

QUALITY IMPROVEMENT AND DEFECT REDUCTION IN HIGH PRESSURE STEAM TURBINE CASTING JOINTS

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Abstract— There is a reoccurring problem in the turbine casting where there are numerous defects in the steam joint area which are required to be reworked after being machined to the required dimension. These defects are primarily occurring at subsurface area and it is further opened after machining of the stock to required dimension and removal of the stock, ^{therefore} its subjected to leakage in steam casing joints which affects the overall efficiency and may lead to turbine failing. The main objective is to identify the cause of the defects in HP steam turbine casing joints and reduce it between upper and lower casing and enable a efficient working of the turbine. This may further help in reducing process time and enabling a better production rate. Blowholes are the major casting defects caused due to evolution and entrapment of gases during casting process. This project aims to develop a systematic approach for blow hole prediction in sand casting based on available knowledge, experience of experts in this area.

Keywords: Keywords: Steam turbine, Casing, Quality control, Defects, Blowholes, Steam area.joint

1. INTRODUCTION:

Sand castings are used in order to manufacture complex shapes. The castings are bound to have one or more defects. The presence of defects may subject casting to rejection. The defect causes stress concentration. More time and money would be saved if it ever becomes possible to produce good quality castings. There are different types of defects produced in sand casting. A high proportion of casting defects are caused due to evolution of gases. In high pressure casings are made two shell castings for the safety purpose. The casings have split in to two section upper half and lower half. Both are

assembled together in order to make a casing around the turbine in which the steam get expanded and power is produced.

2. BLOWHOLES IN SAND CASTING:

to size of the hole and not its origin. Blowholes is very prevalent cause of There are different types of defects produced in sand casting. A high proportion of casting defects are caused due to evolution of gases. gas holes are pinholes and blowholes. This designation belongs casting scrap. Figure 1.1 shows schematic of blowholes, showing blowholes near core, surface blowholes and casting strewn with blowholes. The blowholes are smooth walled cavities, essentially spherical, often not contacting the external casting surface.

The blowhole are usually revealed by machining or by heavy hot blasting. these forms of holes entrapment of more than one short of gas during the course of mold filling and solidification. it is important to know the origin of and reactions producing these gases, so that correct diagnosis and cure can be affected.

3. OBJECTIVE:

- To identify the various causes of occurrence of blowhole and put them together

- To identify corresponding remedies and put them together
- To develop a knowledge base related to blowhole
- Checking this approach for industrial component (HP steam turbine casing) having blowhole defect
- This is an attempt to develop some systematic approach for blow hole prediction, by using knowledge base available in terms of experience, laboratory data and case studies.

4. SCOPE AND APPROACH

- In the domain of casting area of study is limited to sand casting
- Studying various causes and remedies of formation of blowholes
- Studying nature of different types of blowholes
- Checking this approach for industrial components having blowholes

5. IMPROVEMENT OF QUALITY BY VACUUM

One of the most efficient methods introduced for prevention of blowholes, is absorption of gases from the mold or core during casting with the help of vacuum pump. Improvement of Surface Quality of Casting by Creating Vacuum in the Mold During Pouring of Alloys", Indian Foundry Journal, pp 15-23, 1986 In this way, the mold gases are absorbed towards the outside, eliminating danger of their penetration in the liquid alloy.

By imposition of the vacuum in the mold prepared from sand and some bonding material, the following phenomenon is observed

- Reduction of maximum gas pressure developing at mold-metal interface below zero during metal pouring until beginning of solidification, thus avoiding the possibility of blowholes formation

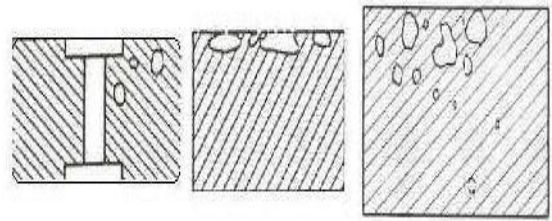
- Gas pressure increase with increase in casting temperature. By creating vacuum this gas pressure will decrease and changes of blowhole formation will diminish

Figure 1.1

- Reduction of gas pressure below zero in cores connected with the system of evacuation directly through the core print, thus avoiding the possibility

6. CONCLUSION

Irrespective of whether metal picks up gas as it fills the mold cavity, gas defect will form when gas pressure exceeds metallostatic pressure. The gas holes not appearing to be



affected by composition of gas. The gas holes form at the end filling and start of solidification.

The approach and the solution are able to predict the blowholes formation in sand casting. Further, it gives approximate idea about temperature drop and hence the idea about pinhole occurrence.

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