disposed below the road surface. The system of coils are arranged in a zig-zag manner to cover the majority of the surface area of the roadway. The objective of the invention is to avoid the difficulty of snow removal by manually that has accumulated on roads in area having cold climates and human life and secure the safety of vehicles.*

Keywords- Heating Coils, Snow, Heated Pavements, Junction, Insulator.

I. INTRODUCTION

The objective of the present invention is to provide an ice and snow melting system, where the heating element is not damaged by the loads of vehicles travelling on roads or aircraft taking off and landing on runways and which does not affect the service life of the road, etc.

The process for disposing the heating coil beneath the surface of the ground is first sufficiently steam rolled so that there is no irregularities in the asphalt beneath the ground. The heating unit is installed at the desired location and wiring connections are made. When wiring work is completed, an additional coating of primer is applied to the upper surface of the heating unit. This is then covered with fine granular asphalt.

The heating Coil used is of aluminium plates, the upper aluminium plate gradually transfers the heat radiated from the heating element to the tar-based moisture-proof sheet and then transferring heat to the highly thermal conductive fine granular asphalt.

SNOW MELTING SYSTEM TYPES:-

HYDRONIC SYSTEM:-Hydronic snow melting system is mainly composed of a heat source, heat exchanging tubes usually embedded in the pavements (floor heating) , heat transfer fluid, sensors for measuring the actual weather conditions and a system control. In hydronic snow melting systems, heat source provides the needed heat energy for snow melting. The heat is transferred by circulating heat transfer fluid (brine, oil, and glycol-water) through the tubing that is embedded in concrete.

INFRARED SYSTEM:- Here infrared radiation is an heat source. Infrared systems have been designed and used not only in snow melting applications but also in space heating and drying applications. Infrared heaters instantaneously provides radiant heat to melt snow without necessarily increasing the temperature of the surrounding air space.

II. RESEARCH

During the winter months, many people are found outside their home or apartment, manually removing a snow from their driveways and walkways The city sends a truck to shovel the streets and drop salt on icy areas. The task of removing accumulated snow from sidewalks, walkways and driveways is accomplished by hard manual labour, using a snow shovel to scoop up, lift and move snow to the sides of walks and driveways. Removing snow manually has a potential to be injurious and dangerous, especially for those people who are older in age or physically unfit.

With the rapid development more and more highways have been built in the cold region with high latitude and high altitude. Heavy snows in the cold region cause the soil freezing and snow cover on the pavement reduces the friction coefficient of pavement, which often result in motor vehicle accidents and endanger the drivers and passengers. Every year, heavy snows will occur in such regions for several times. Moreover, heavy snows causes severe adverse impact on people's production, transportation, and traffic safety.

According to the research, the occurrence of traffic accident in the snow and ice road in winter is 4-5 times of that in other seasons. Considering the traffic safety, energy consumption, economic benefit, environmental protection, and other related factors, it is of great practical significance to change the conventional concept and method for snow-melting and skid resistance of the pavement. Losses and damage caused by heavy snow are steadily increasing worldwide. To overcome this, many snow-melting systems have been developed however, in practice their application is restricted

due to economic reasons, environmental contamination and problems and cost associated with construction technology.

III. METHODOLOGY

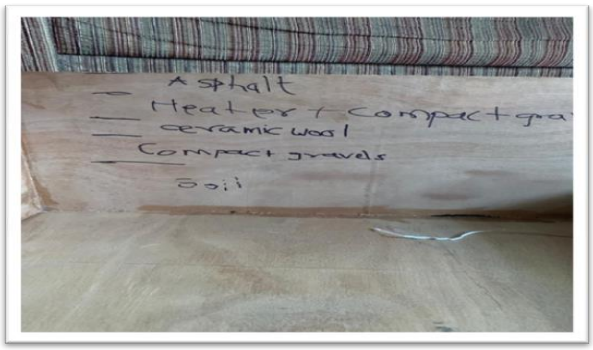
ELECTRIC SNOW MELTING SYSTEM:-

Electric snow melting system uses hot wires or electric mats to heat pavement and roof surfaces to ensure that they are free of snow. The main energy source for these systems is electricity. To melt snow efficiently the designed heating element should deliver the appropriate heating power at the snow melting surface. The main system components include an energy source (electricity), sensors for measuring weather conditions, heating element (cables and electric mats), insulator(silicon wool), gravel and system controllers.

Electric snow melting system uses wire as heating medium, transforms electric energy into thermal energy by electrifying the heating cable and then transfers the thermal energy to pavement, which is the radiant heating. With additional protection of heat insulation material, the significant effect of heat insulation and snow-melting can be received. The heating cable, is mainly composed of several elements, which are heating thread, insulation layer, metal shielding layer, waterproof and anticorrosion layer.

With the advantages of high thermal efficiency, little impact on structure, excellent effect, excellent performance in energy conservation, simple design, convenient installation, zero pollution, long service life, and remote-automatic control the electric snow melting system has been successfully applied.

Heating cables are usually laid in zigzag pattern as the following process: Firstly, the coarse gravel asphalt concrete material is laid in the structural layer of pavement then the heating cables with required power are laid according to related technical requirements. Finally, the fine gravel asphalt concrete is laid as the surface layer of pavement.



Step 1 :- Prototype Foundation.

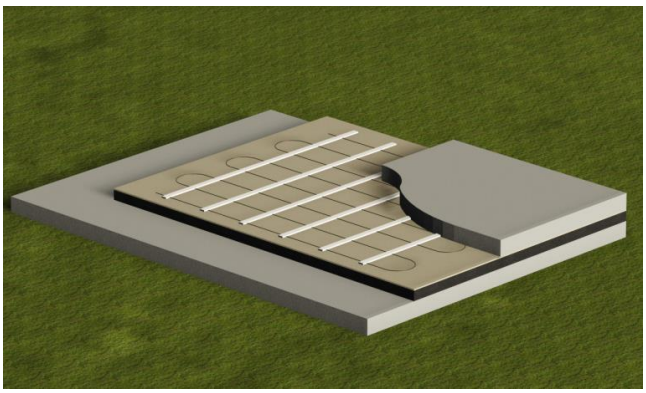
Step 2 :- Layer of Soil and Gravel.

Step 3 :- Layer of Insulator (Silicon Wool).

Step 4 :- Layer of Heating Coil.

Step 5:- Layer of Asphalt.

Snow Melting System with Temperature Controller.



DESIGN

IV. CONCLUSION

In cold region the Electric snow melting system can be employed for snow melting on the roads. In order to get effective and instant melting it is necessary to preheat the road according to the whether conditions.

V. ACKNOWLEDGEMENT

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