Design and Analysis of Core Box

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***Abstract:* During casting process heat is spread in the surrounding which affect the workers. Due to this we are doing an analysis on pattern and insulating over it. In this analysis the temperature reduce up to 40-50C. By doing experiment in shell core machine, we can reduce heat loss and save power consumption. So we are doing analysis in the shell core machine and finding proper solution.**

1. INTRODUCTION

This project is based on study of foundry sand and analysis of shell core machine. In this process the sand constitutes an important role. In this method sand is mixed with resin and send to the hopper. Then the sand is forced into pattern with using pneumatic. The pattern is heated using coils by current during that lot of heat is loosed in that and the radiation from the pattern may affect the worker. Due to this we are doing an analysis on pattern and insulating over it. The temperature of the pattern is taken by laser infrared thermometer. By doing experiment in shell core machine, we can reduce heat loss and save power consumption. So we are doing analysis in the shell core machine and finding proper solution.

The core is a chemically bonded sand shape that creates the interior surfaces of an iron casting. A core box is the tooling used to create the core. High-quality cores are essential to the iron casting process. At Waupaca Foundry, we have the ability to design and manufacture custom core machines. Our machines use three types of core making processes, offering flexibility for both low- and high-volume applications.

2. SHELL CORE MAKING PROCESS

Sand is pre-coated with a resin and poured into a pre-heated core box. In this case, there is no catalyst and the surface is heated until it forms a thin, hard shell. The sand on the inside of the core is uncured and can actually be poured out and reused.

3. COMPONENT DESIGN

Catia Model

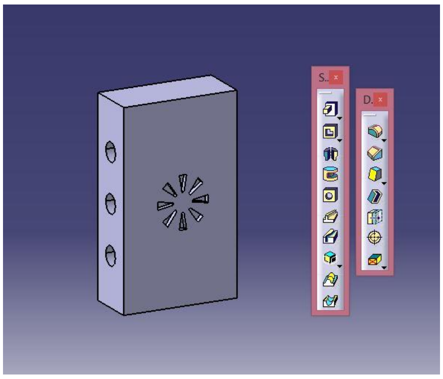

Fig 3.1 Core box.

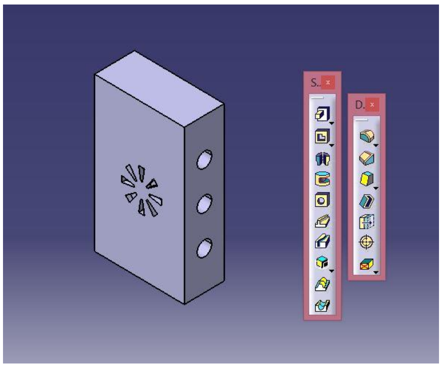

Fig 3.2 Front view.

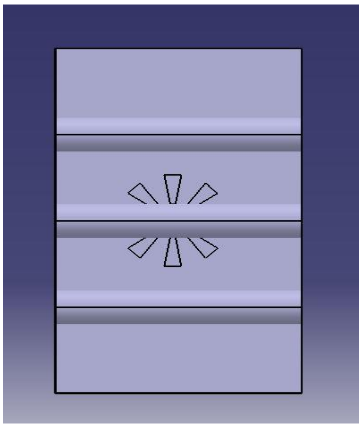

Fig 3.3 Back View

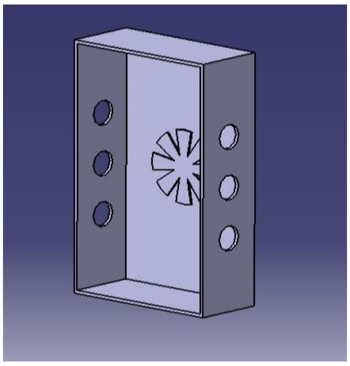

Fig 3.4 Interior View

4. CORE

A core is a device used in casting and moulding processes to produce internal cavities and re-entrant angles. The core is normally a disposable item that is destroyed to get it out of the piece. They are most commonly used in sand casting, but are also used in injection moulding.

5. INSULATION MATERIAL:

Name: Refractory Ceramic Fibre

Density: 9080Kg/m3

Thermal conductivity: 0.02W/mK

6. RESULTS AND DISCUSSION:

BASE MODEL TEMPERATURE PLOTS:

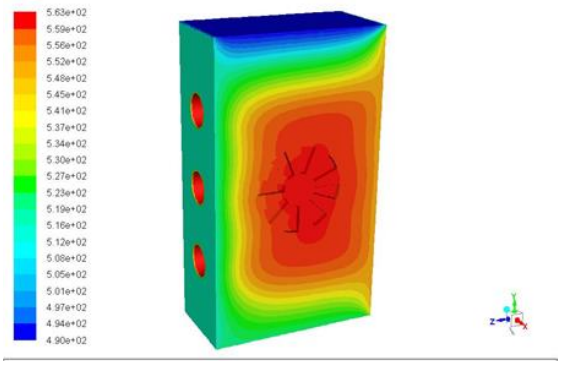

Fig 6.1

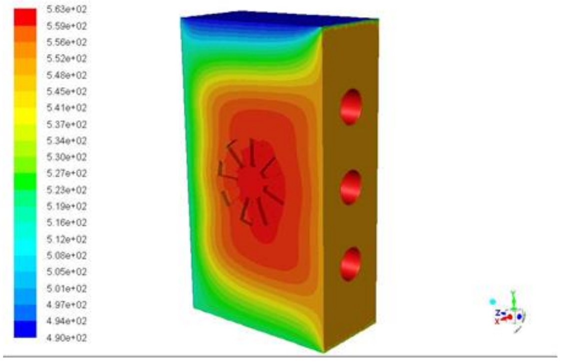

Fig 6.2

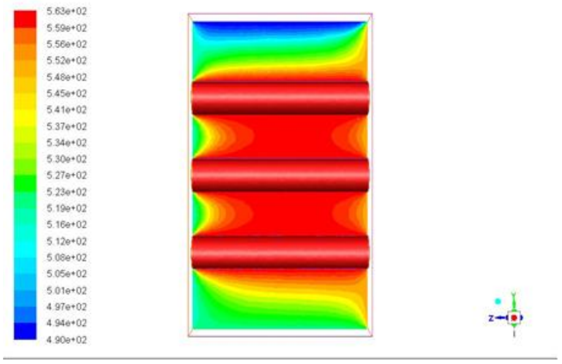

Fig 6.3

From the contour plots of temperature it is observed that the maximum temperature in the core assembly is 563K. Temperatures in other surfaces are arrived from CFD analysis and listed below.

Static Temperature	(k)
core-box	560.03052
core-box:002	546
core-box:003	513
core-box:004	518
core-box:005	490
core-box:006	560.94434

7. INSULATED MODEL TEMPERATURE PLOTS:

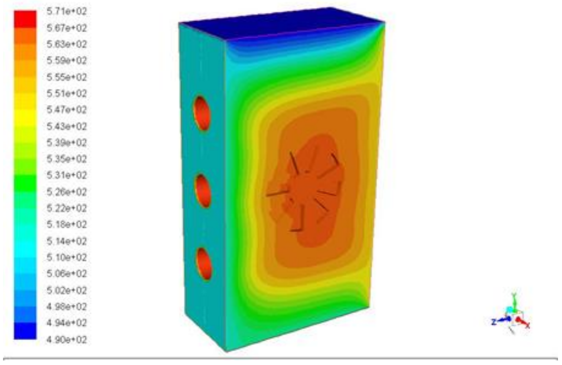

Fig 7.1

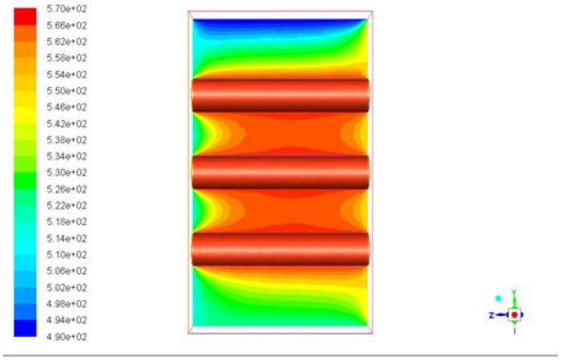

Fig 7.2

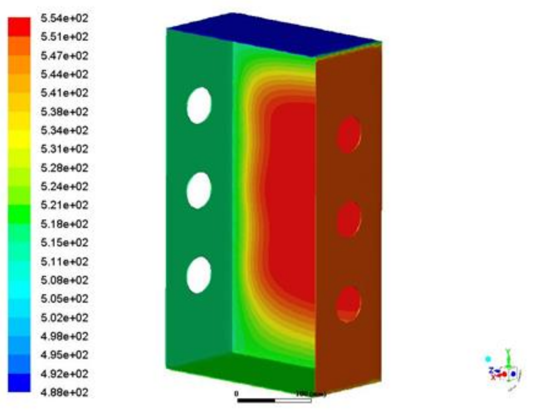

Fig 7.3

Because of introduction of the insulation the maximum temperature inside the core increased and its value is 571K.But the outside temperatures are very much reduced and listed below.

Static Temperature	(k)
insulation-59	489.72412
insulation-59:018	507.53552
insulation-59:019	516.92444
insulation-59:020	532.69269
insulation-59:023	490.74261

8. COMPARISON OF TEMPERATURE BETWEEN BASE MODEL AND INSULATED MODEL:

Static Temperature	(k)
core-box	560.03052
core-box:002	546
core-box:003	513
core-box:004	518
core-box:005	490
core-box:006	560.94434

Static Temperature	(k)
insulation-59	489.72412
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9. CONCLUSION

Thus an exclusive and extensive analysis is executed using computational fluid dynamics (CFD) for core assembly with insulation. From the above plots and graphs it can be very much seen that the temperature distribution become less in case of model insulation. There is a considerable reduction of average core surface temperature by 40-50 C .Thus the inclusion of insulation is found to be effective and efficient in reducing the surface temperature.

REFRENCE

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