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

SHAMLAX

MESSAGE FROM CHAIRPERSON

Steel Casting

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

Steel is the most versatile of the structural engineering materials, so that more grades of steel are available for casting than any other alloy type.

Steel Casting are used when iron casting cannot deliver enough strength or shock resistence. Examples of items that are steel castings include: hydroelectric turbine wheels, forging presses, gears, railroad truck frames, valve bodies, pump castings, mining machinery, marine equipment, turbo charger turbines. As is the demand in general for all other castings is showing upward trend, the demand for steel castings is also moving north and future looks bright.

April month is dedicated to **STEEL**. Keep reading and share your views.

LETTER TO EDITOR

Dear Editor,

Great work and good thought on releasing the magazine topic-wise. Very helpful topics and good use for it. Congratulations to editor for covering so nicely.

Thank you and all the best ahead

With Regards,
Mr. Victor P

MESSAGE FROM THE EDITOR

Anant Bam
Editor Foundry Talk
Foundry Consultant
& Energy Auditor

Dear Readers,

In the year 1960, on 1st May, the then “Bombay State” was divided according to the languages spoken; in to two states, “Maharashtra and Gujarat”. Thereafter, each year, this day is celebrated in both the states as their foundation day. My best wishes to all from Maharashtra and Gujarat.

Maharashtra being my native state, and Gujarat being host state of majority of my clients, I have personal affection for both the states.

The day coincides with “International Labour Day” as well. My best wishes to all for the occasion.

Friends, this issue of “Foundy Talks” is dedicated to “Steel Castings”. Steels are pretty different to cast as compared with cast irons. But Western Region has quite a number of Steel Casting producers. Our energetic Hon. Secretary, Prayut is a proud owner of a Steel Casting Foundry. Considering his in depth knowledge of this subject, the whole issue is compiled and edited by him. For this issue, I am just a name sake editor. My best wishes to him for all walks of life.

Hope you enjoy reading this issue, your comments are precious to us, kindly write back for improvements.

Awaiting your feedback.

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. Amitabh Roy
Vice-President | Siena Engineering Pvt Ltd.

Practical Tips for making Sound Casting at Optimized Cost & Higher Productivity

TOPIC is meant for young practicing engineers employed in steel foundry having basic engineering knowledge & academic qualification.

Introduction:

It is needless to mention that, casting is the easiest way to form a product as compared to any other mechanical engineering process. There are huge number of foundries in India in different clusters, approximately 5000 as on date & 70% are ferrous foundries. There were some regions having maximum foundry density in the world, but some of them are closed for abnormal hike of raw material cost, not achieving sale value according to production cost and most importantly demise of really skilled workmen which eventually found non-replaceable, who loved foundry art.

Young engineers have to realize the fact, once involved in foundry industry that cast products have to be made in most economical manner, production process must be simple, proper selection of process to be adopted for particular product based on infrastructures available. Controlling rejection to best possible value and aiming for higher productivity & stopping wastage of materials by proper storing & handling. Points as stated is easy to say but difficult to execute at the beginning for newly recruited engineers, in an ideal case when ample freedom given to them in their own field of operation in foundry. To achieve all the aims for manifold activities there are needs of coordinated and disciplined activities to be performed sequentially as enumerated below:

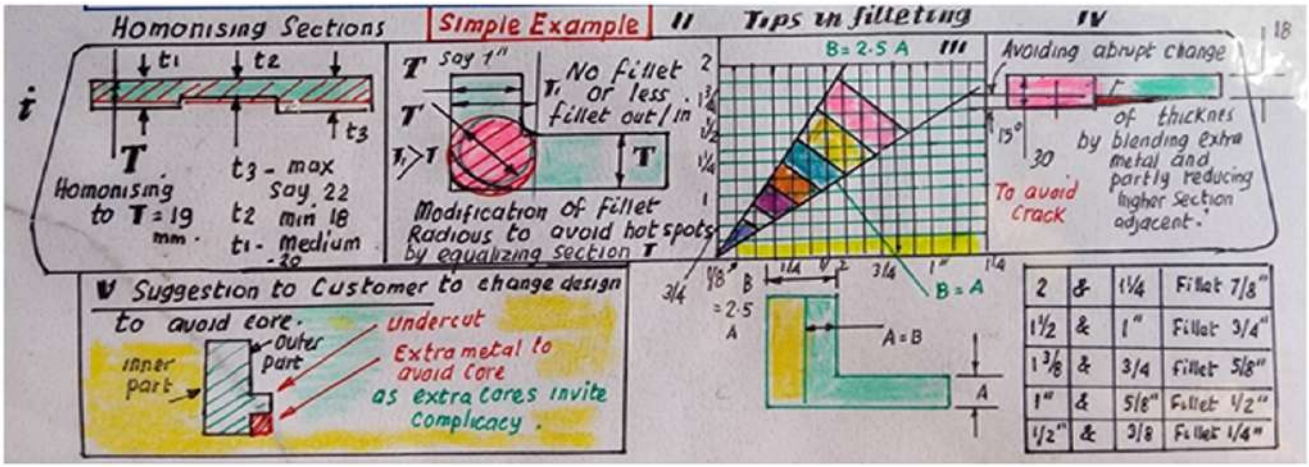
After receipt of drawing & quality/quantity requirement from customer,

Step 1: Freezing the design & cost estimation based on determined process of a product:

Receive drawing from purchaser, understand completely the quality requirement, quantity & delivery. Designer has to evaluate weight or verify the same if it is given in drawing. Foundry methods engineer has to check the feasibility whether the drawing is castable or not, he may suggest change for castability with mutually agreeable term with mechanical designer of customer to make product castable, called freezing of drawing. Next step is to finalize the production process, method, pattern material & product making cost. Advanced process is to predetermine the probable error that may came.

Simple Examples/Tips for the same:

1. Check for the homonization of the sections
2. Tips in Filleting
3. Avoiding abrupt change
4. Avoid Core if feasible



Step 2: Methoding/Pattern material selection depending upon quantity & intricacy:

Methoding includes selection of parting plane of pattern, selection of cope & drag according to riser placement and core arrangement. Core design/requirement must be as minimum as possible. Top riser or side riser selection must be related to heavier flat surface and cooling pattern of casting. Cooling direction must towards riser where metal would freeze at end. Conventionally called directional solidification.

Selection of material by which depends upon quantity of casting produced & its complexity more than one castings can be made, or grouped in common CI match plate.

Tips: Pattern Material Selection

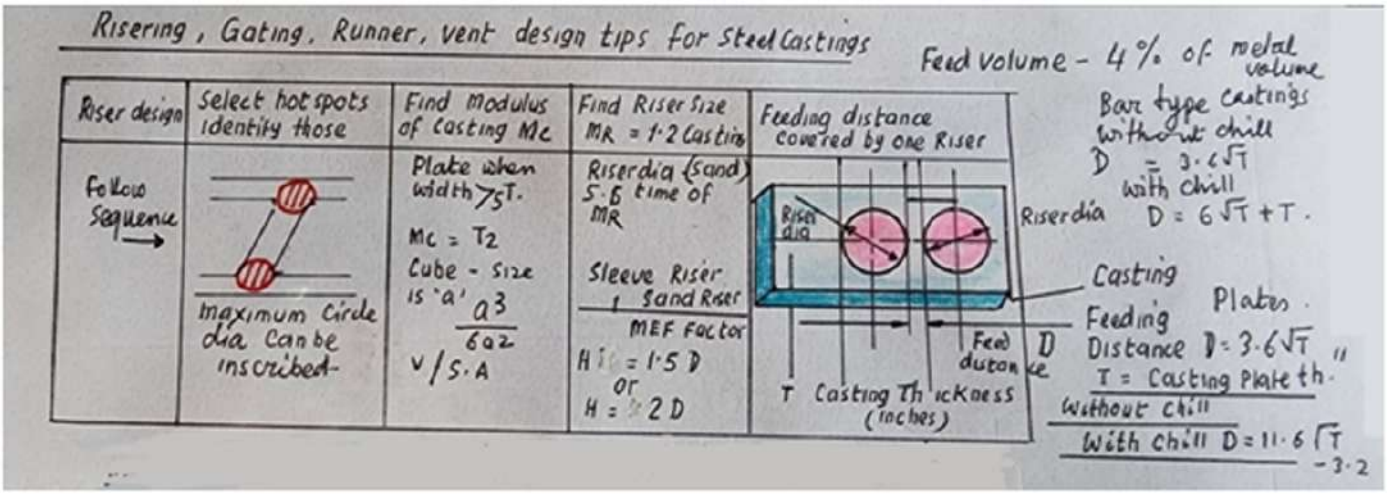
Sr.	Size of Casting (Inch)	Monthly Qty	Simple	Moderate	Intricate	Pattern Material	Match Plate
1	3" to 8"	5000 or more			X	Cast Iron	Cast Iron
2	Above 8" to 12"		X	X	X	Aluminum	Cast Iron
3	Above 12" to 24"		X	X	X	Aluminum Multiple Pattern	Cast Iron
4	Above 24" to 120"	100-	X			Composite Pattern	Steel if Vibration is involved

Composite Pattern – Impact areas are of steel in flat surface. Core prints may be of CI or Aluminum, rest area good quality seasoned teak wood. For massive quantity & intricate castings with repeated or shell moulding or lost wax process is preferred.

Important thing to remember while development of stable live pattern.

A) Make wooden pattern, make sample casting standardize casting dimension if Ok, go for Aluminum pattern or CI
B) This pattern must be fractionally oversized so that if casting dimensions found little bit oversized. If there is scope to reduce material. No minor material is advised to be added on top metallic pattern surfaces, can be make pattern unstable. Pattern must be associated with 100% pattern layout & necessary templates for regular checking when this will be under production. This is important.

Riser, Gating, Runner, Vent design tips for steel castings:



While selecting gating focus on:

1) Sand, slag, dross other impurities trapping device.
2) Avoiding localized shrinkage
3) Gases must not be entrapped.
4) Avoiding Cold Shut or misrun, means metal must be poured fast.
5) Must not produce rough surface by erosion, providing generously filleted and entered at min 120o angle.

Recommended Gating Ratio for Steel:

Sprue	Runner	Ingate	
1	2	1.5	→ **Best for Bigger Casting**
1	3	3	
1	2	2	
1	1	0.7	

Pressurised system is called when total ingate area is either equal to sprue or lesser

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 forth week of April 2023 are given in column 14 in the Table below. Also, given in table are the prices since Jan. 2023. 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}														
	Jan-23	Jan-23	Feb-23	Feb-23	Feb-23	Feb-23	Mar-23	Mar-23	Mar-23	Mar-23	Apr-23	Apr-23	Apr-23	Apr-23
	3rd Week	4th Week	1st Week	2nd Week	3rd Week	4th Week	1st Week	2nd Week	3rd Week	4th Week	1st Week	2nd Week	3rd Week	4th Week
Foundry Grade Piglron	52366	52366	52616	52616	52616	52616	52616	52616	52616	52616	52116	52116	50800	50800
MS Scrap (good quality)	45500	45000	44750	44500	44500	44500	44250	44500	45000	45500	45000	45000	45000	45000
Low Mn Steel Scrap	48000	47500	46000	47000	47000	47000	46000	46500	47000	47500	47500	47000	47000	47500
Si Steel Stamping Scrap	47500	46500	46000	46000	46000	45750	45250	45500	45500	46000	46000	45500	45500	46000
Low Ash Met. Coke	54000	54000	50500	50500	48500	48500	49000	49000	49500	49500	48500	48000	47500	47500
Electro-Graphite Fines	100000	99500	99500	95000	100000	100000	101000	105000	105000	108000	105000	102000	100000	100000
(B) Major Ferro-Alloys {Rs./Kg}														
Fe-Si (70-75% Si)	135	140	140	137	135	135	136	135	135	137	135	135	131	131
Fe-Si-Mg (5-7% < Mg)	200	200	200	190	190	190	200	210	215	225	210	210	200	200
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)	200±5	205±5	195±5	195±5	190±5	190±5	205±5	220±5	225±5	235±5	230±5	225±5	220±5	220±5
High C Fe-Cr (60% Cr)	100	99	110	115	117	117	118	118	120	122	125	125	121	121
High C Fe-Mn (60% Mn)	87	87	88	88	89	90	95	95	100	105	105	100	100	99
Ferro-Moly (60% Mo)	2800	2800	4550	4300	4100	4300	4000	3800	3500	3750	3000	2300	2650	2600

1. Above Prices are Excluding Taxes, GST Extra as Applicable
2. Phenol Price: Rs. 112/Kg during 4th week of April 2023

(Info collected during April 2023, 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. Shamlax Metachem Pvt Ltd
Sushil Sharma | Technical Director

Innovative Coating for Steel Mill Liners And It's Application Techniques

The mill liner is used to protect the mill barrel from the direct impact and friction of the abrasive body and the material, and enhance the crushing and grinding effect of the abrasive body on the material.

With the progress of mineral processing technology, the large-scale mill has become the main development trend of grinding equipment, and the liner is becoming larger and more complex. The market puts forward higher requirements for the service life and grinding efficiency of the liner. With the increase of cylinder diameter, the potential energy of ore and steel ball increases, the wear and impact fragmentation of liner increases, and the service life of liner shortens. The operation rate of traditional grinding system is usually 90% ～ 95%, while the operation rate of many semi autogenous mill + ball mill grinding system is only 80%. Liner maintenance not only increases the material and labor costs, but also seriously affects the mill production efficiency.

TThe use characteristics and failure forms of mill liners are also different under different mine conditions. The liner material has a direct impact on the grinding effect, and then has an important impact on the mine income. Therefore, the reasonable selection of liner material for large autogenous mill is of great significance to the grinding operation.

Through the analysis of chemical composition of high chromium cast iron wear-resistant liner inwhich Cr% normally range from 14% to 30%, the design improvement of casting process and heat treatment process, the mechanical properties of high chromium cast iron wear-resistant liner are better than those of traditional alloy steel. It has been successfully applied in large autogenous mill and greatly increased the grinding output.

At present, mining enterprises have higher requirements for the production capacity of grinding equipment. Energy consumption and material consumption in the process of mineral crushing have become the focus of scientific research workers and enterprises. In the future, the composition and heat treatment process of high chromium cast iron should be continuously optimized to improve the wear resistance of the material. At the same time, the development cost should be considered, the use of precious metals should be reduced, and trace elements such as boron, titanium and niobium should be added appropriately to reduce the production cost. High cost performance wear-resistant white cast iron wear-resistant liner will be widely used in low impact, strong grinding and stripping autogenous mill, ball mill and vertical stirring mill, which can effectively improve the operation efficiency and comprehensive profitability of large-scale mining equipment, and help the large-scale and efficient development of equipment.

Elements	High Chrome White Iron Composition	High Chrome Alloy Steel Composition
C	2.40 – 3.20	1.1 – 2.2
Si	0.60 – 1.20	0.60 – 1.20
Mn	0.50 – 1.00	0.50 – 1.00
Cr	12.00 – 30.00	11.00 – 30.00
S	<0.04	<0.04
P	<0.06	<0.06
Mo	0.10 – 3.0	0.10 – 3.0
Cu	0.10 – 1.00	0.1 – 1.00
Ni	0 – 0.30	0 – 0.30

Fig - 01

The section thickness of Mill liner castings normally ranges from 150 mm to 400 mm and the weight ranges from 300-400 kg to around 6500 kg single piece casting.

Foundries producing mill liner castings normally produce castings with furan resin sand systems with moulds normally having silica or quartz sand and cores with either chromite sand or Cerabeads Due to the cost factors cerabeads are not that popular and foundries normally use cerabeads only in places of hot spot areas.

For moulds, the coating parameters need to be around 90-95 Be and one needs to apply multiple coats. It is highly recommended not to dilute the coating, as should be applied with brush at baume of 90-95 Be and coating should be dried either by torch or warm air or drying oven.

Fig - 02

Fig - 03

maintained at 180-200 deg. Cent. Second coat application is normally done after the first coat has attained ambient temperature. Shamlax recommends coatings like Refracote-888XLCC (M) purple colored coating for Furan mould application which turns yellow on drying and for the applicator it is easy to apply second coat on dried yellow surface, without missing any mould surface with single coat as applicator has to make the yellow surface totally purple with second coat.

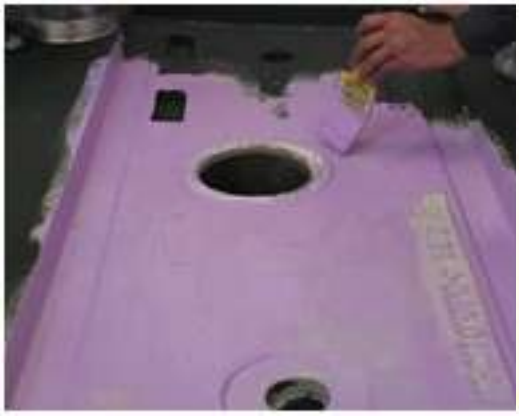


Fig-4
First Coat Application

Fig-5
First coat dried from Purple to Yellow

Fig-6
Second Coat Application

In case of Mill liners it is advised to apply at least 4 coats of coating, one after another to get a better casting surface finish. Multiple coats of coatings create dry film thickness sufficient enough to avoid sand fusion, which is likely to occur if the DFT is not enough.

For cores its advised to use chromite sand instead of silica or quartz sand for better performance and the coating application is recommended by dip process and not by brush application, as it is observed that in spite of applying multiple coats the sand fusin in the bolt area still occurs and is very difficult to remove considering the hole dia of around 50-70 mm and core length of 300-400 mm.

SHAMLAX

Fig-7

Fig-8

Fig-9

Coating recommended for cores is Refracote-888XLCC (C) and it is highly recommended that Mould coating should not be used in Cores and vice-versa. Is mould coating is used in cores than one can see fine cracks develop as shown in **Fig-9**. And if core coating is used for Mould coating applications Then there is likelihood of sand fusion defects arising.

For Mould wherever cerabeads sand is used even Refracote-888XLCC (M) coating gives little bit of sand fusion and in such areas Shamalx recommends to use Refracote-555XLCC a special coating to remove sand fusion defects.

Fig-10

Fig-11

Fig-12

Fig-13
Bolt Area (Before Cleaning)

Fig-14
After Cleaning

Fig-15
After Heat Treatment

Conclusion : If all above parameters of coating for Mould and core applications are taken care off, with recommended application techniques, the post casting operations are minimized to a great extent. The color change on drying property of the mould and core coatings helps a lot in applying multiple coats in the foundry.

SHAMLAX

INNOVATE TO ELEVATE

Ask The Expert

Q. 1. Which is better pressurized gating system or unpressurized gating system?

Ans: It depends on the case to case basis and more on the geometry of the castings i.e. shape, size, thickness etc, moulding process and the pouring process. Below are the comparison between the same which can help to decide which is can be better depending on the requirements:

Sr No.	Pressurized	Unpressurized
1	Typical Gating ratio is 1:2:1 or 1:0.75:0.5	Typical gating ratio is 1:2:2 or 1:3:3 or 1:1:3
2	Back pressure maintained on the gating system by a fluid flow restriction at the gates hence known as “Gate Control System”	Primary restriction at the sprue base (choke), minimum cross section of gating system. Known as Choke Control System
3	Metal velocity is high hence can result in turbulence	Streamline flow is induced
4	It consumes less metal and yield is more	Consumes more metal and the yield will be slightly lowered
5	Gating system will always be full of liquid metal	Gating system flow is not full
6	Possibliity of mould erosion, dross formation and air entrapment	Considerably less spurting, mould erosion.

Q. 2. For making alloy steel which is better arc furnace or induction furnace.

Ans: The main difference between electric arc furnace and electric induction furnace is their heating, efficiency and importantly the metal refining capability in arc furnace due to which majorly this comparisonis being done. To understand better lets see comparison in detail:

In electric arc furnace, the charged material is typically exposed directly to an electric arc, where the current tends to form the furnace terminals to pass through the charged material whereas in electric Induction furnace, heat is applied by induction heating of metal. It means, in arc furnace heat produced by the arc is transferred to the molten steel via the slag, which is indirect heating whereas in the induction furnace, heat is generated inside the molten steel directly. Also, there is high wastage of heat in arc furnace due to heat absorbed by the refractory lined vessel. Due to this, heating and efficiency of arc furnace is less compared to induction furnace. Slag formed in arc furnace has very high temperature than that of molten steel whereas in induction furnace it is low, due to which ability of slag to participate in the metallurgical reaction is strong in arc furnace and it is very weak in induction furnace.

Therefore, in the induction furnace, the processes like desulfurization, dephosphorization and diffusion deoxidation are not effective compared to arc furnace. Hence, it is possible to use a wide variety of charged material in arc furnaces and chemistry can be obtained as final

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.

Mr. Amish Panchal

Message from Past President - IIF (2017 - 18)

Fellow Foundrymen,

Really feeling good to communicate with all after quite some time on this wonderful publication created by the most enthusiastic Western Region Team.

India in its "Amrit Kaal" is witnessing many new thing and many firsts. Many of us are feeling this "Zing" around us. Recently India has become most populus country in the world.As a large set of people can produce and consume more goods, it is expected to lead to more economic growth for the country.India's population is an asset for the business rather than a liability.

Our75% of the population is under 35, with the lowest median age – 28.4 years, compares to 38.3 years in the US, 38.4 years in China, and 40.5 years in the UK. Main advantage of the young working-age population is that young people adapt fast and can keep pace with the continuing dramatic and constant technological change.Ensuring that people have the right skills to play a major role. How our Industry can impart the skills to youth is the challenge we have to work on.

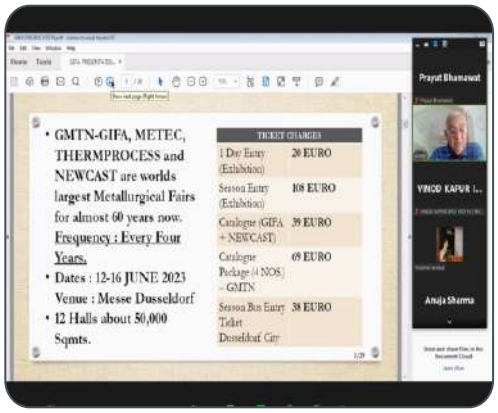
S&P Global forecasts that India will overtake Germany and Japan to become the world's third-largest economy by 2030. Business Talk Magazine has listed **Top 10 fastest growing industries in India** based on their growth over the last two years. These are:

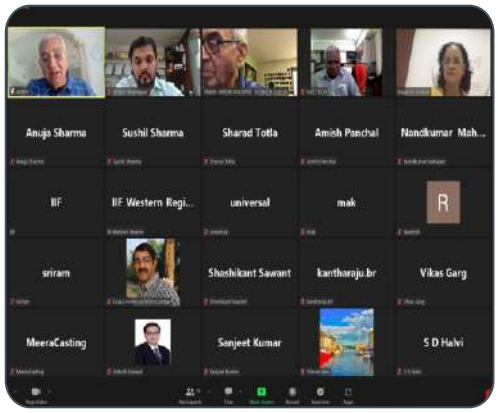
1. Advanced Engineering & Manufacturing
2. Pharmaceutical Industry
3. Digital Marketing & Social Media
4. Artificial Intelligence and Automation
5. Energy Sector
6. Construction
7. Telecom
8. Retail
9. Media and Entertainment
10. Tourism

Out of these 10 industries, three are directly connected with foundry industry. With Indian Govt. pushing hard to increase manufacturing growth and exports, foundry industry will witness tremendous growth in next few years. Let us gear up for this opportunity, make ourselves more resilient against temporary dips and keep our focus on long term growth and prosperity.

Happy Metal Casting !

Western Region Activities





Webinar # 4 under Go Global Project for all the GIFA Visitors / Exhibitors.

Innovation Tech Series # 5 @ Kolhapur

Western Region Activities

Under Project **PRAYAAS** -
IIF Western Region Jointly with IIF Eastern Region organized Inter Regional Work Visit at Kolkata

Amit Enterprise Pvt. Ltd.

Kiswok Industries Pvt. Ltd.

Foundry Cluster
Development Association

NIF Ispat Pvt. Ltd.

IIF Head Office

Amik Metal Pvt. Ltd.

Texmaco Rail & Engineering Ltd, Steel Foundry Division