ISSN : 2455-9679
SJIF Impact Factor : 6.008

IJRTSM
INTERNATIONAL JOURNAL OF RECENT TECHNOLOGY SCIENCE & MANAGEMENT

"A COMPARATIVE STUDY ON HEAT DISSIPATION THROUGH ALUMINIUM 6061 FINS USING DIFFERENT GEOMETRY"

Asif Hussain [1], Dr Gurjeet Singh [2]
[1] Research Scholar, IES College of Technology , Bhopal (M.P.),India
[2]Assistant Professor, IES College of Technology , Bhopal (M.P.),India

ABSTRACT

The cooling fins permit the wind and air to transport the heat away from the engine. Low rate of heat transfer via cooling fins is the primary trouble in this kind of cooling. Here all geometry of engine head fins utilized a motor bike engine head fins model and 3D displaying programming SOLIDWORK 2021 . We have a used one material aluminium 6061 exiting with four different likes geometry rectangular, circular, angular fins, curved fins and curved geometry. Aluminum 6061 then all geometry like rectangular, angular fins and rectangular fins geometry and curved fins geometry get temperature results respectively 284^{0}C, 284.55^{0}C, and 285^{0}C. and 284^{0}C.Here take aluminum 6061 then all four geometry like rectangular, circular, angular fins and curved geometry get heat flux results respectively. 4 w/mm^2 2.77 w/mm^2 and 4.767w/mm^2. So here suggested curved fins geometry is better compared to all geometry.

Keyword: *Aluminum 6061, temperature , heat flux, cooling , fins. Geometry*

I. INTRODUCTION

Generally or practically all ignition motors Engines are liquid cooled utilizing either air (an perform liquid) or a fluid specialist like water running ceaselessly utilizing mechanical siphon through a gadget (radiator) cooled via air. In air cooling framework, heat is dispensed or driven away by the air streaming over and around the chamber. Here blades are sew the plate and chamber barrel which give further warmth conductive and heat emanating surface. In water cooling arrangement of cooling motors, the chamber dividers and heads are given or outfitted with coat Cooling blades encourage keep Chevrolet potential unit battery at perfect temperature we as a whole handle that essentially just if there should arise an occurrence of ignition (IC) motors, burning of air and fuel happens inside the motor chamber and hot gases are produced. The temperature of gases is around 2300-2500°C. this might be a horrendously high temperature and will result into consuming of oil film between the moving parts and will result into seizing or attaching of indistinguishable. Thus, this temperature should be diminished to with respect to 150-200°C at that the motor will work most quickly. an over the top amount of cooling is to boot not captivating since it lessens the warm intensity or proficiency. Thus, the objective or reason for this cooling framework is to remain the motor running at its most operational temperature while not warm gathering inside the motor. it's to be noticed that the motor is style of wasteful once it's cold and in this manner the cooling framework is assumed in such the way that it forestalls cooling once the motor is warming or warming up and till it accomplishes generally affordable or specialist resistible by motor working temperature, at that point it begins cooling.

ISSN : 2455-9679
SJIF Impact Factor : 6.008

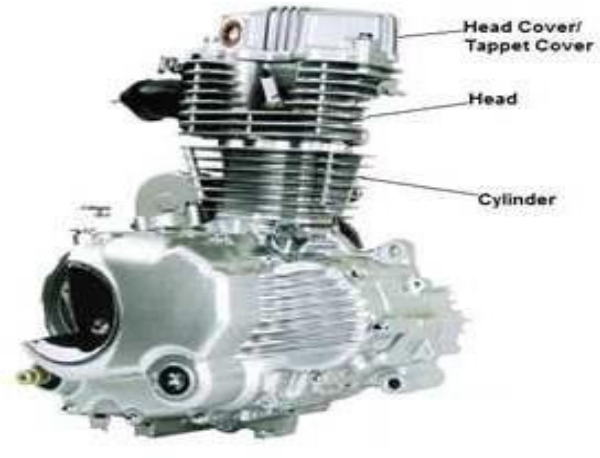


Fig.1 Engine Head

The vitality move from the consuming office of an (IC) start Engines are scatter in three particular habits that. as for 5 percent(%) the fuel essentialness is recoup into significant shaft work or basically mechanical work and concerning percent(%) imperativeness is removed to the vapor. concerning third of the whole warmth created all through the consuming methodology ought to be transmitted from the start chamber through the chamber dividers and plate to the air.

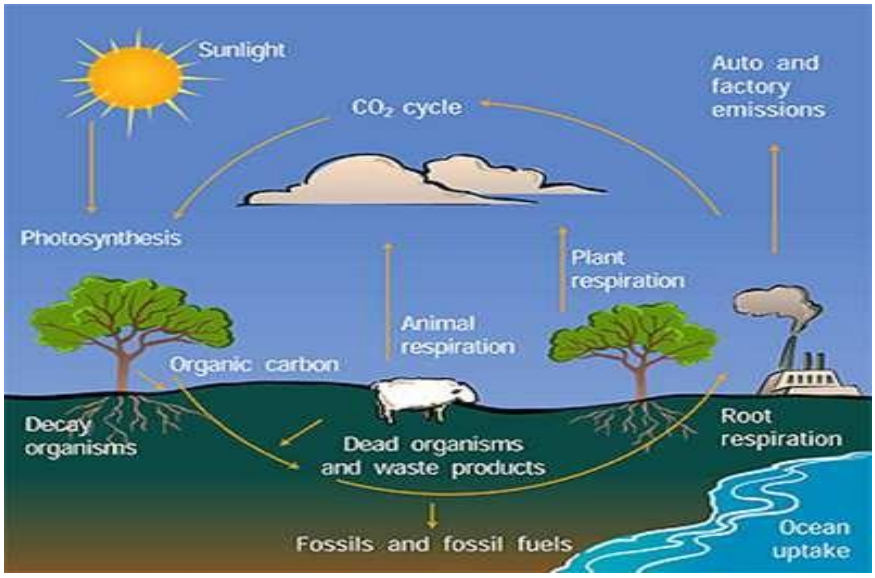


Fig. 2 Fuel Energy

II. MATERIAL PROPERTIES

Aluminum Alloy 6061

Thermal conductivity K = 180 W/m-K=0.2 W/mm-K
Specific heat C_p = 0.896 J/g^{0}C =896J/Kg-K
Density = 2700 kg/m^^{3}

Boundary Conditions:

Melting temperature = 586 ^{0}C
Ambient Temperature: 40 ^{0}
Cylinder Internal Temp. = 285 ^{0}C
Heat Flow = 632.14Watt
Film coefficient value = 5x10^{-006} w/mm^2 ^{0}C

ISSN : 2455-9679
SJIF Impact Factor : 6.008

Aluminum alloy 6061 is precipitation-hardened and primarily consists of magnesium and silicon as alloying elements. It was developed in 1935 and was originally known as "Alloy 61S."[2] It has excellent mechanical properties, is easy to weld, and is one of the most widely extruded aluminum alloys—second only to 6063 in popularity.[3]
Pre-tempered grades like 6061-O (annealed), tempered grades like 6061-T6 (solutionized and artificially aged), and tempered grades like 6061-T651 (solutionized, stress-relieved stretched, and artificially aged) are typically available.
T6 temper 6061 has been treated to give an aluminum alloy made of 6061 the highest precipitation hardening and, as a result, the highest yield strength. It has a minimum yield strength of 240 MPa (35 ksi) and an ultimate tensile strength of at least 290 MPa (42 ksi). It has elongation of 8% or more in thicknesses of 6.35 mm (0.250 in) or less, and its more typical values are 310 MPa (45 ksi) and 270 MPa (39 ksi), respectively.[10] It has 10% elongation in thicker sections. The mechanical properties of T651 temper are comparable. A material data sheet [11] states that the fatigue limit under cyclic load is 97 MPa (14 ksi) for 500,000,000 completely reversed cycles using a standard RR Moore test machine and specimen. The typical value for 6061-T6's thermal conductivity at 25 °C (77 °F) is around 152 W/m K. Because aluminum's S-n graph lacks a clearly defined "knee," there is some debate regarding how many cycles constitute "infinite life." Additionally, keep in mind that the standard de-rating factors of loading, gradient, and surface finish can have a significant impact on the actual value of the fatigue limit for an application.

III. ANALYSIS

Finite part Analysis:
It's a methods for assessing yet an item responds in globe all through powers, heat and liquid stream, vibration and distinctive physical impacts. It to boot assists with validating whether or not an item will fall flat or work the manner in which it had been structured. inside the blessing work Transient warm examination is performed for single chamber four stroke sparkle start motor of Hero Honda 100 cc Bike with the assistance of seat of ANSYS R 19.2.

Transient Thermal Analysis for Actual style of Engine:
Warm investigation may be a strategy inside that a property of the work is observed against the time and in a passing positive district conditions. The warm investigation licenses discovering that however concoction forms that unit related with warming or cooling. Transient warm examination is utilized to make sense of temperature appropriation and diverse warm parameters which can differ over the time. The system of transient warm investigation is exceptionally a lot of equivalent as consistent state warm examination. the preeminent qualification is that for the first [*fr1] applied loads of for the transient warm investigation are a work of it moderate.

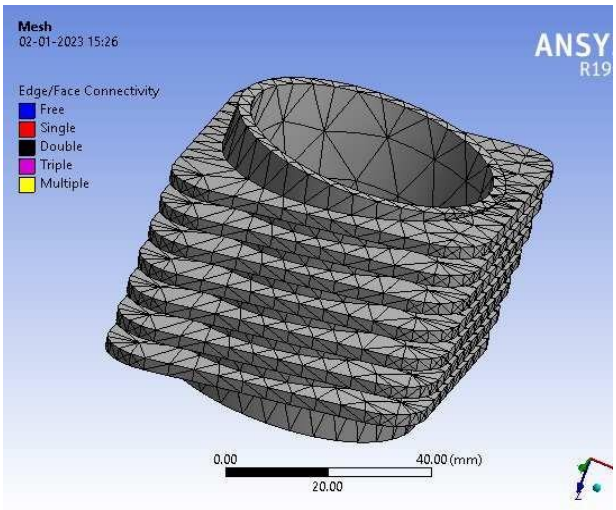
CAD Geometry:
In the blessing work The CAD geometry of motor is made with the assistance of car CAD pioneer programming framework bundle with real measurement, at that point outside in ANSYS seat for any Transient warm investigation. Computer aided design geometry in three dimensional sweep of motor chamber.

IV. BOUNDARY CONDITION

1	**Encompassing Temperature**	284 ^{0}C
2	**Chamber Internal temp**.	284 ^{0}C
3	**Warmth Flow**	632.14 W
4	**Film steady worth**	5x10-006 w/mm^2 ^{0}C

ISSN : 2455-9679
SJIF Impact Factor : 6.008

V. SIMULATION



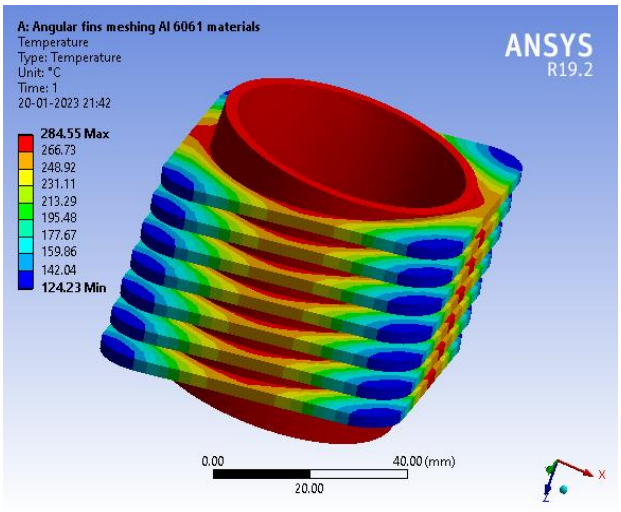
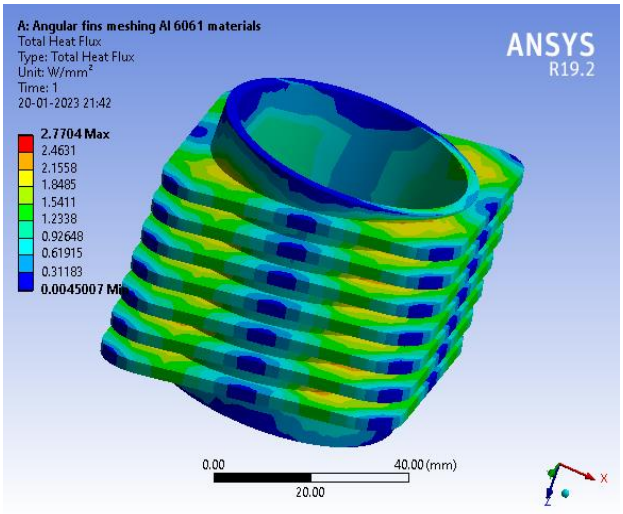


Fig..3 Angular fins meshing Al 6061 materials meshing Fig.4 Angular fins Al 6061 materials temperature result



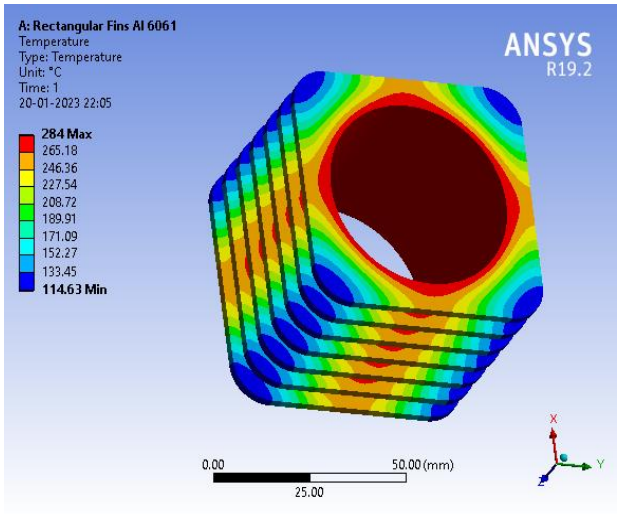


Fig.5 Angular fins Al 6061 materials heat flux result Fig.6 Rectangular fins Aluminium 6061 temperature result

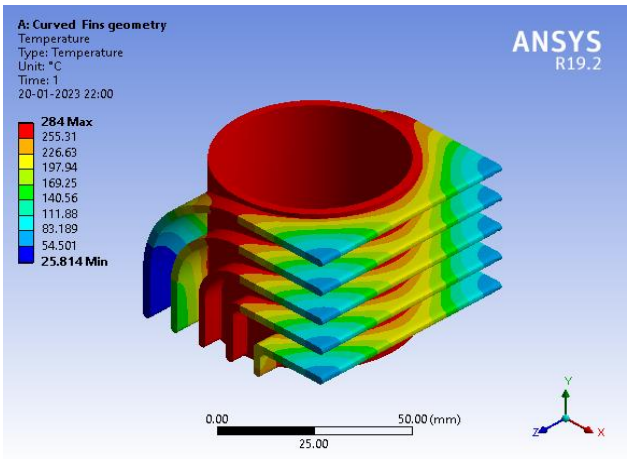


Fig.7Curved fins Al 6061 temperature results

ISSN : 2455-9679
SJIF Impact Factor : 6.008

Table 5.1 overall results summary table

Materials	Temperature/ Heat Flux	Angular Geometry	(Exiting) Rectangular Geometry	Curved Geometry
(Materials) AL 6061	Temperature (^{0}C)	284	284	284
	Heat Flux (w/mm^2)	2.77	4.0	4.76

VI. RESULT & DISCUSSION

Engine life and effectiveness can be progressed with powerful cooling. The cooling mechanism of the air cooled engine is in most cases depending on the fin design of the cylinder head and block. Insufficient removal of heat from engine will cause high thermal stresses and lower engine performance. The cooling fins permit the wind and air to transport the heat away from the engine. Low rate of heat transfer via cooling fins is the primary trouble in this kind of cooling. Here all geometry of engine head fins utilized a motor bike engine head fins model and 3D displaying programming SOLIDWORK 2021 . We have a used one material aluminium 6061 exiting with four different likes geometry rectangular, circular, angular fins, curved fins and curved geometry. Aluminum 6061 then all geometry like rectangular, angular fins and rectangular fins geometry and curved fins geometry get temperature results respectively 284^{0}C, 284.55^{0}C, and 285^{0}C. and 284^{0}C.Here take aluminum 6061 then all four geometry like rectangular, circular, angular fins and curved geometry get heat flux results respectively. 4 w/mm^2 2.77 w/mm^2 and 4.767w/mm^2. So here suggested curved fins geometry is better compared to all geometry.

VII. CONCLUSION

During this paper we have structured a chamber geometry collection of engine head and utilized a motor bike engine head fins model and 3D displaying programming framework bundle SOLIDWORK 2021 and utilized material for balance body is component amalgam balances and inner center with dark cast iron. We have a used one materials aluminium 6061 exiting with three different likes geometry rectangular, angular fins, curved fins and **Curved Geometry.** Exiting rectangular geometry is using but it has low heat flux value. We can suggested new curved shape geometry aluminum 6061 for better engine performance it has more heat flux value compare to exiting geometry.

REFERENCES

[1] M M Abbood, H N Azziz "Investigating the consequences of fin geometry on bike cylinder cooling IOP conference collection: " 1067 012102, substances science and Engineering, 2021
[2] Abhishek Dasore a, Upendra Rajak a, Ramakrishna Konijeti b, Ramakrishna Balijepalli a, okay. Prahlada Rao c, Charan Kumar Ganteda b, Tikendra Nath Verma, Comparative numerical research of square and elliptical fins for air cooled IC engines, 2021
[3] S.Okay. Mohammad Shareef a, M Sai Vikas a, A.L.N Arun Kumar a, Abhishek Dasore c, Sanjay Chhalotre b, Upendra Rajak c, Trikendra Nath Verma d, layout and thermal evaluation of engine cylinder fin body using

ISSN : 2455-9679
SJIF Impact Factor : 6.008

diverse fin Profiles,2021, Https://doi.Org/10.1016/j.Matpr.2021.04.116,2214-7853/ 2021 Elsevier Ltd. All rights reserved.

[4] J. Laxmi Prasad, NEC Prasad, and Bugudala Srinivas, warmness switch evaluation for two-wheeler engine cooling fins by using the usage of CFD, third international conference on "advancements in Aeromechanical substances for manufacturing", https://doi.Org/10.1063/5.0036340, 05 February 2021

[5] B.J. Patil and V. Shetty, Thermal analysis of wheeler engine fins, materials today: complaints, https://doi.Org/10.1016/j., 2214-7853/ 2021 Elsevier Ltd. All rights reserved

[6] I. El Ghandouri, A. El Maakoul, S. Saadeddine, M. Meziane, design and Numerical Investigations of herbal Convection warmth switch of a new Rippling Fin form, carried out Thermal Engineering (2020), doi: https://doi.Org/10.1016/j.Applthermaleng.2020.115670

[7] P. Senthilkumar, S. Rajesh Babu, B. Koodalingam et al., design and thermal evaluation on round fin, materials these days: proceedings, https://doi.Org/10.1016/j.Matpr.2020.02.784 , 2020, 2214-7853/ 2020 Elsevier Ltd. All rights reserved.

[8] C. Thiagarajan, M. Prabhahar, S. Prakash et al., warmness transfer evaluation and optimization of engine cylinder liner the usage of one-of-a-kind substances, substances nowadays: court cases, https://doi.Org/10.1016/j.Matpr.2020.06.173 , 2214-7853/ 2020 Elsevier Ltd. All rights reserved.

[9] S. Padmanabhan, S. Thiagarajan, A. Deepan Raj Kumar et al., investigation of temperature distribution of fin profiles the usage of analytical and CFD evaluation, substances these days: complaints, https://doi.Org/10.1016/j.Matpr.2020.09.404, 2214-7853/ 2020 Elsevier Ltd. All rights rese

[10] Nitesh Kumar Yadav, Suman Bikram Bam, and Sujan Shrestha* examining warmth transfer thru IC Engine Fins," researchgate.Book, August 2019,

[11] Vishal Gupta, Pradeep Kr., Naman Sahu*, Kurmi" Thermal evaluation using FEM on Engine Fins: A assessment," IJTIMES (worldwide journal of Technical Innovation in modern-day Engineering and technological know-how), volume 4, number eight, August 2018

[12] Charan, Srivastav, and Bharadwaj, "warm analysis On square Plate Fin with Perforations the use of Ansys," global magazine of creative studies mind, 2018.

[13] Yakkala, k. Rama Chandra Manohar Somanath, M.Okay. Raghunadh. IOP Conf., "Optimization of Engine Fins of varying warmness transfer and Thermal Conductivity," by way of B. Santosh and B. Koteswararao. Arrangement: Engineering and substances science (2018)

[14] Kiran Beldar and Avinash Patil posted "design and analysis of Chamber having Longitudinal Balances with rectangular Indents" inside the 2017 trouble of the international journal of scientific development and research (IJSDR).