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Helmet Cooling System

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ABSTRACT

The helmet is critical safety equipment for a two wheeler drivers. The purpose of helmet is to protect the human head against injuries and to safeguard the eye from sunlight and dust particles. While wearing the helmet. The inconvenient equipment may affect concentration and create hazards that could lead to accidents. The motorcyclist can be affected by temperature which results in loss of concentration. This work Concentrate on absorbing heat. Glibber Salt is encapsulated inside an Aluminum Foil. In addition, holes are created on the front and rear sides of the helmet. This allows circulation of fresh air flow inside the helmet so that the heat produced in the helmet is instantaneously tapped out. Thus continuous cooling is achieved till it he entire PCM fuses. Solid works is mechanical design software; provide tools to help you implement a sophisticated standard based architecture. Solid works software sketcher is used model and flow simulation, heat is removed by providing the phase change material.

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I. INTRODUCTION

The visor is made of a strong and transparent material, for example polycarbonate, and it designed to protect the face of the rider from wind, dust and insects. In addition, the visor is equipped with a water- and scratch-proof coating. Manufacturing a distortion-free visor including a reliable opening mechanism not only calls in a manufacturer's development strength, but is equally dependent on the right production technology. During an accident, the hard outer shell has to both absorb and disperse the impact. At present, outer shells are generally made of thermoplastics or fiber-reinforced polymer (FRP), a composite material consisting of a synthetic resin reinforced with, for instance, fiberglass. Despite its rounded shape, an EPS liner is much too hard to guarantee a good fit. The comfort padding, which consists of a sufficiently firm synthetic foam pad covered with a skin-friendly fabric, is thus all the more.

Ease of Use

Objective:-

The system ensures fresh air is ducted into the helmet and exhaled air and humid A special synthetic - fiber chin strap that fulfills the strict breaking-and tensile-strength requirements serves to secure the helmet firmly on the head of the rider. The retention system is attached to the helmet with strong metal rivets. ditty are vented out

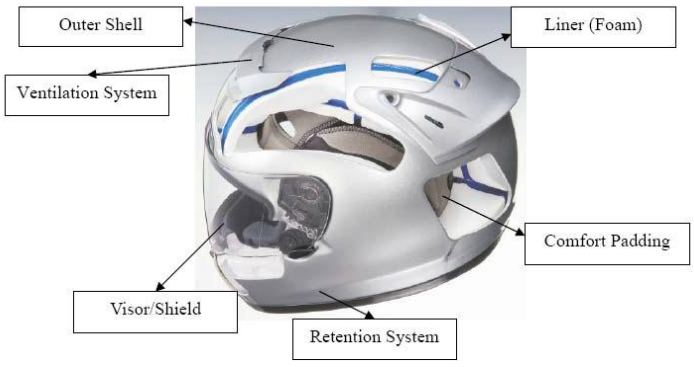

Figure-1. Various Parts of Helmet

Figure-1 shows the parts of helmet. The liner protects the wearer's head by absorbing the remaining force of the impact that was already partially absorbed and dispersed by the outer shell. The liner located on the inside of the shell is made of lightweight and highly impact-absorbing EPS (expanded polystyrene). PCM materials have high heats of fusion so they can absorb a lot of energy before melting or solidifying

A PCM temperature remains constant during the phase change, which is useful for keeping the subject at a uniform temperature.

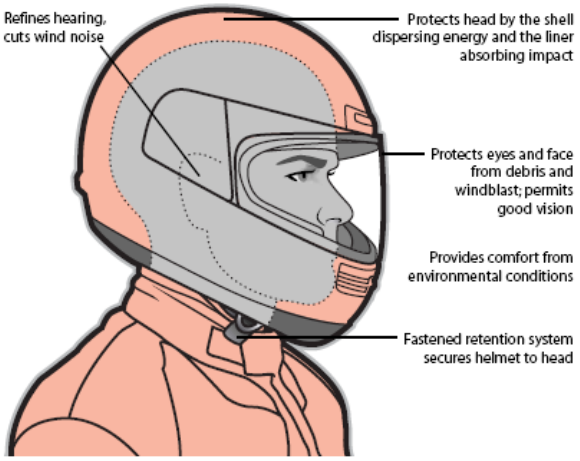

Figure-2 shows the protection and comfort of PCM

Figure-2. Protection and Comfort of PCM Helmet.

Comparison of how long a PCM will remain at a constant temperature during the phase change calculated in

Equation 1

$$D\,I_{+}\,hfp/T$$

[1]Uncomfortable individual protective devices may affect performance of drivers and create disturbances that could lead to accidents. There are numerous factors that can influence the user comfort level. One of the most important factors is temperature

[2]. This work mainly focuses on absorbing the heat produced inside the helmet. To achieve this, a suitable Glaubersalt PCM has been encapsulated inside an Aluminum Foil

[3]. Also holes are drilled on the front and rear sides of helmet. This allows fresh air (reaction air coming opposite to riding direction) to continuously flow in and out of the helmet so that the heat produced in the helmet is instantaneously tapped out. Thus continuous cooling is achieved till the entire PCM fuses. Glauber's salt is being sold commercially. Glauber's salt usually varies its phases at 90°F and has a 108-BTU-per-pound latent heat

[4]. Owing to its high latent heat characteristic, Glauber's salt needs comparatively less storage volume than either rock or water. This property leads to lower storage facility costand more usable space within the home to counteract the material's relatively high cost. PCM's do have some chemical traits that can present problems in heat storage and transfer; but most have been or are being overcome. One is that PCM's tend to overcool as heat is withdrawn. This means that, rather than giving up its latent heat at the phase-change temperature, salt PCM's may remain a liquid until they fall to possibly 15-30°c

[5] Solid works is mechanical design software which provides tools to implement a sophisticated standard based architecture. Solid works software sketcher is used model and flow simulation, heat is removed by providing the phase change material.

Properties of phase change materials are depend upon high volumetric latent heat storage capacity, availability and low cost, sharp melting point, high thermal conductivity, high heat of fusion, Non-flammable.

II. METHODOLOGY

A. Problem Definition The thermal comfort for motorcyclist during hot

weather is important as it can affect the physiological and psychological condition of the rider. This paper examines the use of PCM to cool a motor cycle helmet and present the software analysis on the influence of the solar radiation wind and heat generation rate on the cooling system The outer shell of helmet has the ability to beat impacts. The helmet lessens the impact by absorbing energy and prevents head from injury. Thermo Cole is basically a polystyrene material with hard and brittle nature. It is an inexpensive resin per unit weight. Sodium sulphate is the sodium salt of sulphuric acid. The glauber's salt is wrapped inside aluminum foil and is kept in between the foam and thermo Cole [6]. Foam is good thermal insulator. The heat is removed by providing the holes. While the holes are provided for air exchange, the heat energy with PCM kept inside resulting in an extension of the duration of fusion.
Figure-4 shows the air flow area in PCM helmet. Reserved.

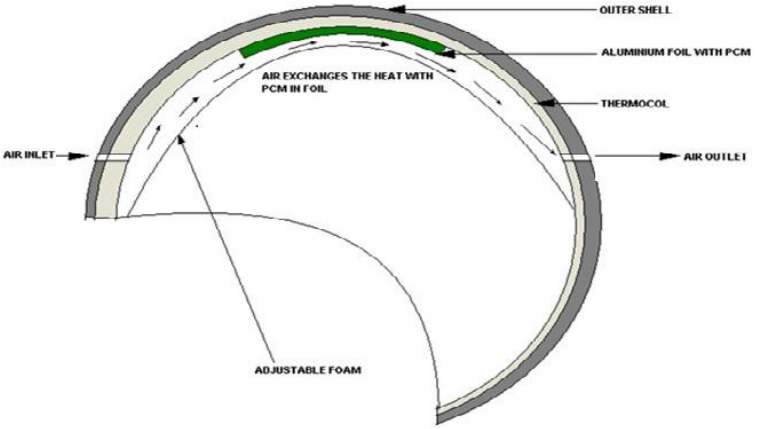

Figure-3. Air flow area in PCM Helmet.

III.RESULTS AND DISCUSSIONS

A. Flow simulation using CFD Computational Fluid Dynamics (CFD) uses numerical method to solve the fundamental non-linear equation that describes fluid flow for predefined geometrics and boundary conditions. CFD applies numerical methods is called Discretization to develop approximations of the governing equation. Boundary condition is the temperature. Domain is discretized into finite set of control volumes or cells called grid or mesh

Parametre	Unit	Average value	Max. Value	Min. Value
SG Av Heat Flux 1	[W/m2]	22.44	22.50	22.36

VG-Av Temp.	[°C]	30.0006	30.0012	30.0001

Table-1. CFD Results.

Calculation
From the data, Heat flux = 22W/m2
Latent heat of PCM = 251KJ per Kg
From diagram, area = 0.05 m2
Latent heat of PCM = 251000 J/Kg
Therefore for 0.05 m2 area, 0.05 * 22.42
From diagram, mass = 0.02Kg
= 22.42 * 5/100
Therefore for 0.02Kg,
251000*0.02 = 1.121 watts
Total amount of heat =5020 joules
Which means, for 1 second, PCM absorbs 1.121 Joules
From these data
Time taken for fusion = 5020/1.121
=4478 sec
=1.24hrs

Figure-4. Assembled View of PCM Helmet.

IV. CONCLUSIONS

In this paper a thermally comfort helmet has been designed using PCM by providing holes at both front and rear side of the helmet for forced convective heat transfer through air. The result shows that the designed helmet gives the comfort up to 1.24 hour while driving.

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