An Effect of Different Parameters of Fins on Heat Transfer of Honda Shine Bike IC Engine

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Abstract - Low rate of heat transfer through cooling fins is the main problem in this type of cooling. The main of aim of this work is to study various researches done in past to improve heat transfer rate of cooling fins by changing cylinder block fin dimensions. So efficiency of the engine is increase by increase the heat transfer. Examples of direct air cooling in modern automobiles are rare. The most common example is the commercials Automobile bike like a Honda Shine, Bajaj bike, Honda splendor etc. From this study, It is conclude about shape try to this fins is more effectively heat transfer in Honda shine bike compare to existing fins. After FEA Analysis it checking on fin whether efficiency of heat transfer increases or not.

Keywords - Fins, Heat transfer rate, Air contact area, FEA, PRO-ENGINEERING, ANSYS.

1. INTRODUCTION

Air-cooling and Water cooling are the main type of the 4S-SI engine cooling system. Water cooling system efficiency is more than air cooling system, but due to some advantages like reduced weight, lesser space requirement and cheaper over water cooling system, most of the Indian Motor-cycles are air-

Figure:1.1 Honda Shine fins [12]

2. SYSTEM MODEL

In this present work FEA analysis of Honda Shine bike fins and it valid with experimentally result. After that FEA analysis and mathematically evaluation of modified existing fins dimensions .To find optimum design of fin with help of trail & error method for increase the contact area to effective heat transfer rate.

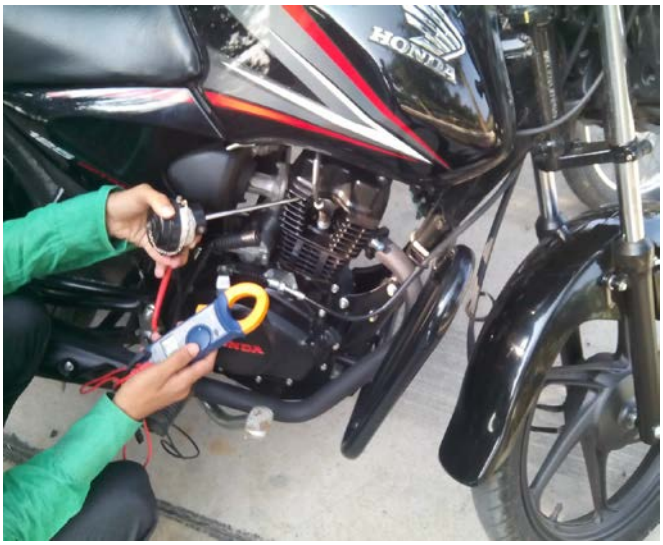

Figure-2.3.1:-Measure temp of Honda CB shine[12]

3. PREVIOUS WORK

- Element type- solid87
- Analysis Type- Thermal
- Material =Aluminum alloy (Cu 4%,si 9% , Mn 2%, Mg 0.09%)
- Thermal Conductivity= 190 watt/m ºC
- Density= 2770Kg/m^3
- Specific Heat= 900J/Kg K
- Length of fin=73mm
- One side height =19.2mm
- Second side height=8.3mm
- Thickness of fin=2.5mm

3.1 FEA ANALYSIS USING ANSYS WORKBENCH SOFTWARE

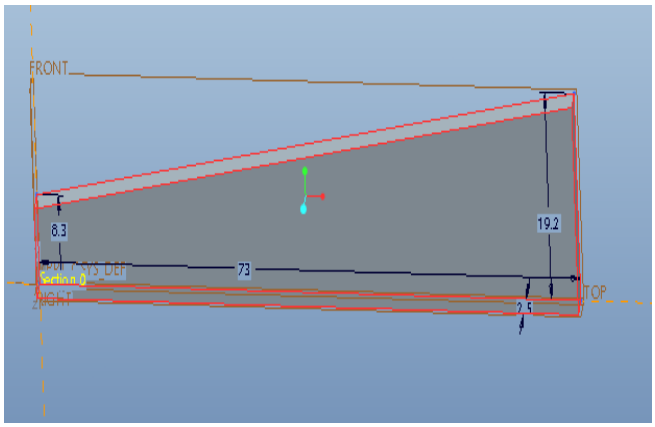

Figure-3.1.1:- Dimensions of Honda CB Shine fin[11]

By using messing tool the fin is dived in the 13127 node. Model of messing is shown in figure for more than 10000 elements it takes more time and for fewer elements the accuracy could now good so I divide in 2448 element for better result.

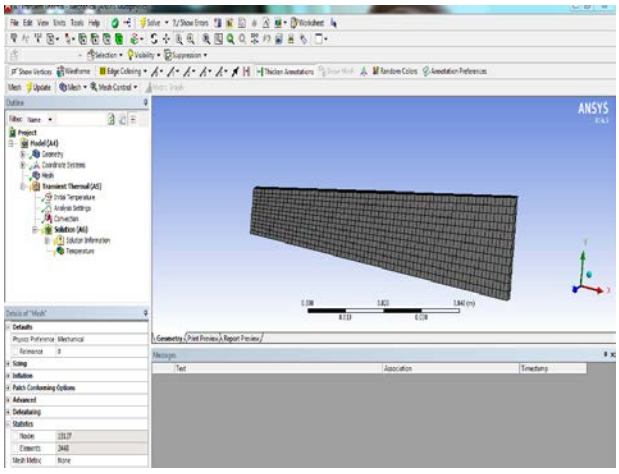

Figure-3.1.2:- Meshing [11]

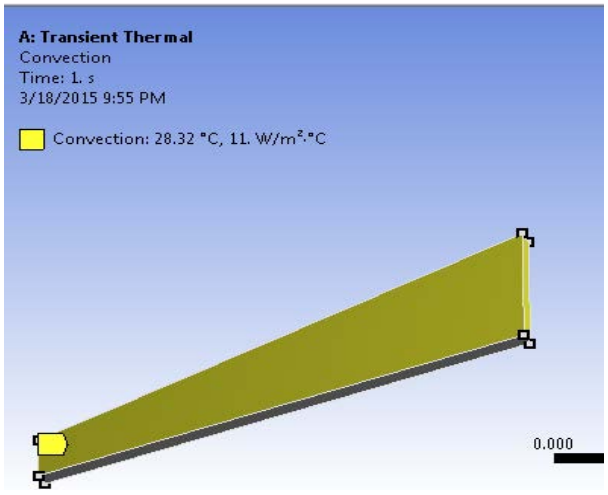

Figure 3.1.3 boundary conditions[11]

In figure Conduction and convection will occurred in fins during heat transfer. Heat transfer process starts when engine stops. 5 sides of fins are in contact of air and one side is contact of cylinder. So in 5 sides there will heat convection will done and in bottom side heat conduction process done.

Shown in figure Fin come to ambient temperature after 1500 sec.

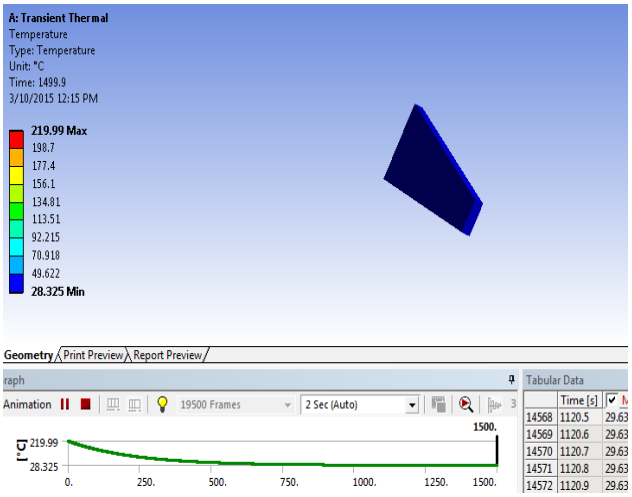

Figure 3.1.4 boundary conditions[11]

3.2 FEA RESULT

Table 2.1 results of **FEA analysis of existing fin**[11]

TIME (SEC)	L=73 t=2 h1=8.3 h2=26	L=71 t=2.3 h1=8.3 h2=23	L=73 t=2.5 h1=8.3 h2=19.2 Existing fin	L=72 t=2 h1=9 h2=26	L=73 t=2.5 h1=8 h2=20	L=72 t=2 h1=8 h2=25
5	215 ºC	215.ºC	216 ºC	215ºC	215ºC	215ºC
50	178 ºC	182.ºC	182ºC	177ºC	184 ºC	177 ºC
100	148 ºC	151ºC	153 ºC	145ºC	155 ºC	144ºC
200	105ºC	107ºC	109 ºC	99 ºC	112 ºC	99 ºC
300	93 ºC	79 ºC	81 ºC	89ºC	84ºC	71 ºC
400	57ºC	61 ºC	62 ºC	54ºC	65 ºC	54 ºC
700	35 ºC	36ºC	37ºC	33 ºC	38 ºC	34 ºC
1120	28 ºC	29 ºC	29 ºC	28 ºC	30 ºC	28ºC
110	28ºC	28 ºC	29 ºC		29 ºC	24 ºC
1200		28ºC	29 ºC		29 ºC	
1250			28 ºC		29ºC	
1300			28 ºC		28 ºC	
1400			28ºC		28 ºC	
1500			28ºC			

4. PROPOSED METHODOLOGY

4.1 FEA ANALYSIS OF ONE MODIFIED FINS

After measuring the dimensions of fin.I have generate the model of that fin in FEA software, length of fin as 72 mm and height is one side 9 mm and another side is 26 mm. the thickness of fin is 2mm.

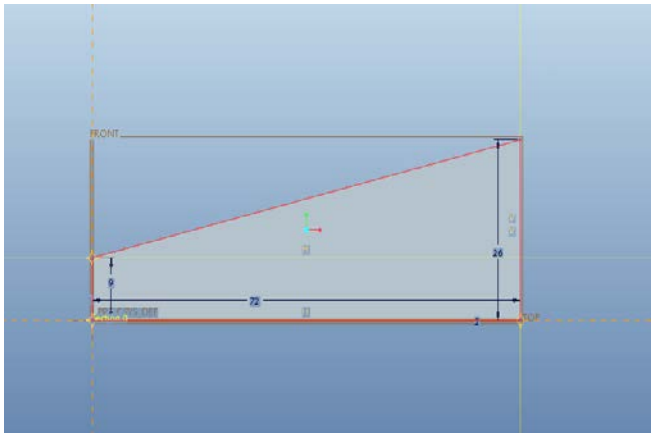

Figure 4.1.1 Modified fin model[11]

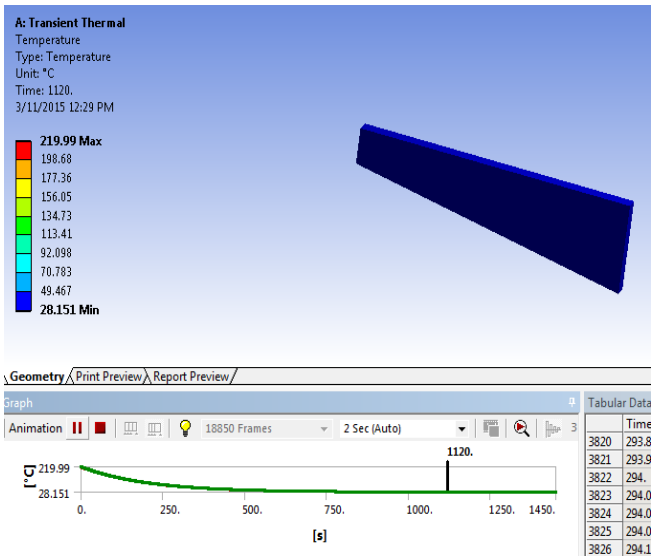

Figure 4.1.2 Modified fin result after 1120 sec[11]

5. SIMULATION/EXPERIMENTAL RESULTS

I take this type different dimensions fins and do its FEA analysis shows reading in below table.

-All fins Ambient temp is 28.32 ºC, t = thickness, h1 = one side height, h2 = second side height, L = length in mm

Table 5.1 FEA result of different modified fins[11]

Time (after stop engine)	FEA result readings
Initial temp.	220°C
5 sec	216.731 ºC
50 sec	182.99 ºC
100 sec	153.3 ºC
200 sec	109.89 ºC
300 sec	81.51 ºC
400sec	62.975 ºC
700 sec	37.764 ºC
1120 sec	29.743 ºC
1500 sec	28.325 ºC

Table shows that Compare FEA analysis of the different modified dimensions fin in FEA software length of fin as 72 mm and height is one side 9 mm and another side is 26 mm. the thickness of fin is 2mm dimensions fin is more effectiveness for heat transfer rate .

6. CONCLUSION

Modified fins dimensions as 72 mm and height is one side 9 mm and another side is 26 mm. the thickness of fin is 2mm is more effective compare to existing fins for Honda shine bike.

7. FUTURE SCOPES

Material and geometry change in fins and optimize of Honda shine bike fins heat transfer

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