Development of Resin Coated Sand

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Introduction

Resin Coated Sand is an economical and excellent material to produce Cores & Molds in Foundry practices around the globe. To achieve precise dimensions, smooth core surface and defect free casting, it is highly recommended to employ shell molding/core making process by international foundry experts. Resin Coated Sands are specially formulated to reduce emissions, smoke and odor during production of cores and moulds in ferrous and non-ferrous metal casting.

1. Advantages

- Castings can be produced with close tolerance and with very minimum machining allowances along with excellent surface finish.
- It gives an exceptionally high hot strength
- Gas evolution is very low during pouring
- It develops uniform build-up with faster rate of cure
- It is highly resistant to peel back.
- It is very dry, smooth, and free flowing with good resistance to moisture
- Exceptionally smooth and excellent surface finish of the casting with no sand fusion
- Shelf life of the resin coated sand is more than 6 months.
- Hollow cores can be produced.
- Lump free sand.
- High transverse strength.
- High production with uniform baking of sand.
- Special fine Resin Coated Sand doesn’t require refractory coatings or core paint.

2. Manufacturing Process

- **Raw Material**
  - Dry washed sand having AFS No. 80 - 90,
- **Additives/Chemicals**
  - Spirit (1:1 ratio to Resin)
  - Hexamine (catalyst) (11 – 14 % of Phenolic Resin)
  - Calcium Stearate (release agent) (3.5% of Phenolic Resin)
  - Phenolic Resin (balance percentage)
Process Flow Chart

Pheonolic Resin → Non-Homogenous Solution → Heat up to 4 hrs → Homogeneous Solution → Add 14% Hexamine → Add 3.5% Calcium Stearate → Resin Compound → Add in Mixer →
- Time: 17 min
- Heat at 360 °C
- Silica Sand

Result: Resing Coated Sand
3. Methodology

**Batch Weight = 50 Kg**

There are two major steps involve in production of “resin coated sand”

Quantity of materials for 50 Kg sand preparation

<table>
<thead>
<tr>
<th>Additive</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spirit</td>
<td>1.25 liter</td>
</tr>
<tr>
<td>Phenolic Resin</td>
<td>1.04 kg</td>
</tr>
<tr>
<td>Hexamine</td>
<td>175 gm</td>
</tr>
<tr>
<td>Calcium Stearate</td>
<td>44 gm</td>
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</tbody>
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(A) **Resin Solution Preparation Step**

i. Add 1.04 Kg phenolic resin in 1.25 liter Spirit and heat it until Phenolic Resin completely dissolves in spirit, this process takes 4 to 4.5 hours

ii. Cool it & add Hexamine 175gm (14% of phenolic resin) in the above solution and allow it to dissolve.

iii. Add Calcium Stearate 44 gm (3.5% of phenolic resin).

iv. Solution is ready.

(B) **To prepare a batch of 50 kg resin coated sand:**

i. Set temperature of Sand Coating Machine’s temp at 360°C.

ii. Turn ‘ON’ the Heaters of Coating machine until it achieves the required temperature.

iii. Add 2.5 liter (5%) prepared resin in 50 kg sand.

iv. Operate mixer about 15 – 17 minutes.

v. Before extracting sand turn ‘ON’ Vibrator, automatically followed by sieving, for breaking the sand lumps and cooling it which give finally graded, fine sand of homogeneous quality.

vi. Pack sand in plastic bags of 25 Kg each for storing it up to indefinitely time

4. Precautions
1. Pre-coated sand should be kept dry and without exposure to excessive heat, which causes clumping.
2. Hexamine & Spirit are highly flammable and harmful for health (organic compound)
3. Avoid over baking, agglomeration can result due to this.
4. Resin limits up to 4 to 6%, it will depend upon the size, shape of the Core.
5. Cast iron or SG Iron Dies are recommended for core production by resin coated sand rather than copper or brass, as ammonia released during curing will cause corrosion.
6. Phenol and ammonia are released during curing, so good ventilation is needed at Core Shooters Machine.

5. Applications

It’s used in automobile foundries (both for ferrous and non ferrous), mainly at Pump and Motor Casting foundries, Engine Block foundries and other general Engineering Industries.

By using resin coated sand on core shooter machines a wide range starting from very simple shape to most complex and intricate can be produced with high accuracy and minimum rejection rate. In addition to excellent surface finish casting can be produced with close tolerance with very minimum machining allowances.

6. Cost Comparison

I. Imported Cost approx Rs. 45/Kg
II. Locally manufactured approx. Rs. 25/Kg

That gives almost Rs 20,000 pkr/ton saving.