

PRAYAS

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Dear Reader,

At the onset, on behalf of Team Tata Metaliks, I would like to express my heartfelt gratitude for giving us an opportunity to serve you.

I am happy to share the new edition of “PRAYAS” after a pause of one quarter.

In the earlier issue of Prayas, we have covered the procedure of Wet chemical analysis for pig iron. I am sure, this process is helping you in having a better understanding for determining the chemistry. Keeping the essence of the current issue, we are also encompassing **Methodology of Cupola Charge Mix Calculation and Impacting Factors**. We believe that this procedure will help foundry officials in devising economical solutions for the production of cast iron suiting different sizes, mixed with the desired physical and mechanical properties.

We shall continue to provide technical assistance to foundries, to improve processes and products to make our customers more competitive in the market place.

Initiatives such as **Safety Awareness Session and CFT interaction, Health Camps** for foundry workmen will continue ensuring each member is heard, understood and collaborative action is taken to resolve issues.

In today's era, **Digitalization is no longer a concept, but a ubiquitous fact**. As you all must be aware, we at Tata Metaliks, have embarked on a Digital Transformation journey. We intend to transform the way we work and the way we deliver exceptional value to all our stakeholders including customers. Under this initiative, we have undertaken 16 digitization projects in wave 1 of the implementation – 7 projects in PI division, 4 in DI Pipe division and 5 projects in Shared Services. In Marketing & Sales also which is under Shared Services, we have undertaken 2 projects. In our subsequent issues, we will share snippets on the projects that are under implementation.

On this note, let me conclude by wishing you and your family the best of health, success and prosperity. We look forward to your continued support as usual.

Sandeep Nandi

Head-Marketing & Business Development



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The TML team is back with the 15th issue of Prayas.

In the previous issue of Prayas, 14th issue, we have interacted with 70+ foundries in Howrah, Faridabad/Delhi NCR & Ahmedabad to understand technical topics that can be of help in the day to day working of foundry officials.

Since a significant proportion of domestic foundry output in India is dependent on cupola operations, hence controls while calculating charge mix becomes a crucial factor for consistent quality check.

In the last issue, we had covered the topic of Procedure of Wet Chemical Analysis for Metallics, that prepares the base for selection and testing of a metallic charge mix. This has been well accepted by the foundries.

Adhering to the same intent, in the current issue we are covering the Methodology of Cupola Charge Mix Calculation and Impacting Factors. We hope that this will help the foundry officials in getting economical solutions for the production of cast iron suiting different sizes mixed with the desired physical and mechanical properties.

For further consultation & availing of our services, we request you to kindly remain in touch with our Customer Service Centre, Howrah, West Bengal.

Regards
Shivam Pandey
& Swati Pal

Customer Visit at Tata Metaliks

Kharagpur Plant



In November 2018, TML had launched a Safety Awareness Campaign for foundry owners at its Kharagpur plant. The objective of this campaign was to sensitize the foundry owners about the importance of safety, along with establishing a direct line of communication with foundries to develop an understanding of their requirement. Under this campaign conducted in Q1 FY' 20, 6 customers attended the program, thereby taking the cumulative number of customers to 40.



Customer Delegation & TML Team during the Safety Awareness Session and CFT interaction

The customers have also visited the MBFControl Room & the DIP Production Facility to have a look at TML's production, quality management and sales distribution processes. TML has planned to conduct more such plant visits in the coming months which will also help consumers in getting a feel of the production process of Pig Iron.



CSR Initiatives at Foundries of our Customers

Quoting Shri Jamsetji Tata, Founder- The Tata Group, *"In a free enterprise, the community is not just another stakeholder in the business, but in fact, the very existence of it."* He also went on to add, *"We do not claim to be more unselfish, more generous or more philanthropic than other people. But we think we started with sound and straightforward business principles, considering the interests of the shareholders our own and the health and welfare of the employees as the sure foundation of our prosperity."*



Team TML at Parucco Foundry Pvt. Ltd. (UNIT-II)

Inspired by this in April 2018, we have started an initiative of conducting health camps at foundry premises with the intent to benefit workmen in the Howrah foundry belt. The idea was widely supported by foundries and till date, we have covered basic health screening & medicine distribution to 2251 workmen across 14 foundries.

We would like to take this opportunity to thank the foundries mentioned below for supporting our initiative.

BINAYAK HI-TECH ENGINEERING PVT LTD
GLOBE IRON FOUNDRY
HOWRAH ENGINEERING PATTERN WORKS
KEITH CERAMICS INDIA PVT LTD
KHARAGPUR METAL REFORMING INDUSTRIES PVT LTD
PARUCCO FOUNDRY PVT LTD
PROMPT CASTINGS PVT LTD
RAMESWAR FOUNDRY PVT LTD
SANKAR IRON ENGINEERING WORKS PVT LTD
SHIV SHAKTI IRON FOUNDRY
SHREE HANUMAN IRON WORKS
SWASTIKA ENTERPRISES
USHA FOUNDRY PVT LTD
VINAYAK FOUNDERS PVT LTD

Methodology Of Cupola Charge Mix Calculation And Impacting Factors



The principal objective of a good Cupola Charge Calculation consists of economical production of cast iron having a composition suited to the section sizes involved and to develop the desired physical and mechanical properties at a quality level, as per the customer's requirement.

The important factors to be considered in cupola charge mix calculation are mentioned below:

- Based on the section sizes involved.
- Based on the physical and mechanical properties (grade) required.
- Availability of raw materials.
- Effect of cupola operation on the chemistry of charge.



Machinable higher(thick) section sizes could be made with lower silicon % in the metal and lower(thin) sections thickness require a higher % of silicon in the metal to carry out machining.

The Carbon, Manganese, Phosphorous and Sulphur percentage need to be maintained in the metal as per the grade and application requirement.

For higher grades of castings, we need to lower the Carbon% in the metal and vice-versa with Manganese i.e. higher grades require higher % of Manganese content in the metal to get the desired properties. Based on this application, we need to control the elements. For example, to withstand the pressure, we need to lower the Phosphorous % in the metal.

The availability of raw materials and their respective prices plays an important role in charge mix calculation. Due to non-availability of suitable materials or due to higher rates, there are times when inferior quality materials along with ferro alloys are to be used to get the proper chemistry in liquid metal.

The efficiency in cupola operations and practices alters the metal's chemistry, as higher silicon and manganese losses occur due to improper volume and air pressure. The coke bed height and coke quality play

a role in the gain/ loss of carbon and gain in sulphur % of the liquid metal.

The following is the method of calculating the cupola charge:

1. Calculate the average composition of the ingoing charge based on the respective weights and chemical composition of the various metallics used.
2. The losses or gains of elements during melting is subtracted or added to the average composition determined as above.
3. The result obtained in point 2, gives a close approximation of percentages of Carbon, Silicon, Manganese, Sulphur, Phosphorous and also of alloys (if there were any present in the charge) to be expected in the iron at the cupola spout.
4. If not, adjust the % of each constituent of the charge and recalculate the final analysis of iron.

Careful attention should be paid to the layout of storage facilities to promote ease and economy of handling. All the raw materials should be kept separated in the storage yard. Unless this is done with care, the effort of calculating the cupola charge mix will be wasted.

In addition to the above, the bins used for the storage of the metallic components of the charge should be emptied and cleaned at regular intervals. During this clean up, non-metallic materials such as sand, cinders and other trash should be removed from the bins. The large quantities of foreign matter which finds its way into the cupola charge have the same effect as inaccurate weighing; this in turn may often result in poor uniformity of composition of the metal at the cupola spout.



CHARGING SEQUENCE

INTO THE CUPOLA FOR PROPER MIX

1. Pig Iron
2. C.I.Scrap (rust, oil and grease free)
3. Foundry returns (shot blasted)
4. M.S.Scrap (rust free) and additives (lumps)

APPROXIMATE LOSS/GAINS OF ELEMENTS IN CUPOLA OPERATION



CARBON: Metal suffers a loss in carbon content because of oxidation, at the same time iron picks up carbon from the coke. The factors that affect the absorption of coke are:

1. **Initial carbon content lumps**
2. **Size of the coke**
3. **Temperature**
4. **Time allowed for the metal to remain in the cupola**

Generally, in a continuous cupola, it is assumed that the oxidation loss is equal to the gain from the coke.

SILICON: Silicon has a tendency to get oxidised and is lost during the melting operation. Even under well controlled and normal working conditions, the loss may be in the range of 7 to 12% of the silicon in the charge and for ferro silicon lumps it may range between 10 to 15%. Under abnormal conditions, the loss may be as high as 30%. Thus, to achieve a certain silicon content in casting, either the original charge used must be richer in silicon by the amount that is expected to be lost, or it should be compensated for the loss.

Silicon in the form of ferro silicon may have to be added externally to the ladle containing molten metal. For homogeneity and uniform distribution all over the metal, a granulated charge of ferro silicon is added to the stream of molten metal as it is tapped from the cupola into the ladle.

MANGANESE: Has a tendency to get lost along with silicon during melting. The loss may be about 15 to 20% of the manganese present in the charge and for ferro manganese lumps it may range in between 15 to 25%. Here again, to get a certain manganese content, either the initial charge used must be richer in manganese or external additions may have to be made in the form of ferro manganese.

SULPHUR: Like carbon, the sulphur content also tends to increase due to its absorption by the metal from the coke. Generally, the gain in sulphur content is assumed to be 0.03 to 0.05% or 40 to 60% of metal charge sulphur. The pick up of sulphur by iron depends upon:

1. Content of sulphur in coke
2. Initial content of sulphur in the metal charge
3. Iron coke ratio
4. Manganese content in the cupola charge (since manganese combines with sulphur and forms manganese sulphide)

PHOSPHOROUS: This constituent does not change, and its percentage remains nearly the same throughout the re-melting operation.

IRON: During the melting operation, iron itself also tends to get oxidised and lost, but the loss is generally quite small and is within the range of 3 to 4%, which is called Burning Loss.

For any assistance and queries on your Cupola Charge Calculations, kindly get in touch with Tata Metaliks Customer Service Centre, Howrah, West Bengal.



Onsite Technical Support in the Ahmedabad Foundry Cluster

Over the last two years, TML has established itself as a leading foundry grade Pig Iron supplier in the Ahmedabad foundry cluster. We thank the foundries in Gujarat for their continued support.

Inspired by the success of TML's onsite technical support to foundries at Howrah & Nagpur foundry clusters, we have approached regular TML foundries in Ahmedabad.

For a period of 10 days, the TML technical team along with the respective foundry production team observed a guided production of hot metal after suggesting changes in the ongoing method of production. Consumers have accepted TML's Technical Support very positively and derived a beneficial output. TML is planning to conduct a second round of the Onsite Technical Support Programme for foundries in Gujarat in Q3 FY 20.

The opinion of foundry owners in Ahmedabad about TML's Technical Support are listed below:

*"Coke saving and reduced gaps as compared to competitor's material was observed. I also got to see a lot of things in practice that I had studied in theory. The labour dependence has reduced and the TML team is ready for future guidance. The other players have limited their interaction to distributors only; whereas as TML is reaching out to end customers"- **Saurabh Patel, Kumar Industries***

*"Help in cupola operation was received. A lot of savings in various aspects have been observed. As per technical advice, change in operation has been done which proved to be beneficial. We are receiving good quality and consistency in low silicon material". - **Parth, Sunshine Metals***

*"A saving of half an hour in cupola operation was observed as compared to competitors' material due to increased melting rate. A number of new techniques like reducing the airway of the blower which increased the air pressure helped in efficient operation".- **KS Patel, KS Metal***

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