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Report on the Exercise of Sand Casting

# Introduction

Sand casting is a type of the casting manufacturing process. Casting generally is divided into two broad kinds, viz;

1. Expendable mould casting
2. Permanent mould casting

Sand casting is under expendable mould casting which is either made from a permanent pattern or an expendable pattern. Sand casting is so named due to the use of sand in making mould that is used for the process. It involves basically, making a pattern, a replica of the part to be cast; from wood. The mould is made by packaging green sand (a mixture sand, clay and water) around the pattern and ramming the sand to form a compact shape around the pattern. The pattern is removed from the mould and allocations are made for sprues, gating system, and risers. If there is a hole within the pattern, cores are placed in the mould to cater for that. The molten metal of the material type desired is poured into the mould and allowed to cool and solidify. Once solidified the casting can be removed by destroying the mould and the sand recycled. The casting is then finished to obtain precise dimensions.

# Objective of exercise

1. To make a mould for a prepared pattern.
2. To familiarize with the process of melting and pouring metal in the sand casting process.

# Tools, equipment and materials required

1. Sand
2. Clay
3. Water
4. Mould board
5. Flask
6. Pattern
7. Sieve
8. Shovel
9. Rammer
10. Strike-off bar
11. Casting spoon
12. Gas furnace
13. Crucible
14. Tongs
15. Metal bristle brush

# Method

The process of sand casting involves three main stages, viz;

* Pattern making
* Mould preparation
* Material melting and pouring

The pattern used was made from wood and was already made before the exercise, thus the sand casting was the kind with the permanent pattern.

# Mould preparation

1. The drag (bottom part of the flask) was inverted onto the mould board.
2. The board was spread with a layer of parting powder.
3. The cross section of the lower part of the pattern was placed on mould board, positioned at the middle of the drag.
4. With a sieve, moist sand was sieved onto the pattern in the drag and compacted around the pattern to obtain the facing sand.
5. Additional sand which was not sieved was added onto the facing sand until the flask was well-filled and compacted.
6. The strike-off bar was used to remove the excess sand over in the drag and level the drag to the height of the flask. This completed the drag.
7. The drag was turned over.
8. The cope (upper part of the flask) was placed over the drag.
9. A layer of parting powder was spread over the drag precluding the area of the cross-section of the lower part of the pattern. This was to facilitate the lifting of the cope from the drag.
10. The upper part of the pattern was placed exactly onto the lower part such that they fitted into each other.
11. Sprue and riser pins were placed vertically at suitable positions supporting them with pattern sand. It is a preferable practice to place the riser at the highest point of the pattern.
12. The cope was filled with sand and compacted using a rammer.
13. The excess sand was removed from the top of the cope.
14. The cope was lifted from the drag placed onto the mould board.
15. Both halves of the pattern was removed from the drag and the cope.
16. A gate was cut from the lower base of the sprue to the mould cavity. The diameter of the runner was reduced as the mould cavity was approached to prevent slug from entering the mould cavity.
17. Cope was carefully placed over the drag again and clamped. This completed the mould preparation.



# Material Melting and Pouring.

This stage involved the furnace charging, holding and melt treatment and pouring into moulds.

The process was as follows;

1. A crucible was filled with broken pieces of the metal to be melted.
2. The crucible was put in the pit of a furnace.
3. The crucible with its content were heated to the pouring temperature of the metal.
4. The molten metal in the hot crucible was brought out with aid of tongs.
5. The molten metal was poured into the mould through the pouring cup and the sprue.
6. The molten metal was allowed to cool and solidify.
7. After solidifying the cope was lifted off the drag and the mould broken to obtain the casting.
8. The casting was brushed with a metal bristle brush to remove the sand still attached to the surface.

Post casting practices such as fettling and machining are done to obtain the precise dimensions needed.

# Conclusion

Sand casting as observed from the exercise is relatively simple process and owing to that has become very widespread among local manufacturers. With improvement in the technology, more advantages can be drawn from it and the limitations reduced.

# Reference

The New Metallurgy of Cast Metals by John Campbell