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RAPID DEVELOPMENT OF EXPORT CASTINGS IN OUR FOUNDRY BY SIMULATION TECHNIQUES – SOME INDUSTRIAL CASE STUDIES

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Introduction

In the Steel Foundry of Texmaco Rail & Engineering Limited castings for Ukraine Railways, American Railways and Mining Industries for Australia have been developed.
The requirements of international customer are to get quality castings as per their stringent Specification within committed delivery time including development of tooling, samples etc. So, to cope up with this situation policy has been formulated in such a way that can deliver quality castings within committed delivery schedule..

1. **Tooling development at our vendor end with close monitoring by methods departments.**

First we made the relevant method drawings describing the parting line, pattern print design, core print design, number of cores involved and their locking arrangement to eliminate extra fins in a casting, number of loose pieces in core boxes, special instructions for a part of castings either it will be made from cores or self system adopted, contraction allowances, draft allowances specified on pattern and core boxes along with machining allowances and if the casting is a plate type casting requires camber allowances to be specified in the method sheet.
and pattern print to make the pattern and core box model.
Pl. refer the Fig.1 for draft analysis on a pattern green colour showing positive and red colour showing negative draft. and the model of the constructions of core boxes taking into consideration different loose pieces and their stripping arrangements.

Fig.1 Draft analysis on pattern green colour showing positive and red colour showing negative draft

2 ***Finalisation of method of gating and riser design by simulation & experience by prediction chances of defects and suitable corrective measure***

The second step of the development is the finalisation of method of gating and riser design by simulation & experience by prediction of chances of defects and suitable corrective measure to be taken on computer screen to eliminate these defects. refer the Fig.2 for the flow and solidification simulation of side frame casting.

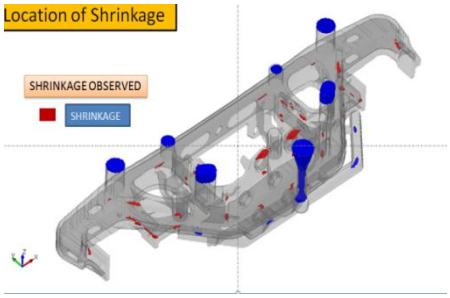

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Fig. 2 Flow and solidification simulation view of side frame

3. ***Defect prediction like hot tear defects or other solidification and flow related defects on computer screen and to take corrective actions to eliminate these defects***

The third step is the Defect prediction like hot tear defects or other solidification and flow related defects on computer screen and to take corrective actions to eliminate these defects.

Case study -Hot tear defects in Bolster casting- Technical Discussions

Fig.3 shows the simulation result of Centre pivot area of Bolster castings. The view shows that the hot metal at this junction whose temperature is 1470 °C which is well within solidus range and is in mushy form and solidifies latter causing hot tearing due to contractional hindrances by mould or core materials. But after positioning of external chills Fig. 4 at this area the temperature at this area found 1380 °C as per Fig.3, which indicates faster cooling of this area and no hot tear found as per Fig 5.

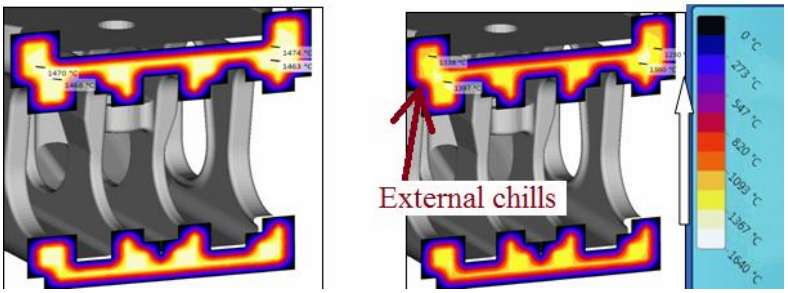

Fig.3 Showing hot zone (temp.1470°C) & No hot zone (temp.1380°C)

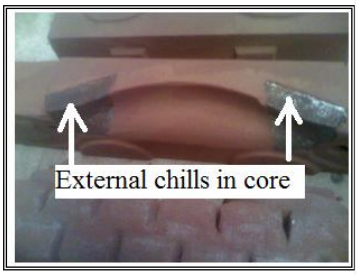

Fig4 External chills to arrest hot tears *Fig 5 Hot tear before and after in real casting*

Conclusion

Simulation results help to predict the defects during solidification and during flow of molten metal. In this way the number of trials for a newly developed item has been reduced considerably.

It has been seen that where the total development time in conventional system is 4 to 5 months but here the total development time by incorporating CNC make metallic tooling, methoding done by simulation results etc. Development time reduces to 1 to 1.5 months.

Acknowledgement

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References

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