

# Study Of various Leakage Testing Machine and Defects in Casting Process.

Sonali Kala<sup>1</sup>, Aditya Jadhav<sup>2</sup>, Asst. Prof. Rohit Jadhav<sup>3</sup>

*Students<sup>1,2</sup>, Assistant Professor<sup>3</sup>*

*Department of Mechanical Engineering Nutan Maharashtra Institute of Engineering and Technology, Pune, India*

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**ABSTRACT:**As the title suggests it is a Special Purpose Machine . This machine is manufactured in industry as per the requirement of the customer in order to specify testing need. As structure of many of the component is of the form of a casting tube they must be precisely tested for leak. Hence, for preventing the leakage in the component their is requirement of Special Purpose Leak Testing because the component are required to check for a particular product itself, once used then there is no need of such machine. Hence we make use of SPM. Also industry will train us to design and manufacture the whole machine. The most important consideration is the testing method. Hence Testing based on the application of component testing method is selected. Mostly casting method is used for manufacturing of components. Because of which many defects occur into it which may cause leak in the component. As we know we can't do welding or machining to this casted products so that the defects are minimised. Hence here further we will discuss about the defects that are caused due to casting process and also we will discuss about the various methods to detect the leakage in the component.

**KEYWORDS:**defects in casting, SPM, Automation,Leak testing machine methods, detection of leakage,measurement of leakage and location of leakage.

## I. INTRODUCTION

In industries components are tested to check whether there is leakage present in the component or not. Leak can be defined as the escaping of different fluids or gases from a close medium through unintended crack, joint, hole or porosity in an enveloping wall. As components are used at high application of pressure so they must be leakage proof so that the pressure inside it is not

leaked.Many components are manufactured through casting process. Hence while manufacturing the component lots of defects are associated with it. The defects like Crack, dent, hole, porosity, etc are present into it which causes leakage into the component and hence will affect the functioning of part. In order to prevent the leakage there are many methods to test the equipment for solving this problems. If the leakage rate is present above or below certain specified level then the machine must able to detect the leakage. here are many types of methods which are used for leakage testing such as ultrasonic measurement, bubble test, water immersion bubble test.

## SOAP BUBBLE TESTING:-

In Soap bubble test method the component is not allowed to submerged in water, instead pressurised air is passed through the component. This unit to be examined is sprayed with a pressurized cleaning soap solution. If the operator is able to see the bubbles shaped by way of gas escaping from that means leak is there in component. Some of them have a broom applicator and others have a dabber as an applicator. Some brands actually might have a twig applicator to fast cover massive regions of tubing in a quick quantity of time. This is an advantage that however it likewise messy and timeingesting to smooth up.Some of the soap solutions may have an antifreeze base to prevent them from freezing in the iciness time. Others might also have a decrease density to make them even greater touchy to very tiny leaks.This technique has a better sensitivity than water immersion. It has capability to detect the detection upto 10mbar and is suitable for extremely huge systems. This soap solution technique is quality used while the approximate vicinity in which a leak can also exist is thought. In this situation, the cleaning soap answer is best used in

that specific area to test for and pinpoint a leak. It is the best and least steeply-priced method, material wise, acknowledged these days. However, if the operator does no longer understand wherein the leak is probably, it can be more costly due to exertions prices. Increasing the gas stress increases the chance of pinpointing the leak and is less time-eating. However, for operator protection, the stress ought to be limited to 1700 kPa (250 psi). The cleaning soap-solution bubble take a look at is constrained by a few drawbacks. The region to be sprayed should be a simple and easily accessible surface. On finned pipes or the lowest a part of a massive warmth exchanger, it may be extraordinarily hard, if it is not possible to spray the component with the help of operator then look for the bubble.

#### **ULTRASONIC TESTING:-**

Any form of leaks emits the sound depending on the dimensions of the leak, frequency of the leak can be higher or lower. Very high frequency of sound is emitted for a smaller leaks to locate so an ultrasonic leak detector is used here. Ultrasonic leak detectors are the hand held gadgets that may be used with a couple of headphones, a sensitivity adjustment, a nozzle and a few level of software programs. More complex structures may be used as it is essential to automate the process in a production surroundings as an example wherein more leak detection points are probably gift. This method is not very reliable in case of complicated structures wherein ultrasonic sounds may be reproduced by more than one leaks however different assets too, which do not necessarily mean a leak. Also, the leak fee can't be measured, however the handiest estimated based totally on the frequency of the emitted sound. Device sensitivity is rather low as nicely, as it is able to reliably stumble on leaks best up to 10 mbar. For these motives, this approach is proper to finding large leaks, however it isn't always endorsed for the high-quality leaks in a production environment depending on the tracer gas. Sniffing isn't always encouraged in a excessive quantity production environment, different than for finding leaks for restore. Depending at the tracer gasoline, sniffing may also contain a exceptionally low tooling fee investment, representing a cost effective approach of leak detection. However the cost of tracer gasoline can be vast and in the case of especially pricey gas, the usage of a appropriate fuel recuperation need to be taken into consideration, in addition to increase the overall fees.

#### **SNIFFING:-**

Sniffing is one of the best awareness of an inside-out check. The sniffing is one of the technique of leak detection that makes use of a sniffer detector to sense leaks and then a pressure is passed with a gas called tracer. Unit is need to be evacuated, before filling the unit with a gasoline tracer. Such type of methods are completely based on operator. In fact, the probe is forced to move it over the component and so as to detect the leak if it passes over the leak. probe sensitivity helps to determine the accuracy of the leak detection present in it. On Sniffing does not allowed in a excessive-quantity production environment, different than for finding leaks for restore. Depending at the tracer gasoline in it, sniffing might also contain a exceptionally low tooling tool, investment in fee, this represent a cost effective approach of leak detection. The cost of the tracer gasoline can be high. In case of a especially pricey gas, the usage of a appropriate fuel recuperation and reclaim device need to be taken into consideration, in order to increase the pricey gas in addition increasing the overall fees

#### **DEFECTS DUE TO CASTING:-**

Casting is a process in which we can manufacture a product of any desired complex shape object. It can be formed by pouring the molten metal into the mould that may contain hollow cavity in order to get the required shape. The molten metal that entered firstly flows into the cavity and then the molten metal get solidifies into that cavity. The required shape of the object is obtained as the metal gets solidifies in the cavity. The solidified material is the required product and can be removed from the mould without any difficulty. During this process minor or major defects get produced on the object. Anyhow we can manage the minor defects but it is difficult to manage major defects. Defects that are formed during the casting process are as listed below:-

#### **GAS POROSITY:-**

As we know the molten metal has capability to hold large amount of air in it but as the molten metal get solidifies it can't hold this gases so it releases this gases. Hence due to this formed gas bubbles gets stucked (trapped) in inner side of the metal. These bubbles can include pinholes, blowholes and open holes. Pin holes are formed on upper part of the casting and are smaller in size. They mainly appears in a group and are mainly visible through our eyes. Blowholes are formed on inside part of the casting and are larger in size. This defects can be detected by using

thexray or by ultrasonicanalysis. Open hole Appears on the surface piece add the gas gets trapped inside the mould as the molten metal is poured into it. In order to prevent gas porosity make sure that the moulds are dry and make use of sand that is too fine. also make sure that the molten metal is melted into a vacuum chamber so that it gets prevent from air touching molten metal.

#### **SHRINKAGE:-**

As we know that, as soon as the molten metal get solidifies the alloy metal starts to shrink. Shrinkage defects is the defect that occurs due to shrinkage of an alloy as it keeps cool. When there is uneven shrinkage of a metal then this type of defect occur Which leads to disordernes in the final product .Shrinkage are further classified as open and closed shrinkage. In open shrinkage the holes are formed on the upper surface of the cast products And closed shrinkage appears inside the product in the form of holes Because inside part of molten remain hotter then the rest of the material. The whole stand can be micro or macro. The defect Micro shrinkage can be seened through the eyes while micro Shrinkage can be observed through the microscope itself. This can be prevented by providing a runner and gate system with riser to supply the molten metal when the metal starts to solidifies.

#### **POURING METAL DEFECTS:-**

Pouring metal defects occurs when temperature is too low during the pouring of a metal into the mould. the defects that falls under pouring metal detects are cold shot, cold shut and misrun. Cold shut is a fault in the surface of the piece caused due to improper joining when piece is cast. In this molten metal is poured from two different gates and hence they do not fuse together properly during the casting process. The appearance of crack is seen as these defects are visible through eyes. Misrun defect occurs when the cavity is not fill completely leaving an unfilled portion behind. Before filling the entire mould, the molten metal solidifies fast. This type. of defect occur when the molten metal is poured when it's not that hot enough.

#### **METALLURGICAL DEFECTS**

Metallurgical defects are the defects that deals with the problems that are associated with the molten(liquid) metal. There are two types of metallurgical defects that are hot tears slag inclination and hot spots. In hot tears, when the metal is weak the metals get pulled away due to residual stress in metal. Hot spot defects occurs

when the casting area in mould cool very faster then the surrounding. Slag inclination occurs when slag are not properly removed from the molten metal poured. Honeycomb like structure are observed in a metal because of slag inclination. Hot tears can be prevented by using proper and soft mold design. slag inclination can be reduced by using purified metal that means removing the slag from the molten metal.

#### **II. CONCLUSION:-**

The main aim of the review was to study the different methods for leakage testing machine. Leakage testing machine approach begins with an expertise of why the best is being accomplished followed by the way of establishing. A cautious and thoughtful evaluation at every stage of those steps, blended with the selection of excessive fine test hardware. Also further we studied the different defects that occurs due to casting manufacturing. By referring various research paper causes and remides of various defects are studied and listed above. These will help to quality manage branch of casting industries for analysis of casting illness. For improving the productivity of casting and also improving the yield of the casting this will surely help us.

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