THE INSTITUTE OF INDIAN FOUNDRYMEN

WESTERN REGION

FOUNDRY TALKS

Foundry E-Magazine

For The Foundrymen By The Foundrymen

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INNOVATE TO ELEVATE
IIF-WESTERN REGION 2022-23

Innovation Article By

GANESH QUALITY MACHINES PVT. LTD.
Offering quality solutions to foundry world since 1978

HA GROUP

MESSAGE FROM CHAIRPERSON

The Croning Process

Anuja Sharma
Chairperson, IIF-Western Region
Dir.-Mrkt.-Shamlax MetaChem Pvt. Ltd.

During the last few decades, Foundries have shifted from conventional sand systems like Silicate-CO_2 to No bake sand systems like Alpha Set, Phenolic two part, Furan Resin and Shell sand systems.

Shell sand system is very important when we wish to make critical shape castings in particular automobile castings like cylinder block etc.

The Casting finish obtained in such process is very good if we control various parameters of shell sand.

In this article we are detailing various factors which a foundryman needs to consider while making castings by shell sand process which is also known as the croning process after its inventor.

So happy reading and **Wishing you all a Very Happy and successful New Financial Year.**

LETTER TO EDITOR

Dear Editor,

Indeed Enjoyed Glancing through - rapid Reading

Will read again.

Contents are very rich

All the contributors & the compilation by Anant Bam Deserve loud applause a word of Appreciation for the young Dynamic Hon Secretary too..

With Regards,
Mr. R. C. Kothari

MESSAGE FROM THE EDITOR

Anant Bam
Editor Foundry Talk
Foundry Consultant
& Energy Auditor

Dear Readers,

It gives me immense pleasure in presenting this 9th issue of Foundry Talks. This issue is dedicated to "Shell Moulding".

As we all know, shell moulding is required for 'Precision Castings' and the process is capable to deliver consistent dimensions and surface finish. However, the process is unique in its own way, and it also has its own do's and don'ts. The equipment like core shooters, it's blow pressure and core box venting also plays critical role in surface finish and dimensions of the Casting. No process is fool proof and hence to avoid common mistakes and probable rejection, our tips from experts will be helpful.

While going green, one can't overlook wastage of natural resource like 'Silica Sand' and hence reclamation means a lot for the future of our planet and has to be duly considered.

I sincerely hope that you would like this issue and enrich us with your valuable feedback.

Wishing you all a happy Samvat and best wishes for Ram Navami and Hanuman Jayanti.

We truly welcome your feedback or suggestions for WR E-magazine. Please feel free to write to us at **wr@indianfoundry.org** with subject “Letter to Editor”.

FOUNDRY TIPS

By Mr. Vinay Desai,
Foundry Consultant, Kolhapur | Vinaydesai50@gmail.com

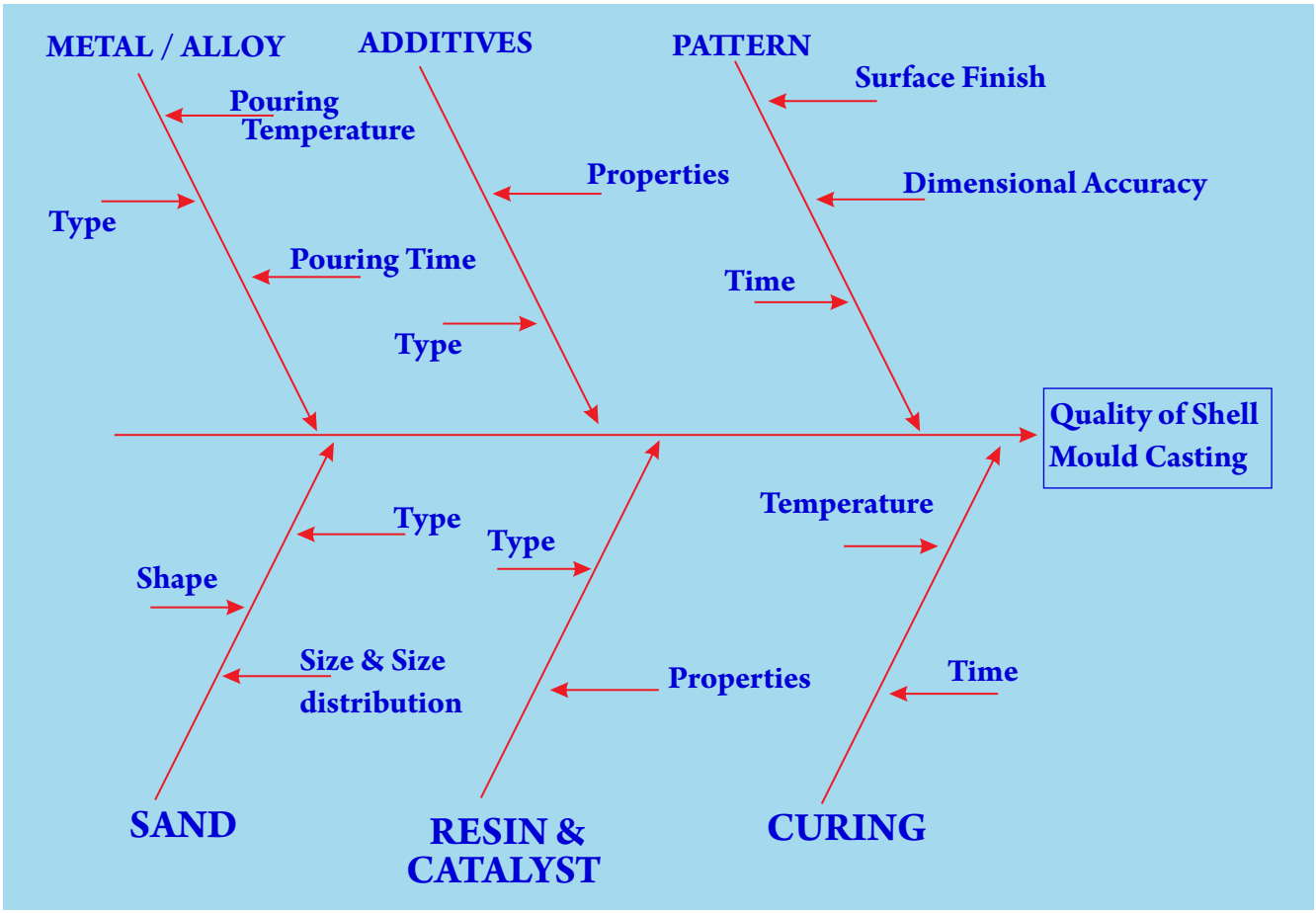
Important Process control parameters for Shell Moulding Process

Shell Mould, sometimes referred to as resin sand or hot shell & core casting process, is a casting process in which the molten metal is poured into in shell made up of mixture of phenolic resin and thermosetting catalyst. Because of its advantages like automated process, high dimensional precision and smooth surfaces compared to sand casting it is very popular for mass production but small weighing casting products.

Being a costly manufacturing process and high-quality expectation from this process, one has to monitor and ensure all the critical parameters are being taken care of. Such parameters that affects the quality of castings are discussed as below:

Pattern: Dimensional Accuracy, Surface Finish and Draft requirement
Additives: What type of additives, function of additives and its properties
Alloy: Pouring temperature, pouring time and type of alloy
Sand Type: Silica, Zircon, size, size distribution and grain shape
Resin & Catalyst: Type of resin, catalyst and quantity of addition of the same
Curing: Temperature and time

Ishikawa cause-effect diagram has been constructed as below and all the above-mentioned process parameters are indicated through this which can have affect on the casting quality.



Some of the Troubleshooting Tips

Below are few common issues that are faced during the shell moulding process for which some solutions are also suggested.

Distortion of Moulds: It is mainly caused due to either less content of the catalyst in the sand or due to ejection pins may not be properly aligned causing uneven pressure at the time of stripping and causing distortion. One should check the alignment of ejection pins and locations to ensure uniform pressure at the time of stripping

Sticking of Moulds or Cores: Insufficient and improper lubrication on pattern and core boxes can lead to sticking. By using a good quality silicone spray, one can avoid the same. Other reasons can be excessive temperature of pattern/core box or problem with the resin coated sand.

Warpage of Shells: Too high temperature difference between pattern & oven can cause this issue. Maintaining the differential temperature within level can eliminate the same. Also, it can be due to improper handling and placing of moulds / cores after ejection from core box.

Drop off of the sand or part of the shell: Either there is over lubrication which prevents proper adhesiveness of resin sand mix to the pattern or pattern temperature is below that is needed to properly bond resin and sand. In first case, check the quality and quantity of the silicone spray used and in second case, increase the pattern temperature.

Cold Line or Cold Surface on Casting: This might be due to less pouring temperature. Remedy is to either increase the pouring temperature or reduce the number of stack. Make provision for cold metal to be drawn out of mould

Blow holes after machining: It is mainly due to gas entrapments, need to provide good path for escape for gasses and use lower percentage of binder for sand.

Mahesh Date

Raw Material Price Index

Movement In Foundry Raw Material Prices

As per IIF data, there are nearly 7,000 foundries across India. The Indian foundry industry is ranked second globally with a production of 10 million tons per annum. It is catering to the automotive, tractor, power train, railways, energy and engineering sectors in domestic as well as overseas markets - Directly and indirectly.

There was sudden spike observed in April 2022 and continued due to various reasons. Prices got declined-stabilized thereafter but these fluctuations led us to establish the common reference point where we can study the actual raw material prices variations.

Now prices ruling in Kolhapur during second week of March 2023 are given in column 14 in the Table below. Also, given in table are the prices since Dec. 2022. These prices are collected from Kolhapur market. These are approximate, ruling during the month and week as indicated in the table.

In the prices indicated below, transportation cost is included in most items. Only applicable GST is to be added. Prices of many materials are on the basis of "Immediate Payment"

Movement Of Prices of Raw Materials over a Period of 4 Months

(A) Major Ferrous Metallic Raw Materials, Low Ash Metallurgical Coke, and Electro-Graphite Fines {Rs / Tonne}														
	Dec'22	Dec'22	Dec-22	Dec-22	Jan-23	Jan-23	Jan-23	Jan-23	Feb-23	Feb-23	Feb-23	Feb-23	Mar-23	Mar-23
	1st Week	2ndWeek	3rd Week	4th Week	1st Week	2nd Week	3rd Week	4th Week	1st Week	2nd Week	3rd Week	4th Week	1st Week	2nd Week
Foundry Grade Piglron	52314	51766	51766	51766	51766	52366	52366	52366	52616	52616	52616	52616	52616	52616
MS Scrap (good quality)	45500	45500	44000	44500	44500	46000	45500	45000	44750	44500	44500	44500	44250	44500
Low Mn Steel Scrap	49000	48500	48000	48500	48500	49000	48000	47500	46000	47000	47000	47000	46000	46500
Si Steel Stamping Scrap	48500	48000	47750	47000	48000	48000	47500	46500	46000	46000	46000	45750	45250	45500
Low Ash Met. Coke	52600	52600	51600	52000	52000	53500	54000	54000	50500	50500	48500	48500	49000	49000
Electro-Graphite Fines	100000	100000	99500	99500	99500	100000	100000	99500	99500	95000	100000	100000	101000	105000
(B) Major Ferro-Alloys {Rs./Kg}														
Fe-Si (70-75% Si)	135	132	132	138	138	135	135	140	140	137	135	135	136	135
Fe-Si-Mg (5-7% < Mg)	195	190	190	195	195	195	200	200	200	190	190	190	200	210
Fe-Si-Mg (5-7% < Mg) (TOL)	±5	±5	±5	±5	±5	±5	±5	±5	±5	±5	±5	±5	±5	±5
Fe-Si-Mg (8-10% Mg)	195±5	195±5	195±5	200±5	195±5	200±5	200±5	205±5	195±5	195±5	190±5	190±5	205±5	220±5
High C Fe-Cr (60% Cr)	100	98	98	98	97	100	100	99	110	115	117	117	118	118
High C Fe-Mn (60% Mn)	88	88	86	84	84	86	87	87	88	88	89	90	95	95
Ferro-Moly (60% Mo)	2750	3000	2900	2800	2800	2700	2800	2800	4550	4300	4100	4300	4000	3800

1. Above Prices are Excluding Taxes, GST Extra as Applicable
2. Phenol Price: Rs. 108/Kg during 2nd week of March 2023

(Info collected during March2023, Reader are requested to check the market prices)

Disclaimer: Rates represented here are as per the data collected from the reliable sources based in Kolhapur and it may vary based on the supplier, location, payment terms & other conditions.

Innovation Article

By M/s. Ganesh Quality Machines Pvt Ltd
Milind Biradar | Managing Director

Optimising Shell moulding process with efficient practices to get competitive edge.

Being a passionate second-generation foundry equipment manufacturer with 13 years of experience in the field of machine building, I regularly visit foundries across India. During my recent visit to one of our old customer, he was complaining about increasing cost of shell moulded casting and his decision to discontinue some components for a reputed customer.

Being a one stop solution for equipment for shell moulded casting my curiosity took me into detail about his process, I realised some of the mistake that foundry was doing. Also I realised many low hanging fruits for cost optimisation were ignored. So, I thought I will share those with you all, and give readers food for thought about **how one can produce shell moulded casting with optimised cost?**

Today in the field of green sand moulding there are many standardised proven solutions, but when it comes to shell moulding, they are none. Every shell moulding foundry follows differentpractises and methods in casting production.

In this article I would be throwing light on the improvements one can take into consideration are as below.

(1) Tooling Preparation Shell moulded casting process starts with Tooling. Many a times this is neglected area by foundrymen. Sometimes coreboxes are supplied by customers and foundries are using the same tooling to produce the castings or sometimes the tooling is produced by not so expert tool maker.

In shell moulding while tool making; our main focus should be on Sand to Metal ratio as well as yield. If the existing tooling is having more sand to metal ratio, cost of production will always be higher. If we try reducing the sand to metal ratio to reduce the sand, defects like warpage are more evident. Hence the tool maker needs to match the right balance between sand to metal ratio and yield.

There are some other check points in tooling design like:

- In shell moulding to reduce the sand consumed we can design tooling in which we can use the special design of punches in core boxes.
- Moulds should have gum grooved pattern design to achieve no leakage in poured moulds.
- One should always check the sand thickness outside the casting and try optimising it.
- Proper venting in the tooling and carefully designed gating system helps foundries to achieve low rejection in moulds and castings.
- During parting type selection- Vertical or horizontal, most attention should be given. Sometimes by selecting proper parting type, we can save time in mould finishing.
- During tool designing we should take into consideration the concepts like SMED for tool loading-unloading and Poka-yoke in mould assembly so that productivity can be increased and rejections can be reduced.

We at **Ganesh Quality Machines Pvt Ltd, Ichalkaranji;** backs our technical know-how and experience to analyse the sand to metal ratios before tool preparation. **In some tooling for cast iron we even achieved sand to metal ratio as low as 0.7 and yield as high as 90 %. With proper tool designing for someparts, we have achieved machining allowance as low as 1.5 mm.TodayWe are equipped with manufacturing well designed tooling for part size 1.5 Mtr* 1.5 Mtr.**

(2) Core or mould making Selection of machine is the next step after tooling preparation. A few years back, Dump box shell moulding or Four station shell moulding were the favourite amongst user. In dump box machine, we faced two drawbacks, mould weight variation and mould finish. These are overcome by mould shooter machines. We are regularly approached by our customers to covert the conventional components to reduce the cost and better surface finish.

As sand is the main input for shell moulding, every gram of sand saved helps in building strong bottom line for foundries. Today there are machines with rollover option, which allows core to be hollowed out effectively and reduce the sand consumed. There are some machines which allows foundries to mount two core boxes at the same time, hence saving in the manpower.

Generally, people make mistakes by selecting small moulding machines and produce cope and drag on two different machines. But now, by increasing the size of machine we are able to accommodate both Cope and drag on the same machine at one time. We have even developed some machine, which is of bigger size like 1.2Mtr*1.2Mtr, which can accommodate 2 to 4 different core boxes at a time which are required in the particular assembly. Mounting all these core boxes on one big machine reduces number of operators and number of machines and easy production line balancing.

Machine actuation method is also one deciding factor. Generally, the core boxes where clamping is done by hydraulic method will have less mould rejections and minimal mould weight variation than that of pneumatic. Recently we introduced Gas heating system to our core shooter machine. This is helpful in increasing the core productivity and reduce the energy consumption significantly.

These small cumulative efforts in saving sand, manpower and time boosts cost competency. Today we can manufacture machines which produce cores from 100 gms to 150 kgs in Shell and cold box method. Our top shooting with rollover machine is very popular as it is versatile for both small and big coreboxes and very effective to hollow out the sand. We also make fully automatic machines equipped with Industry 4.0 which can effectively monitor the production down time.

(3) Resin Coated sand When you are running a shell moulding foundry you should always check for **make or buy** option when it comes to resin coated sand. For any foundry the cost of resin coated sand in finished costing is around 30-40% of total cost.

If your volume justifies the ROI, having in-house resin coated sand production system will definitely give you competitive edge over competitors. Inhouse machine setup will allow you to conduct various trials on sand strength and resin percentage required. With this you can achieve optimum strength with minimum possible resin percentage.

For foundry consuming 700 tons monthly sand, payback period can be within 8 months.

If the sand required is less which forces you to buy the coated sand, you can always put your thinking hat on and work to reduce the resin percentage used by introducing various methods in mould preparation and support.

You can reduce the shell sand weight or resin percentage by trying different options like,

- Use of green sand or CO2 mould for backing purpose.
- Use of metallic clamping plate which will support mould during pouring.
- Use of dead weights, clamping cylinders to ensure moulds are properly clamped before pouring.
- With these improvements you can reduce the strength required for resin coated sand and reduce the running cost.

We at Ganesh Quality Machines Pvt Ltd, Ichalkaranji, manufacture complete automatic resin coated sand plant (Liquid and Solid Resin) which helps you to achieve your production with minimum manpower.

(4) Thermal reclamation system Key raw material for shell moulding is resin coated sand. Which; is non reusable unless reclaimed thermally. Having a thermal reclamation support always give you edge over competitors. You can reclaim the sand and re-coat it in sand coater unit with less resin percentage. You can also reduce the dependency over other sand supply source.

Some of our customer with consumption of 700 tons of sand have achieved payback period within one year.

With thermal reclamation system and resin coating system inhouse, shell moulding can become a complete closed loop system. Hence there will be very less dependency over new sand. Also, Foundries can use good quality of sand which reduces resin consumption in used sand.

Shell moulding foundries with inhouse sand coating and thermal reclamation system can produce casting at much lesser cost than the competitors. So effectively the reclamation and resin coating plant will work as profit centre for any foundry.

(5) Foundry automation For catering the growing customer demands, foundries need to upgrade the facility and reduce manpower cost by introducing effective mould handling system, easy pouring systems, sand shakeout and conveying system.

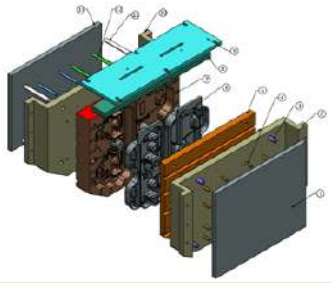
This upgradation will not only help you to reduce the manpower but also improved productivity, customer faith and confidence.

We at Ganesh Quality Machines Pvt Ltd, work upon bridging the gap between conventional processes and required practices of today. We build the cost competence in our customers by providing Part to Plant support in developing the shell moulded casting.

Today we can proudly claim to be a single stop solution for Shell moulding foundry.

- Tooling - Proven optimised coreboxes
- Core making - Core/ Mould shooter- Horizontal or vertical.
- Sand preparation - Resin sand coating plant (Liquid and Solid Resin).
- Sand Regeneration - Thermal reclamation system
- Foundry automation - Complete turnkey solution

ONE STOP SOLUTION FOR SHELL MOULDING FOUNDRY



1. TOOLING

- Part to plant consultation
- Proven coreboxes with optimised sand to metal ratio
- Maximum Tooling dimension - 1Mtr*1.2Mtr

2. CORE MAKING

- Core/ Mould shooter Machines- Horizontal or vertical
- Core weight 100 gms to 150 Kg.
- Maximum Core box size - 1Mtr*1.2Mtr

3. SAND PREPARATION

- Fully automatic Resin sand coating Plant
- Liquid or Flake resin
- Plant capacity 0.5Tph to 3 Tph

4. SAND REGENERATION

- Thermal reclamation system
- Fully automatic system
- Plant capacity 0.5Tph to 5 Tph

5. FOUNDRY AUTOMATION COMPLETE TURNKEY SOLUTION.

- Hydraulic Mould Handling system
- Monorail System
- Mould Shakeout and sand handling system.

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SPECIAL INSIGHTS

Journey with Shell Moulding Casting Process

By: Mr. Mayur Acharya, Director, Abhishek Alloys Pvt Ltd, Belgaum, Karnataka

Born and Brought Up in Belgaum, Completed my Schooling upto Degree in Belgaum and later did my MBA in SP Jain, Mumbai. Immediately after completing my MBA in 2016 started my journey in Foundry.

The company was established in 1992 by father Mr M. N. Acharya, after working for 8 years with small Machine shop. So from 1992 -1997 we did all types of process castings , like shell , no bake , green sand, silicate.

In 1998 he took a firm decision that we will be doing only shell Process. So this was the year that we entered completely into shell molding line.

Its been 6 years now since I have entered into our business. Since we were already into shell molding, my journey started with shell molding only , as we don't have any other process.

My journey with Shell Molding

The journey till now has been great, in 6 years have learnt a lot and lot to learn as well.

Didn't had idea about the process, so spent almost a year to understand everything what we do and why we do. How cores are taken, how cavities are created with cores, what should be done to get more finish, how to reduce rejections in the process. There are n number of things to learn and foundry is like an institute where the learning never ends, until we stop learning from it. My father has been a main reason for my growth as well as for the company.

The market now and will always be very competitive in which ever field we go. Especially in foundry the competition is tremendous, and customers are well aware of this and they take the advantage. So the concept that only this specific process has more profit is no more. Due to competition the pricing has come to one level and very tough to get the pricing above that set value in the market.

If you are doing something special or you are providing solution which very few in the market can give, then there will be upper hand in the market and customer are ready to pay the higher price.

If we get into the same league like others then as we don't have any other option other than rate reduction to get the orders. No one wants to do this , so if we don't want to enter this, we need to monitor these 3 areas.

So the only way to remain in the market or sustain is

1. Innovation
2. Rejection Reduction
3. Monitoring of your costing

Innovation: Its not something like what a scientist do. We know our process, so must be able to do something differently than others to sustain in the market. If we don't try anything new then we become stagnant.

Eg Earlier we used to take shell from Manual Machines, Four stations, Dumping type machines. We have completely switched over to Auto process of shell removal from all these manual molding methods. Though the initial investment was high, we took time and switched over to auto shooting process. Today due to this our productivity has increased by almost 200% and quality improvement by 80%. So this was impossible for me to do with manual molding process.

Rejection: This is one of the key areas for any foundry to look for. Monitoring this closely is very important. We loose major of our profitability due to rejection. Especially for shell molding process because the molding, core making cost is too high compared to other process. So rejection in shell molding area as well as after pouring impacts a lot.

Eg Every foundry analyse the rejection, some do daily, some do weekly and some do monthly. Analysing is OK. But segregating them based on value and weight both are important.

We have a mass production part, everyday analysis results was around 4%, so in terms of percentage we thought part is running at better percentage. But since it was high volume, low weight part, when we took both the analysis, the result was eye opening. Value as well as tonnage wise was on top 3 always. So made us to concentrate more on it and we try to bring the percentage to 3%.

So my intention of telling this was though the percentage might look small or within target when we analyse rejection in all the possible terms it will help us to understand and take further actions.

Monitoring of costing When we quote, we take our standard methoding of calculating, but when the part is in serial production we don't know at what price the part is running at. This is one of the major area to look after, as there are lot of things we change during the process to achieve customer requirements or when addition in requirements are made after part comes to serial production. Looking deep into this is majorly required.

Eg Always every foundry has a part which is high volume, bread butter earner, which we might know / feel is earning a good profitability. But take a deep dive into it and calculate the exact costing. When we develop the part we might know, but as the year passes, there will be lot of changes that might have happened, but we might have not noticed it. Customer gives us only RM cost, what about the rest of the parameters?

We had a part which we thought was running with decent margin, but when we took the costing, we went by surprise. The molding cost was double than what we had calculated earlier. Because due to some internal cavity issues we had changed the sand of core and we had started using imported sand as the problem was solved. So it was changed everywhere including in documents, work instructions, procedures, but not in costing sheet.

This happens to everyone, as everyone will be busy with new product development, new customers, expansions. But this is more important than that.

The myth that shell molding has high profitability.

As now the customer is well educated in every process, so getting higher profitability is very tough, as said Higher Profitability can be achieved only if we keep innovating in the process. So it's the technique / experience / technology we need to use to increase our profitability. As no customer will give a penny extra. To achieve anything more, extra efforts are required.

Customers come to you than you approaching them only when you do something different than other, when they say you do something different means you are doing with something new ideas / or achieved some process where no one else has been able to do so and that's innovation.

As I explained since shell molding process cost is high, these points are must or else we will never know where we are heading towards.

Innovation Article

By M/s. GARGI HUTTENES-ALBERTUS PRIVATE LIMITED

Shell Moulding process with optimized technology

Due to severe competition, increasing input costs & limited resources, foundries worldwide are coming under increasing cost pressure to produce the best quality casting at optimal cost. In addition, more technically sophisticated castings are also being demanded. Hence its today's needs to have the best quality input raw materials like sand quality, advanced quality binder system, and excellent process optimization.

To cater to the market demand Gargi Huttenes Albertus P Limited has developed a new generation binder system in liquid Novolac system as well as solid Novolac resin system to meet foundry demand.

GHA developed a new generation liquid Novolac binder system Resital 7100 which offers advantages like,

(a) Improve casting quality.
(b) Excellent mechanical strength which can also help to operate at a lower binder addition level.
(c) The best dimensional accuracy.
(d) Excellent casting surface finish
(e) Allows complex cores at a very low core weight.
(f) Superior hot distortion properties with lower deformation.
(g) Elimination of ammonia odour while RCS preparation,reductionof smoke& odour while cores and moulds preparation for casting with new modified special grades Hardeners for curing.

GHA also offers the new solid Novolac resin for different applications such as high strength, low expansion & quick curing types. These resins are used to prepare RCS by hot coating process which has many advantages in the RCS manufacturing process.

Solid resins are used to prepare RCS for the different casting like cast iron, aluminum & also to prepare hollow & non hollow cores.

Solid Novolac resin has many advantages over liquid Novolac resin in shell resin-coated sand preparation.

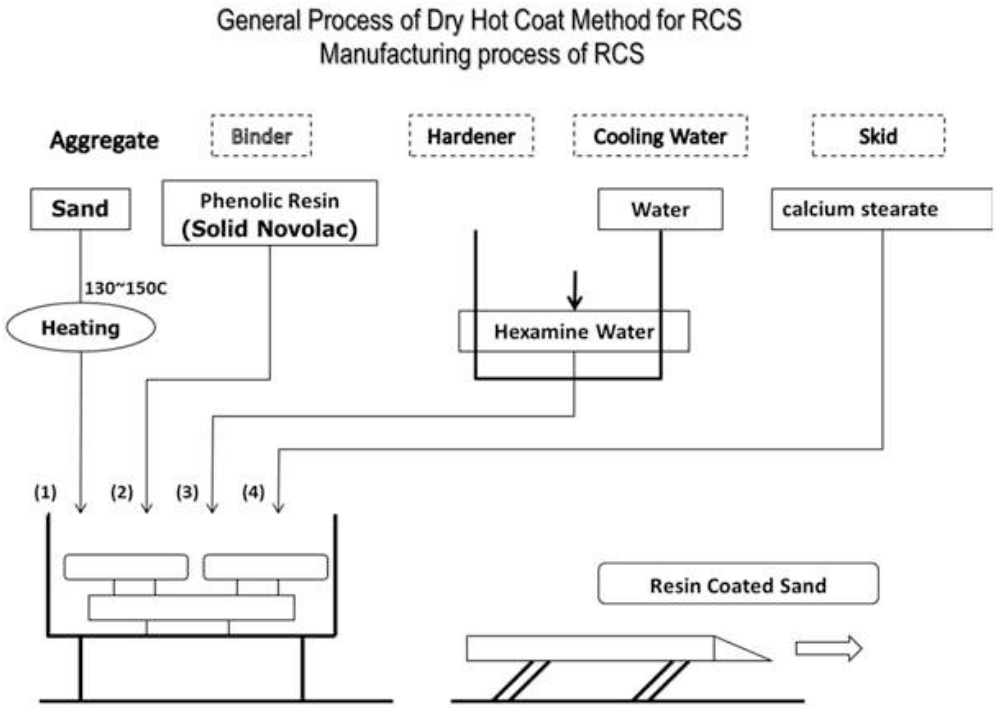
(a) Comparatively less hazardous due to no gases released while RCS preparation.
(b) Lower gas emission & lower smell in sand cores & performs better for complex-shaped casting.
(c) Excellent mechanical strength at a lower resin addition rate
(d) Higher productivity & lower RCS manufacturing cost.
(e) Low heat expansion rate
(f) Lower deformation & excellent thermal stability.
(g) Lower wastage of RCS in lumps form

Following is the comparison in use of liquid and solid resin for manufacturing Resin Coated.

Liquid Novolac resin by warm coating process	**Liquid Novolac resin by warm coating process**
Higher free Phenol content	Lower free Phenol content
Higher odour during coating	Lower odour during coating
Higher V.O.C. released to atmosphere during coating because of evaporation of solvent.	No V.O.C. released to atmosphere during coating because of evaporation of solvent.
Lower productivity due to longer batch cycle time	Higher productivity due to longer batch cycle time
Higher resin addition for same performance	Lower resin addition for same performance

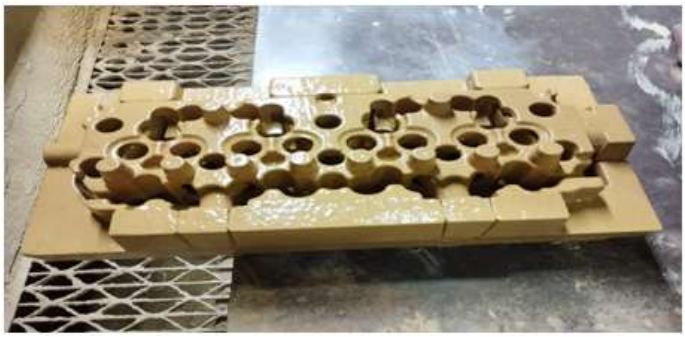
Different type of sand also used in combination with regular silica sand to enhance the shell sand performance. Special synthetic sands such ascerabeads, boxite, ceramic, kerphailite are used to reduce the sand fusion, veining, sand burn & to avoid mold metal reaction. These sands also improve mechanical strength and reduce thermal deformation.

Additives such as iron oxide is used to reduce metalpenetrations, veining & Sphereox is also used to reduced veninng, pinholes, sand burn& sand fusion.



Few critical casting & cores prepared by GHA new generation Novolac liquid resin & solid Novolac liquid resin:

Cylinder Head VNBF -BS-06



Core assembly VNEF BS-6

Core assembly VNEF BS-6

Impeller casting cores

Ask The Expert

What is the ideal property of the sand for the shell moulding process?

Sand must be completely free of clay content. Grain size of the sand should be generally in the range of 100 -1 50 mesh, as the shell casting process is recommended for castings that require good surface finish. However, depending on the requirement of surface finish of the final casting, the grain size of the sand can be ascertained. Also, if the grain size is very fine, it requires large amount of resins, making it expensive.

Is it recommended to use additives in shell moulding casting process?

Additives may be added to the sand aggregate to further enhance the surface finish of the casting or two improve the strength of the mould or to develop the resistance to thermal cracking and distortion. The recommended additives are coal dust, manganese dioxide, calcium carbonate, ammonium boro-fluoride, lignin and iron oxide. To improve the flowability of the sand and to permit easy removal of shell from the pattern plate, some lubricants are added in the resin sand aggregate. The common lubricants used for such purpose is calcium or zinc stearate.

What casting tolerances could be achieved by Shell mould casting process?

The casting tolerances for the shell mould castings have much higher accuracy and tighter tolerance than sand castings. The commonly used casting tolerance table for linear dimensions is CT9 according to ISO 8062 (Wall thickness CT10) with casting surface roughness for steel is Ra 50 – 100 microns and Iron is Ra 25 – 50 microns.

What are the advantages and disadvantages of the shell moulding casting?

Advantages:

1. Shell-mould castings are more dimensionally accurate than sand castings
2. Smoother Surface of the finished castings
3. Lower draft angles
4. Less gas inclusions due to high permeability of the shell
5. Ready automatization/mechanization solutions available hence faster productivity and simple processing.

Disadvantage:

1. High production costs and hence costly castings
2. Pattern cost is more costly hence it is not suitable for producing small quantity of castings
3. As it is produced by shell molding machines there is limitations on size and weight of the casting that be manufactured. Too long or too heavy castings cannot be produced by this process.

To ask your question or get the suggestions, please write your problem with detailed description to **wr@indianfoundry.org** with subject "Ask the Experts". Identity of the Questioner will be kept confidential.

Message from Imm. Past President - IIF

Mr. Devendra Jain
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Today Indian Foundries are in a very strategic position, where on one hand Chinese internal issues accompanied by its aggressive foreign policy has forced MNCs to look towards other sustainable source of casting supply, and India holds the centre stage in terms of ease of doing business, India's growing young work force and English language as main communication Pan India. Demand has already starting coming in from big global players.

It is a now or never situation for us the foundryman. But are we ready. Lets jot down some major hurdles:

1. **Low level of automation** and high dependence on cheap labour.
2. **Technology:** Indian foundries lag behind in technology adoption which makes them less competitive in terms of quality, productivity and cost.
3. **Skilled Manpower:** Indian Foundries are struggling to attract and retain skilled manpower which is essential for innovation and creativity.
4. **Outdated technology:** Many Indian foundries still rely on traditional casting methods that are inefficient and produce lower quality parts. There may also be a lack of investment in newer technologies such as automation, which can reduce human error and increase efficiency.
5. **Lack of standardized processes:** Standardized processes are crucial for efficient and high-quality production, but many Indian foundries may not have well-established procedures or systems in place. This can lead to inconsistencies in production and quality issues.

What are the options open to us:

1. Focus on research and development by integrating with academic institutions. A symbiotic equation need to be created between the technical institutions and the production units.
2. Foundries need to adopt sustainable practices such as renewable source of energy and reduce carbon emissions. This will enable them to stand out in the global market which is increasingly focussing on sustainable and eco friendly products.
3. Maintain high standards of quality control to meet global standards, certifications and regulations. Should have well documented process control mechanism.
4. Employee training and development, to improve skills, productivity and job satisfaction.
5. Last but most important is the adoption of latest technology and development of product required by global market and not just copy the products being manufactured by others,

Western Region Activities

Under Project **PRAYAAS** - IIF WR Jointly with IIF Rajkot Chapter
hosted delegates from IIF Southern Religion for the knowledge sharing work visits.