LAB MANUAL

FOUNDRY ENGINEERING LAB

ORISSA SCHOOL OF MINING ENGINEERING
Government of Odisha
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Metallurgical Engineering Department

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Course code: Pr-1

Semester : 6th sem

List of Experiments

1. Introduction to foundry
2. To determine the moisture content in green sand
3. To determine the percentage of clay content in molding sand
4. To determine the green compressive strength of molding sand
5. To determine the A.F.S. green fineness number of molding sand
6. To determine the green core hardness test of molding sand.

INTRODUCTION TO FOUNDRY

Introduction:

There is various manufacturing process by which a product can be made. Each process however has its place and can particularly be added to a certain specific application. Thus products can be manufactured in two or more processes. The real problem is to change the most economical out of them.

Definition:

Foundry is a casting process in which we can get our desired shape and size of the product by melting the metal into liquid and then pouring them into a mould. where they solidified and take the shape of the mould cavity.

Basic steps in the casting process:

1. Pattern Making
2. Core Making
3. Moulding
4. Malting and pouring
5. Cleaning

1. Pattern making:

This is the first step in the casting of a job. Patterns are required to make mold patterns made out of wood, metal, or plastic.

A pattern is a mould or replica of the object to be cast. Sand is packed around the pattern.

Patterns make the mould cavity which is filled with molten metal to becomes the casting.

2. Core Making:

Cores are produced by blowing ramming or in a heated process, investing sand into a core box. They are in finished cores, which can be solid or hollow and are inserted into the mold to provide the internal cavities of the casting before the mould's halves are joined.

3. Moulding:

Moulding consists of all operations necessary to prepare a mould for receiving molten metal. Moulding usually involves placing moulding aggregate around the pattern with drawing the pattern to leave. the mould cavity and closing the mould. The mould is ready for pouring.

4. Melting and pouring:

The preparation of moulding metal from casting is referred to as melting. Melting is usually done in a specifically designed area. Now metal is in the mould through the sprue. Let the cast be cooled for 1 hour inside the mould box.

5. Cleaning:

This is the last step of casting which involves the removal of the casting and desired machining is done to clean the casting.

❖ Precaution*:*

- Observe the correct matching of cope and drag.
- Use safe application during working in the furnace and handling the liquid metal.
- Mould area must be cleaned and placed in a proper height during metal pouring.

EXPERIMENT - 2

AIM OF THE EXPERIMENT:-

To determine the moisture content of green sand.

APPARATUS REQUIRED:-

1. weight balance
2. Cleaning brush
3. Speed moisture teller
4. Calcium carbide

THEORY:-

Function of the moisture clay added in the moulding sand impact bounding action & strength is presence moisture when clay is moistured to do not penetrate sorms a micro or local on the surface of each individual taken so that bonding properties maintain on the surface of each individual takes so that the bonding properties maintain on remaining the micro filler acts in such a way that it takes the grain in & then retain in position.

Speedy moisture teller:-

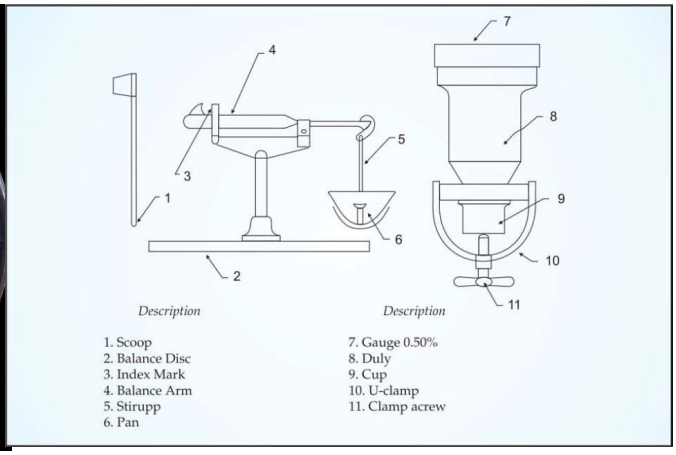
The moisture teller compresses 0.2,0.3, 0.4 to 10gm & a cylindrical which beams of top dial gauge with making 0.100. There are no difference size like inside the cylinder the top course of where dial gauge is founded in lightened by form nuts during working upon the top & put moisture quality sand, calcium carbide surface in sent the steel ball into it carefully that the door & shake 3-4 minutes in sand.

PROCEDURE:-

I. The cores of speedy moisture teller was opened and dried with a brush.
II. Then 50gm of green sand was taken and then put into the tester.
III. Then the calcium carbide powder was taken on a paper as specially measured by the equipment.
IV. Then that paper was put in the tester and made open.
V. Further the equipment was shaken and the reading in the meter was observed.

$CaC_2 + 2H_2O \longrightarrow Ca(OH)_2 + C_2H_2$ (Acetylene)

DIAGRAM:



Description	*Description*
1. Scoop	7. Gauge 0.50%
2. Balance Disc	8. Duly
3. Index Mark	9. Cup
4. Balance Arm	10. U-clamp
5. Stirupp	11. Clamp acrew
6. Pan	

CONCLUSION:-

Pressure reading in drops

- Green sand shake
- Moisture content in green sand
- Clean glass dust from the cylinder

EXPERIMENT - 3

AIM OF THE EXPERIMENT:-

To determine the percentage of clay content in moulding sand.

APPARATUS REQUIRED:-

1. Physical beaker
2. Hot plate
3. Machine beaker
4. Clean crucible
5. Forge not spoun

THEORY:-

The main purpose of clay is to binder impact accessories binding through moulding sand so that the mould does not loose its shape after remaining after percentage of clay gives strength to the sand so that it can remain in its shape as mould cavity. The limit percentage of clay on moulding sand mixes in a proportional. So that it can be directly used, selected and plastically bounded and hardened so as to be maintained the adequate bounding sand time to so as to maintain adequate strength.

PROCEDURE:-

I. 100 gm of moulding sand in a wash bottle and add 4/5ml of distilled water and 25ml of NaOH solution to it.
II. Using a mechanical stirrer, stir the mixture for about 10min and then allow the mixture to settle down for 10 min.
III. Then remove 500 ml mixture and again add 50 ml water and stir the content again. Allow the mixture to settle down for 10 min.
IV. Repeat the above procedure for 8-10 till the water becomes clear in the wash bottle.
V. Transfer the wet sand from the bottle into a tray and dry it to remove moisture.
Note down the dry sand weight accurately.

CALCULATION:-

Weight of moulding sand W1 = 145.492 gm

Weight of dried sand W2 = 161.604 gm

$$\% \text{ of clay} = (W_1 - W_2)/W_1 \times 100$$

DIAGRAM:-

EXPERIMENT: CLAY CONTENT TEST

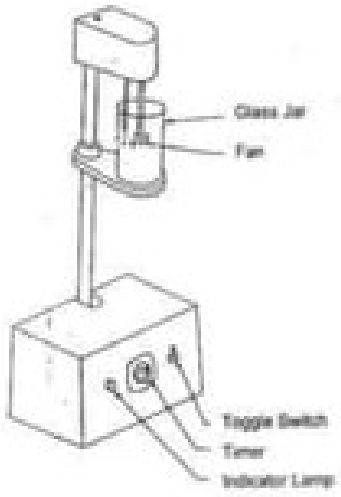


Fig: 1 CLAY WASHER

CONCLUSION:-

We found clay content in moulding sand is ------%

EXPERIMENT-4

AIM OF THE EXPERIMENT:-

To determine the grain compressive strength of moulding sand.

APPARATUS REQUIRED:-

1. Sand ramming machine (rammer)with specimen tube base
2. Stripper
3. Universal sand testing machine with compression shackles

THEORY:-

- The constituent of moulding sand are silica sand clay,water and other special additives.
- Clay imparts the necessary bonding strength to the moulding sand when it is mixed with Bentonite, water etc.
- Compression test determines the bonding or adhesiveness power of various bonding materials in green sand.
- The green compressive strength of foundry sand is the maximum compressive strength a mixture is capable of developing when it is moist condition.

PROCEDURE:-

I. Prepare of a standard sand specimen with the help of a sand rammer and standard specimen box was done.

II. The compression pads were inserted in respective position to apparatus.

III. The specimen was placed between the pads such that the plain surface of the specimen touches against the pads.

IV. The load was gradually applied on the specimen by rotating the hand wheel on a clockwise direction till specimen is fractured.

V. When the specimen was fractured the needle of the pressure gauge returns to its original position while the red pointer of the pressure gauge remains at the maximum reading.

VI. The corresponding reading on the compression strength scale of the pressure gauge was noted.

VII. The above procedure was repeated for four more times and the corresponding readings were taken.

VIII. Then the average of five readings is calculated, which shown respective compression strength of given sand sample.

Observation table:

NO. OF SPECIMEN	STROKE	COMPRESSIVE STRENGTH

1		
2		
3		
4		

SAND RAMMER

CONCLUSION:-

The average compressive strength of given sand sample is _____

EXPERIMENT - 5

AIM OF THE EXPERIMENT:-

To calculate the grain fineness number (GFN) of moulding sand.

APPARATUS REQUIRED:-

1. Sieve shaker
2. Moulding box
3. Sieve of different mesh size
4. Sand
5. Electronic weighing scale
6. Stop watch

THEORY :-

1. The base sand is a mixture of grains having a variety of shapes such as

a) Round

b) Sub-angular

c) Angular

d) Compound grain

Base sand is relatively free from any binder OR additives.

2. Depending be on the average size of the grains,the sand can be grouped into

a) Fine

b) Medium

c) Coarse grain

3. The shape & size of grains has a large influence on the permeability of sand mix as well as on the bonding action.

4. The shape & size of grains determine the possibility of its application in various types of foundry practices.

Ex :- Fine grain sand result in good surface , on the casting but gases can not escape out of the mould made from it. Coarse grain sand allows gases to escape out easily but the casting surface will be rough. Hence grain size should select appropriately.

5. The given size of sand grains is determined by a number called grain fineness number that indicates the average size of grains in the mixture.

6. The size is determined by passing the sand through sieves having specified apparatus which are measured in microns .

7. The sieve number designated the pore size through which the sand grains, may pass through it or retained in it.

8. Average grains fineness number can be found out by the equation.

GFN = Q/P

Where ,

Q = sum of product of % age sand retained in sieve & corresponding multiplier

P = sum of percentage of sand retained in sieve

SIEVE SHAKER

PROCEDURE :-

i) 100 gms of dry sand was taken by taking the weight measurement in Electronic weighing scale.
ii) Then the sand is placed on the top of the sieve series & the lid was closed.
iii) The whole assembly of sieves was placed on the sieve shaker & clamped.
iv) Then the motor was on & the sieve assemble was allowed to shakeminutes. Then the motor was switched off.
v) The retained sand particles were collected & their weight was measured inthe electronic weighing scale.
vi) Then their measurements were converted to a tabular form.

TABULATION :-

SL no.	Mesh size	Weight %	Factor	Product
01				
02				
03				
04				
05				
06				
07				
08				

CALCULATION :-

Total sum of the percentage of sand retained on pan & each sieve =

Sum of product =

AFS or **GFN =** sum of product/total no. of the % ge of sand retained on pan & each sieve

CONCLUSION :-

EXPERIMENT - 6

AIM OF THE EXPERIMENT:-

To determine the green core hardness test of moulding sand.

APPARATUS REQUIRED:-

1. Sand ramming machine with specimen tube with base
2. Stripper
3. Core hardness tester

THEORY:-

- It involves testing the hardness of both green and baked cores
- Green core hardness can be tested by using the mold hardness tester having a larger indenter, green strength of the cores as compared the molds.
- The tester employed for finding baked core hardness uses a knife-edge indenter (because of the hardness of the backed cores)which is spring loaded and scratches the core surface.
- The tester is slowly drawn over a flat baked core surface and the hardness is directly read from the dial of the tester.

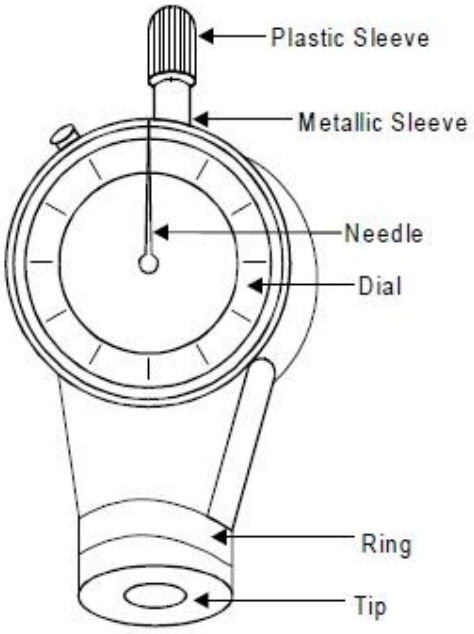
PROCEDURE:-

1. Prepare a standard sand specimen with the help of sand rammer and standard specimen box.
2. The tester employed for finding baked core hardness uses a knife-edge indenter (because of the hardness of the baked cores) which is spring loaded and scratches the core surface.
3. The tester is slowly drawn over a flat baked core surface and hardness is directly read from the dial of the tester.
4. Repeat the above procedure for two more times and take its corresponding reading.
5. The average of these five reading shows average core hardness of given sand sample.

TABULATION:-

No of specimen	Stroke	Core hardness test num .
01	3	
02	4	
03	6	
04	8	
05	10	

DIAGRAM:-



Mould Hardness Tester

CONCLUSION:-

Hence, we found the core hardness of moulding sand.