

FOUNDRY TALKS

Foundry E-Magazine

For The Foundrymen By The Foundrymen

Edition : July 2022
By : IIF - Western Region



Innovation Article By



MESSAGE FROM CHAIRPERSON

Setting the Stage



Anuja Sharma

Chairperson, IIF-Western Region
Director-Marketing -Shamlax MetaChem Pvt. Ltd.

Dear Fellow Foundrymen,

This year of 2022 has started with fear, anxiety, turmoil, and existence of corona but with a tamed effect. With half of the year passing and life returning back to old normal, IIF held successful IFEX, meeting foundrymen in person after a long time. This physical interaction was a wonderful experience after a long queue of multiple zoom meetings and social distancing. Finally, with the year kicking in more meetings and programs are shifting from virtual to physical showing sign of relief.

Western region is known for its excellent work and dedication towards foundry fraternity. "Innovate to Elevate" is the theme for this year and launching this monthly E- magazine is an idea to reach out to the masses and exchange the knowledge. This is not a news bulletin but a practical knowledge based magazine, wherein articles are shared by the foundrymen for the foundrymen with their shop floor experiences and other day to day stories at work. With this e-magazine, there shall be an intellectual exchange of problems and queries answered by experts and also insights on raw material price index. Along with WR activities, there shall be dedicated column with every chapter chairman's message (published in alphabetical order).

Apart from E- Magazine, WR is planning many other projects, filling the gap between industries and institute with its upcoming project "EKLAVYA". The other programs shall focus on innovation and digitization with the need of the hour aiming to make our industry 4.0. This year we will encourage innovation and digitization.

As Western Region Chairperson 2022-23, I thank you all for considering and believing in me for this responsibility. I will try my best to fulfil this with all your support. So the stage is set and time for talk less and more work.

Thanks.

MESSAGE FROM THE EDITOR

Dear readers,

It gives me immense pleasure in presenting this very first issue of "Foundry Talk"; the first ever "e-magazine" published by IIF-Western Region; which is brain child of our dynamic chairperson Anuja Sharma Ji. This magazine is designed for broader interaction and hence it has some unique features like:

- "R M Price Trend" which will help as supportive document for foundries while negotiations.
- "Ask the experts" where the readers can post their questions for guidance from field experts.
- "Innovation and Technology page" which will showcase latest innovative products/ services... The forum is open for any new creative inputs from readership.

I thank Anuja ji and Team WR for assigning me this task, and I will try my best in delivering fruitful results for the benefit of foundry Industry.



Anant Bam

Editor Foundry Talk
Foundry Consultant & Energy Auditor

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



Balaguru S.



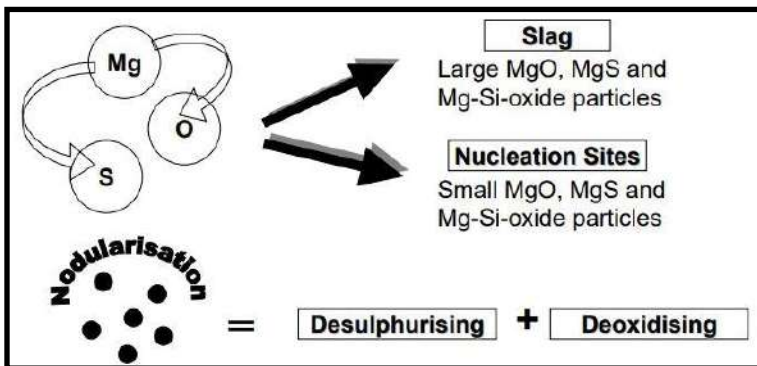
Kumar Kislay

Optimizing Mg treatment in SG iron production

Compiled by Balaguru S. & Kumar Kislay

Since the origin of Ductile iron in the 1940's, foundries have been optimizing the process of casting production, right from the raw materials selection and melting, to the pouring and solidification stages. Though contributing less than 2% in the content by weight, the treatment alloys play a very important role in achieving the final casting quality. Some of the important factors which can control and influence the efficiency of Magnesium treatment using Ferro Silicon Magnesium can be as below:

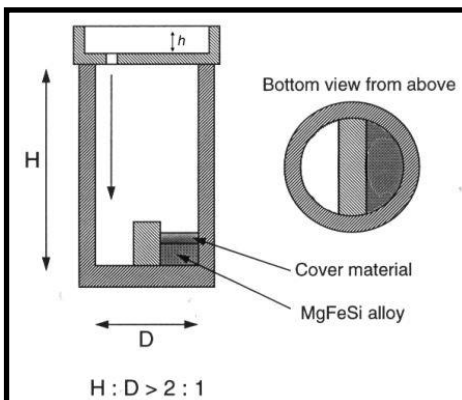
Chemical Composition Composition with control on trace elements/anti-nodulizers like Sulphur, Titanium, Lead, Zinc, Vanadium etc can support in efficient treatment. Also, the content of Carbon and Silicon in the desired range as per the iron grade and casting geometry can have a direct impact on the micro structure. Not to forget the amount of Oxygen and Sulphur required in the system for the effective Nucleation.



Impact of Sulphur and Oxygen on Mg Treatment

Tapping Temperature A lower tapping temperature allows for less oxidation losses and hence better Magnesium recovery, thereby reducing the alloy consumption. Heat retention is another factor to consider achieving better results. Control on the temperatures further improves the cycle time and reduces the overall power consumption in a foundry.

Time for Pouring All treatment alloys fade. To control the fading of Mg and to achieve it within the acceptable range, a controlled pouring time (usually 8 minutes) allows for optimized addition rate and helps avoid need for excess Mg during the start of pour. Also, Metal filling rate in the ladle should be high in order to achieve a high ferro static head in the ladle before the reaction starts.



Optimal Ladle Design

Ladle Design The internal Height: Diameter ratio should be at least 2:1 and the FSM pocket should have space enough to carry the alloy addition and covering material. The ladle should also be properly insulated to minimize heat losses and consequently the required treatment temperature. A tundish cover lid is also highly recommended for alloy and temperature recovery reasons.

Treatment Process Use of pre-heated ladles and Heat-retention measures helps improve process consistency. Ladles with Tundish covers allow for reduced atmospheric interaction (Oxidation) and hence less Mg losses and lower slag generation, along with reduced heat losses due to radiation.

Alloy Size and Addition A suitable alloy size and size distribution, which allows for better packing density and delayed reaction helps improve treatment effectiveness and consistency. And against common notion, large sized particles of FeSiMg is not the best for treatment because large sizes may cause floatation and non-dissolution issues of the alloy.

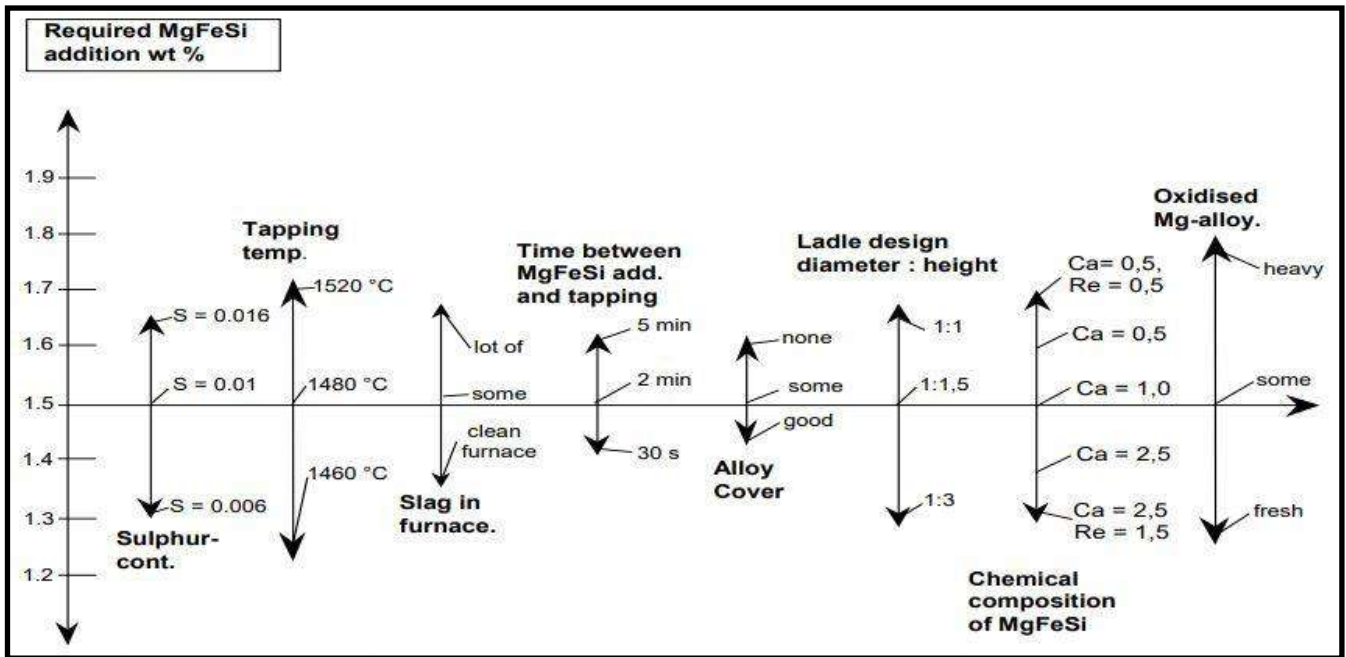
Slag Content in the Metal Slag that is transferred from the furnace will react with Magnesium and reduce the recovery. Proper separation procedures to minimize slag carry over have to be in place to avoid the Magnesium losses.

Alloy Composition Use of standard FeSiMg alloys with optimized range of major treatment elements like Mg, Ca, RE etc can vastly influence effectiveness. Remember to choose alloy based on the foundry process parameters. High or Low content of above mentioned elements, based on the process requirements can be harmful, and they may cause issues like slag, Chunky graphite, Exploded graphite and Carbides in the castings. Also, compared to other processes like Cored-wire and Pure-Mg treatment, FeSiMg treatment is much more consistent, harmless and environment friendly.

Inoculation Inoculation promotes graphite precipitation which in turn forms Nodules due to the Mg treatment. A good suitable inoculation can support Nodule formation and Nodularity and immensely contributes to the effectiveness of the Mg treatment in ductile iron production. Without a proper inoculation, FeSiMg addition alone may still result in Carbides, Shrinkage and poor Nodularity in the castings.

Alloy Storage All foundry alloys will oxidise if exposed to moisture. Oxidised alloys will give a lower recovery than fresh materials. Containers of alloy should be stored in a dry place and not opened until required at the treatment station.

Any foundry with good control on the abovementioned conditions will be best equipped to produce good quality castings consistently and efficiently.



Factors that can influence the FeSiMg effectiveness in a Ladle treatment process

Trivia Magnesium used for Ductile iron production was an accidental discovery in 1940's, when exploring different Carbide promoting elements in iron castings during the 2nd World War. Magnesium still is a strong carbide promoter, and hence, foundries should aim to achieve highest Nodularity, with the minimum possible residual Magnesium.

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 tonne 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, but in June 2022 prices start little bit declining. Now Prices ruling in Kolhapur during second week of July, 2022 are given in column 14 in the Table below. Also given in Table are the Prices since July 2020, Presented in past 13 issues of FOUNDRY. These prices are collected from Kolhapur Market. These are approximate, ruling during the Month & week Indicated in the Table below.



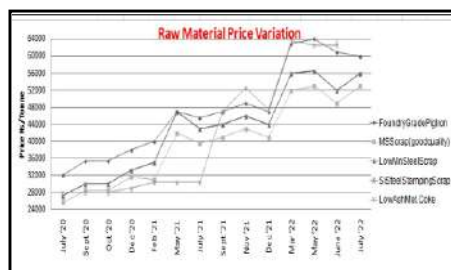
Mahesh Date

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'

Graphical presentations of price Movement of some of these materials / alloys appear below in two graphs.

Movement Of Prices of Raw Materials over a Period 24 Months

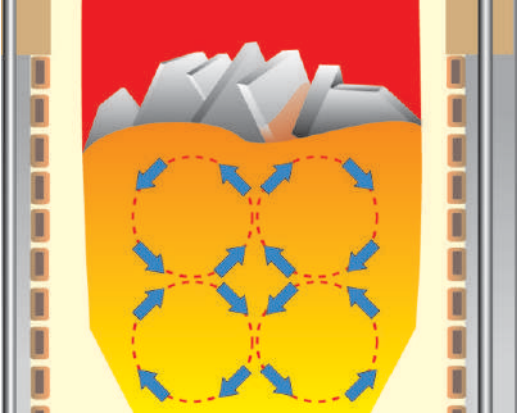
(A) Major Ferrous Metallic Raw Materials, Low Ash Metallurgical Coke, and Electro-Graphite Fines {Rs / Tonne}														
	July '20	Sept '20	Oct '20	Dec '20	Feb '21	May '21	July '20	Sept'21	Nov'21	Dec'21	Mar'22	May'22	Jun'22	July'22
	3 rd Week	1 st Week	3 rd Week	2 nd Week	2 nd Week	3 rd Week	4 th Week	5 th Week	4 th Week	5 th Week	4 th Week	3 rd Week	3 rd Week	2 nd Week
Foundry Grade PigIron	32000	35300	35300	38000	40000	47000	45500	47000	49000	47000	63000	64000	61000	60000
MS Scrap (good quality)	25700	28500	28500	31700	31000	42000	39500	41000	43000	41000	52000	53000	49000	53000
Low Mn Steel Scrap	27200	30000	30000	33200	35000	47000	43000	44000	46000	44000	56000	56500	52000	56000
Si Steel Stamping Scrap	27200	30000	30000	33200	35000	47000	43000	44000	46000	44000	56000	56500	52000	56000
Low Ash Met. Coke	28000	28000	28000	29000	30500	30500	30500	47000	52500	47500	63500	62500	62500	610000
Electro-Graphite Fines	63000	62000	62000	64000	70000	—	80000	95000	105000	100000	100000	110000	110000	110000
(B) Major Ferro-Alloys {Rs / Kg}														
Fe-Si (70-75% Si)	80	89	87	94	110	128	147	210	200	190	215	153	152	152
Fe-Si-Mg (5-7% Mg)	113	118	116	121	133	155	165	250	280	250	250	230	230	230
Fe-Si-Mg (5-7% Cr)	113±5	118±5	116±5	121±5	133±5	155±5	165±5	250	280±5	250±5	250±5	230±5	230±5	230±5
Fe-Si-Mg (8-10% Mg)	120±5	125±5	123±5	128±5	139±5	160±5	170±5	255	286±5	256±5	265±5	240±5	240±5	240±5
High C Fe-Cr (60% Cr)	77	80	80	82	102	102	110	135	140	130	130	130	130	130
High C Fe-Mn (60% Mn)	70	72	70	72	77	128	110	120	130	120	125	110	99	99
Ferro-Moly (60% Mo)	925	950	1025	1100	1300	1325	2000	2070	2150	2050	2150	2160	2160	2160



(Info collected during July 2022. Readers are requested to check the market prices)

1. Above Prices are Excluding Taxes, GST Extra as Applicable.
2. Phenol Price: Rs. 140 / kg during 2nd Week of July, 2022

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

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Aluminum Melting By Inductotherm Increase Productivity & Metal Quality

HIGHER METAL QUALITY

Induction technology heats the aluminum directly which leads to a variety of benefits.

Since the metal in an induction melting furnace generates the heat in the metal itself, there are no hot spots anywhere in the furnace. This homogeneous temperature of the metal and refractories promotes reduced hydrogen pickup and oxidation of the metal compared with alter-native methods of melting.

This leads to higher quality metal with lower levels of inclusions and porosity. Reduced porosity means less time and expense for degassing. Reduced inclusions means that less filtering needs to be done and less time is spent dedrossing the furnace, thus lowering the labor cost.

The electromagnetic forces induced by induction melting stir the bath. This constant motion forces inclusions to join together for easier removal and much cleaner metal. This motion also promotes a more complete mixing of alloying materials which is essential for the production of alloy hardeners and other applications requiring a high degree of alloy consistency.

Inductotherm technology can help you produce higher quality aluminum more profitably. We offer a wide range of advanced induction technology and equipment ideal for melting, processing, recycling and handling aluminum. Our equipment can be used for a variety of applications such as:

- Aluminum Recycling
- High Volume Casting
- Ingot Production
- Investment Casting
- Alloy Manufacturing
- Die Casting
- Alloy Hardener Production
- Aluminum Chip Melting

Induction melting is clean, quiet and has a high productivity rate. Induction furnaces use a non-radiant energy transfer process. Electricity heats the charge, not the shop, and there is no combustion noise, which means fewer distractions for a safer melt shop.

For maximum productivity and safety, we can equip your furnace with an automated charge preheating or drying system and a material handling system. Optional push out linings get your furnace back on-line faster.

From our Acutrak® Direct Electric Heat (DEH) Systems to our Hybrid™ furnaces—we have the products and technology needed to help virtually any size aluminum producer to:

- Create Higher Quality Metal
- Increase Productivity
- Lower Energy Costs
- Lower Metal Costs

INDUCTION MELTING IS CLEAN AND QUIET AND CAN BE CONFIGURED TO SUPPORT A HIGH LEVEL OF MELT SHOP AUTOMATION.



Highly Efficient

LOWER ENERGY COSTS

Induction melting has lower energy costs than all other types of melting. In many parts of the country, Inductotherm induction furnaces are the lowest cost way to melt aluminum. “Dollar-for-pound” they can be more economical than oil or natural gas. Inductotherm coreless furnaces achieve nearly perfect energy utilization as they are matched with VIP power supplies designed for your aluminum melting application. For maximum energy efficiency, Inductotherm can equip furnaces with a charge preheating system.

LOWER METAL COSTS

With induction melting, metal loss can be as low as one half of one percent. Induction furnaces bring down the cost of charge materials by allowing recycled aluminum scrap to be used in some applications that previously required primary or secondary ingot. The electromagnetic stirring action rapidly submerges the recycled scrap charge, promoting more rapid melting while reducing oxidation of the charge before it melts. Coreless induction furnaces are particularly cost-effective for melting chips and turnings.

RECYCLING ALUMINUM SCRAP

Whether you are recycling aluminum beverage cans or other aluminum scrap materials, coreless induction melting systems operating at 60 cycles handle this job better than any other melting technology. Induction is the most efficient way to melt light-weight scrap materials and chips or punchings. And these 60 cycle systems provide the ideal level of metal stirring needed to roll together dross for easier slag removal and to achieve a homogeneous metallurgical product. They also minimize magnesium and alloy losses during melting and reduce metal porosity.

Only Inductotherm offers technologically advanced, fully solid-state, 60 cycle power supplies designed for aluminum melt-ing. These units, available from 150 kW to 10,000 kW, are far superior to transformer-type mains frequency power units, providing important advantages. Solid-state control eliminates the need for mechanical contactors and tap switches by providing power control via a single power control knob. They are very efficient as power levels remain consistently high, even at low metal levels.

HIGH QUALITY ALUMINUM CASTINGS

Using induction systems to melt ingot for high quality castings preserves the metallurgical characteristics of the metal. The inductive stirring ensures that it is consistent from the top to the bottom of the furnace. Castings remain true to specifications mold after mold from first metal poured to the last pour.

ALLOY HARDENER

Maintaining precise chemistry is key to making top quality alloy hardeners. That’s why the vast majority of alloy hardener manufacturers use induction furnaces for melting. Only induction provides the close control of metal chemistry temperature and homogeneity required by this application.

Important: Appropriate Personal Protective Equipment (PPE) must be worn by anyone in proximity to molten metal.



For more information, call 1800 419 2900 or visit www.inductothermindia.com
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Ask The Expert

Q: While making grade 500/7, we get higher T.S, but lower elongation. Customer also demands a minimum BHN of 180 BHN on casting of section thickness 15-30 mm. What process parameters to control/achieve for getting desired physical properties for this grade?

A: Suggested Chemical Composition-

- (a) Base Metal : C-3.8%, Si-1.2-1.4%
Final Casting : C-3.7%, Si-2.3-2.4%, Mn-0.4% max, Copper 0.25-0.35%, S-0.02% max, P-0.04% max.
- (b) Keep inoculation level of 0.3-0.5% Si, using any good grade of Fe Silicon / Inoculant.
- (c) Nodularity – 85% min.
- (d) Matrix – 30 -45% pearlite, Bal : ferrite.
- (e) Try to keep Silicon level to 2.4% max. At the same time, no carbides should be obtained in the matrix.
- (f) Hardness can be increased by addition of about 0.3% Copper, which will give about 30-40% Pearlitic matrix.

Answered By: Mr. Amish Panchal

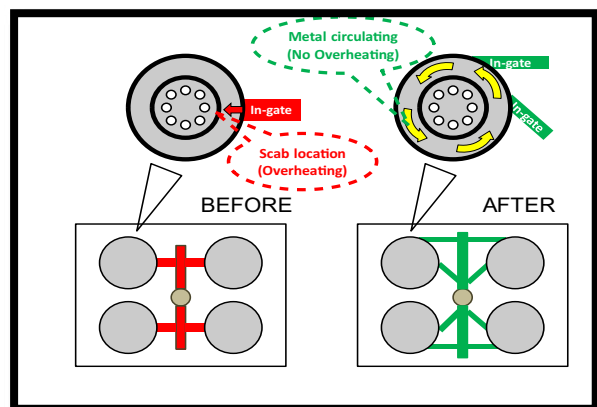
Q: We are observing the SCAB defects in Cast Iron Wheel Casting on the inner profile of the flange portion. The defect would appear as extra metal loosely adhering to the corner after shot blasting. After machining, the flange would expose underlying inclusions on the face. We attempted to increase the WTS, Lowered Pouring Temp, Venting the pattern near corner for compaction, improving mould hardness but problem still persisted though severity was minimized. What can be the permanent solution to this?

A: The root of the problem was excessive heating in the defect zone resulting in mold rupture during pouring. There was enough time available for the mold in that corner to expand, buckle and disperse loosened sand out and permit liquid metal to streak into the space created.

Normally, the remedy lies in quickly filling the mold before such expansion becomes catastrophic to cause scabs. However, the gating system for the wheel casting in this case was prone to create turbulence. An alternative would be delaying the expansion by a modified metal flow path inside the mold cavity.

The runners and in-gates for the wheel casting to be redesigned to provide for quicker metal fill with minimal turbulence, yet permitting the scab prone zone to remain moderately heated and not allow the mold wall to buckle. When implemented, the modified gating system will help in eliminating scab defect altogether from the casting, permanently.

Answered By: Mr. S. Subramaniam



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 IIF Ahmedabad Chapter Chairman



Dear Foundrymen & Members of IIF

I feel challenges for foundries are:

- Shortage of skilled work force.
- Unprecedented rise in the prices of key input material. This has disturbed liquidity in foundries.
- Delayed payment from the customers is also hurting the industry.

I am hopeful we can come out of this with a few improvements:

- Promoting & implementing energy efficient technologies & processes in foundry.
- Conduct training & skill up-gradation program for your personnel.
- Periodic rate revision & shorten your credit terms by renegotiating with your customer.

I feel honoured while expressing my thoughts here; I extend my best wishes to Ms. Anuja Sharma and her WR Team for the success in all your endeavors.

Bipin Sharma

Chairman IIF Ahmedabad Chapter
Proprietor Rakesh Moulding Works

Annual Chapter Meeting - WR

Ahmedabad Chapter



GMC Chapter



Indore Chapter



Kolhapur Chapter



Nagpur Chapter



Pune Chapter



Rajkot Chapter



Vadodara Chapter

