

DESIGNING SOP FOR HIGH PRESSURE DIE CASTING BY RISK ASSESSMENT TECHNIQUE

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Abstract – The ultimate aim of an industry is to create a work place safe for their workers, One of the important ways to achieve a safe working place is to follow safe working procedure. High pressure die casting is a manufacturing process in which molten metal is injected into a die casting machine under force using considerable pressure in order to form the solid products. Since the temperature here is very high, risks of getting injured are also more and therefore the workers need to perform their work in a safe manner. This project deals with the analysis of risks involved in the high pressure die casting process using Hazard Identification and Risk Analysis and illustration of Safe Operating Procedures to the workers for carrying out the task in a safe manner.

Keywords: Casting, Mould, Risks, Safe Operating Procedure, Hazard identification and risk assessment.

I. INTRODUCTION

The industry has to identify the hazards, assess the associated risks and bring the risks to tolerable level on a continuous basis. For any industry to be successful it should meet not only the production requirements, but also maintain the highest safety standards for all concerned.

Casting operation being a hazardous operation has considerable safety risk to casting. Unsafe conditions and practices in foundry lead to a number of accidents and causes loss and injury to human lives, damages the property, interrupt production etc.

HAZARD IDENTIFICATION AND RISK ASSESSMENT

Risk assessment is a systematic method of identifying and analyzing the hazards associated with an activity and establishing a level of risk for each hazard. The hazards cannot be completely eliminated, and thus there is a need to define and estimate an accident risk level possible to be presented either in quantitative or qualitative way.

Because of the existing hazards of casting activity and the complexity of casting machinery and equipment and the associated systems, procedures and methods, it is not possible to be naturally safe. Regardless of how well the machinery or methods are designed, there will always be potential for serious accidents. It is not possible for an external agency to ensure the safety of an organization such as a foundry industry nor of the machinery or methods it uses.

The principal responsibility for the safety of any particular casting and the manner in which it is operated rest with the management of that casting division. It is widely accepted within industries in general that the various techniques of risk assessment contribute greatly toward

improvements in the safety of complex operations and equipment.

In many industries there is legislative requirement for risk assessment to be undertaken of all hazardous equipment, machinery and operations taking account of the procedures used for operation, maintenance, supervision and management.

Hazard identification and risk analysis involves identification of undesirable events that leads to a hazard, the analysis of hazard mechanism by which this undesirable event could occur and usually the estimation of extent, magnitude and likelihood of harmful effects.

The objective of hazard and risk analysis is to identify and analyze hazards, the event sequences leading to hazards and the risk of hazardous events. Many techniques ranging from simple qualitative methods to advanced quantitative methods are available to help identify and analyze hazards.

SAFE OPERATING PROCEDURE

SOP's are written instructions that document a routine or repetitive activity followed by an organization. They address all the requirements to perform casting procedures safely. The purpose of SOP's is to maintain consistency with technical operation and to support quality. It describes about process for maintaining, calibrating, and using equipment's.

Before designing an SOP the following should be kept in mind, it should ensure compliances with government regulation and they are usually specific to organization or facility. Hazards in casting process are identified with the help of risk assessment techniques, enabling to design an effective safe operating procedure. The Role and function of SOP's describes the use and content of SOP's in atypical casting operation.

- Developing safe operating procedure describes generic steps and requirements for preparing a comprehensive set of SOP's. Related considerations include the use of committees or teams, staffing, mechanism for gathering input, document formats, and reviews, approval processes.
- Implementing safe operating procedure discusses the requirements and systems needed to ensure that new SOP's are understood and used correctly. Subjects include planning, notification, distribution, accessibility, training and performance monitoring.

Evaluating safe operating procedure defines the purpose and types of formal processes that departments can use to analyse the effectiveness of existing SOP's. General steps and a detailed case study are presented. In an era of shrinking resources, departments must contend with: Expanding organizational missions- emergency medical care, hazardous material response, technical rescue, fire prevention/public education, and terrorism incidents. Increasing legal and regulatory requirements safe work practices, public and employee right-to-know, equal opportunity, performance standards, employee relations, and much more. Increasing complexity in emergency response techniques and equipment-personal protective measures, chemical safety, infection control, building and industrial codes, information management, training systems, and so forth. Increasing coordination and reporting requirements with other groups-emergency response agencies, community managers and planners, mutual aid organization, federal and state government, members associations and others.

Industries must meet these growing requirements in an environment that it is a challenge. Budgets are tight and personnel are stretched thin. The experience of the workforce may be declining due to a decrease in the number of structural personalities and the retirement of more experienced personnel. As a result, the decision that personnel face are more complex and controversial. Mistakes have greater repercussions and cost. Emergency service provides need help understanding and navigating the maze of regulatory and administrative requirements.

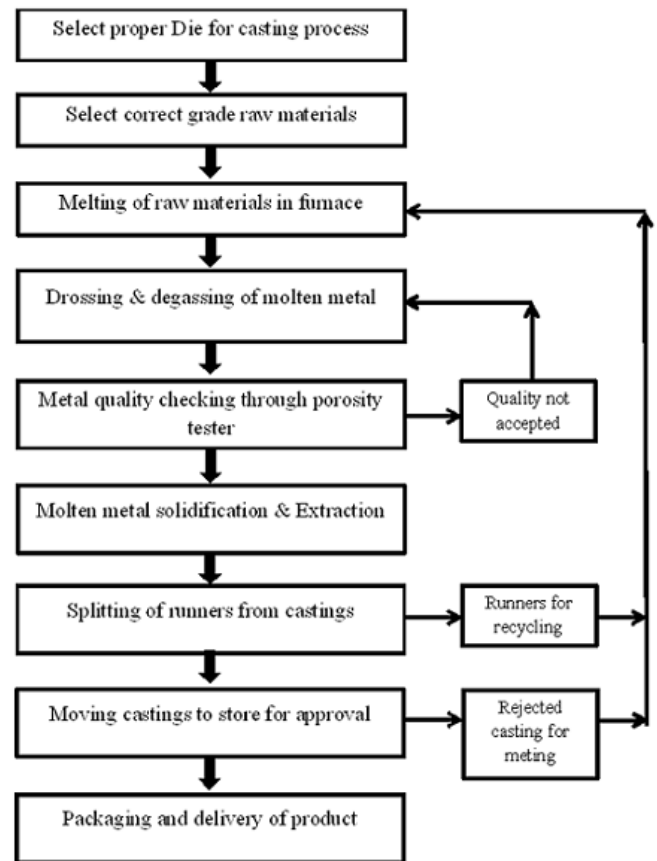


Fig1. Process flow of casting in foundry

II. METHODOLOGY

RISK ASSESSMENT:

- Hazards are identified by using risk assessment techniques in casting process.
- Evaluate and provide risk rating based on the identified hazard.

HAZARD IDENTIFICATION AND RISK ASSESSMENT IN DIE CASTING									
Task	Hazard	Type of Hazard	Probability of Occurrence	Severity of Risk	Risk Rating	Controls	Probability of Occurrence with Control	Consequence with Control	Risk Rating

Table 1 : Risk assessment procedure

- The risk rating can be evaluated by using the formula $RISK = HAZARD * CONSEQUENCE * ELEMENT\ OF\ RISK$

- After the hazards are identified and risk rating are assigned control measures are implemented.

SAFE OPERATING PROCEDURE:

- Observing and analysing all operations in casting process.
- Analysing the unsafe working procedures in each operation in casting process.

COMPANY LOGO - COMPANY NAME			
DOC.No : SOP NO	Page No: 1 Of 1	Issue/Rev. No: 1/0	Rev. Date : D/M/Y
STANDARD OPERATING PROCEDURE – LOCATION – OPERATION			
1. Purpose:			
1.1 Scope:			
1.2 Responsibility:			
1.3 Procedure:			
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Table 2 : Safe operating procedure format

- Preparing Safe Operating Procedure for each operation in casting.
- Implementing SOP in each casting operation.
- Sop casting operations are
 - Raw material storage
 - Issuing raw material
 - Melting raw material
 - Solidification of casting
 - First off-approval
 - Grinding, polishing
 - Packing and delivery

III. RESULT

Safe operating procedure has been created for all die casting operations and verified with the safety officer. Modification and recommendations in the SOP has been carried out as per safety officers suggested. These SOP's will be soon implemented which will result in the reduction of accidents.

IV. CONCLUSION

Thus by analysing all the unsafe working procedure in the casting process, Safe operating procedure are designed and implemented to reduce these accidents which causes severe/ fatal injuries.

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