V-Process Casting (VPC)

Ferrous & Non-Ferrous Castings.

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[1]A Mechanical Engineer and MBA having 30 years of diversified experience in Product Application and implementing new Concepts and Project in India. Liquid Helium, Brewpubs, Lost Foam Castings(v-LFC) and V-Process (VPC) are few of the Products and Processes introduced in India by his efforts.

What are new Solutions & Technologies in foundry today?

The foundry which can use all its resources efficiently, with minimal wastage and pollution to environment, would be an ideal foundry today. Other than Power/Energy the most important input in any of the sand-casting foundries is "Sand".

In conventional sand foundries, be it Green Sand Process, Resin Sand Process or Shell Sand, sand needs binders to serve our needs to make various types of moulds. The sand from these moulds after use is to be reclaimed. Most of the smaller sand foundries do not have Sand Reclamation units because of Capital Investment and its Operational & Maintenance Costs. Of Course, these binders are also Pollutants to some degree in the Shop Floor as well as when thrown out as waste. The process of reclamation is prone to breakage of sand grains which lead to suspension of fine fibrous silica dust in the air, leading to life threatening disease called Silicosis to the manpower exposed to it and often wrongly diagnosed by Doctors as Tuberculosis. All these adds to cost to the foundry owner and the society at large.

New Technologies and Solutions:

1. Vacuum assisted Lost Foam Casting (v-LFC)
2. **V-Process (VPC) Vacuum Process Casting Process**
3. Freeze Cast (FC)
4. 3-D Printing (3DP)

Such High Energy Efficient Modern Moulding Lines are the answers to these above issues.

LFC, VPC, FC & 3D Printing needs no sand binders. The Mould strength is achieved by vacuuming in specially designed flasks or boxes. Adequately designed vacuum arrangement guarantees equal mould hardness in horizontal as well as vertical walls of the mould. In V-Process Moulding system, after pouring and cooling of casting, there is no vigorous effort & time-consuming Knockout Process, just topple the flask, the free-flowing sand goes into the sand cooler after dust-removal and back to hopper for moulding.

1. Steel, Ductile Iron & Grey Iron, Non-ferrous all can be cast very successfully
2. Environmentally friendly and Pollution Free workshop.

V-Process (VPC) or Vacuum Process Casting

Pioneered by HWS-Sinto V-Process has a high efficiency in making sound castings. This is yet another moulding process which doesn't need any chemical or organic binders in the sand for moulding. One of the foundries which adopted VPC in India could envisage to double its moulding capacity in 2 years' time, after all his process cost had become economical by 20-25% by adopting this process.

India presently has 3 operational V-Process Foundries casting Counterweights & exporting most of their products. One more foundry is under installation for Counterweight for Forklifts, Cranes & Earth Moving Products.

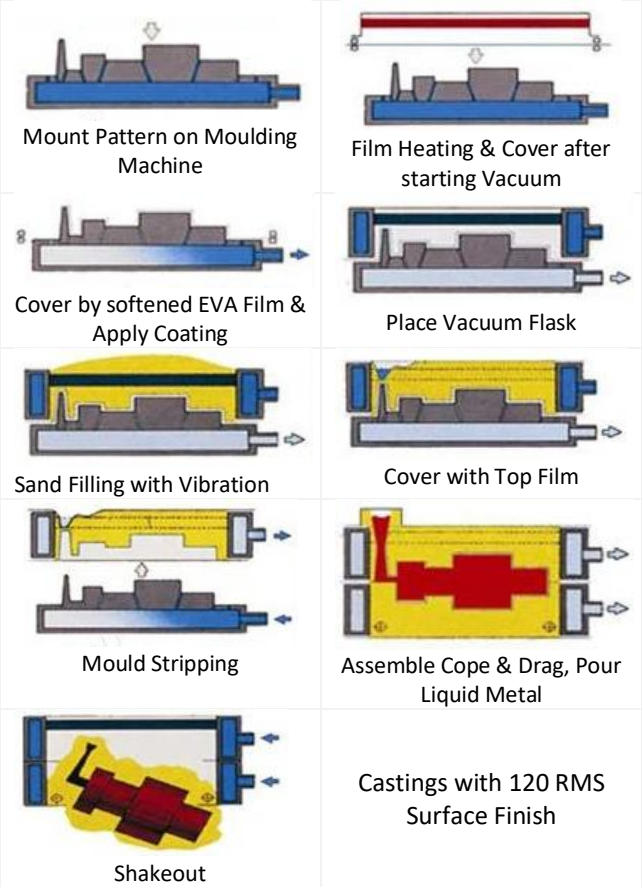
Two more V-Process foundries are coming for Wear Resistant Castings like Jaw Plates, Cone-Mantel and various Engineering Castings.

Which Foundries can adopt V-Process?

Foundries which are into Railway Castings in India making Side Frames, Bolsters for Casnub Bogies, Coupler etc and CMS Crossings, Axle Housing, Gear Boxes, Brake-Drums should immediately target to reduce sand cost and shop-floor related pollution in their foundries.

Foundries making large wear resistant Mn-Steel castings like Jaw Plates, Blow-Bars, Cone and Mantel should reduce their cost of resin sand usage and cost of Primary, Secondary Attrition and Thermal Reclamation and related manpower and maintenance costs.

V-Process Steps:



Step 1: The pattern (with vent holes) is placed on a hollow carrier plate.

Step 2: A heater softens the 0.02 to 0.3 mm EVA (ethylene-vinyl acetate) plastic film. EVA Plastic has good elasticity and a high deformation ratio.

Step 3: Softened film drapes over the pattern with 0.3 to 0.6 Bar vacuum acting through the pattern vents to draw it tightly around the pattern.

Step 4: The flask is placed on the film-coated pattern. Flask walls are also a vacuum chamber with the outlet shown at right.

Step 5: The flask is filled with dry, un-bonded sand. A slight vibration compacts sand to maximum bulk density.

Step 6: A sprue cup is formed, and the mould surface levelled. The back of the mould is covered with unheated plastic film.

Step 7: Vacuum of 400-550 mmHg is applied to the flask. Atmospheric pressure then hardens the sand. The vacuum is released, pressurized air is introduced into the carrier and the mould is stripped.

Step 8: The cope and drag assembly form a plastic-lined cavity. During pouring, moulds are kept under vacuum.

Step 9: After cooling, the vacuum is released and free-flowing sand drops away leaving a clean casting, with no sand lumps. The sand is cooled for re-use.

Benefits of V-Process

1. Reduction in Sand Consumption 98%
2. No water, no binder and no additives in Sand
3. Cost reduction by about > 20%
4. Very Smooth Surface Finish 120 RMS
5. Excellent Dimensional Accuracy
6. Zero Draft
7. Thin Wall Sections Possible
8. Excellent Reproduction of Details
9. Increased Pattern Life (no wear of pattern)
10. Very Easy Knock-out, within no time.
11. No sand sticking or inclusion
12. No toxic fumes from burning the binders
13. Excellent sand permeability
14. Moisture related casting defects is zero.
15. Yield increases.

The dimensional accuracy and weight constancy of the castings are excellent. The same applies to large casting dimensions, high casting weights and difficult geometric moulds. The reproducibility of the good values at the serial production is excellent, from batch to batch there are no differences ascertainable.

Approximately ± 0.3 % can be indicated as a reference value for the dimensional accuracy.

Examples by V-Process

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<tr><td>CI Coke Oven Doors by V-Process</td><td>Mn-Steel Track Shoe</td></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td>CI Counter Weights</td><td>Casnub Bolster for Railways</td></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td>Mn-Steel Cone Mantel</td><td>Casnub Side Frame for Railways</td></tr>
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CMS Crossings for Railways by V-Process (VPC)</td></tr>
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VPC today has very promising future in Indian foundries, where because of various types of pollutions now young capable engineers refrain to join. These options are win-win situation for Foundry Owners and Executives. Sooner the better Foundries should do an audit towards adaptation of these modern moulding technologies and increase profit margin per kg.

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References:

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