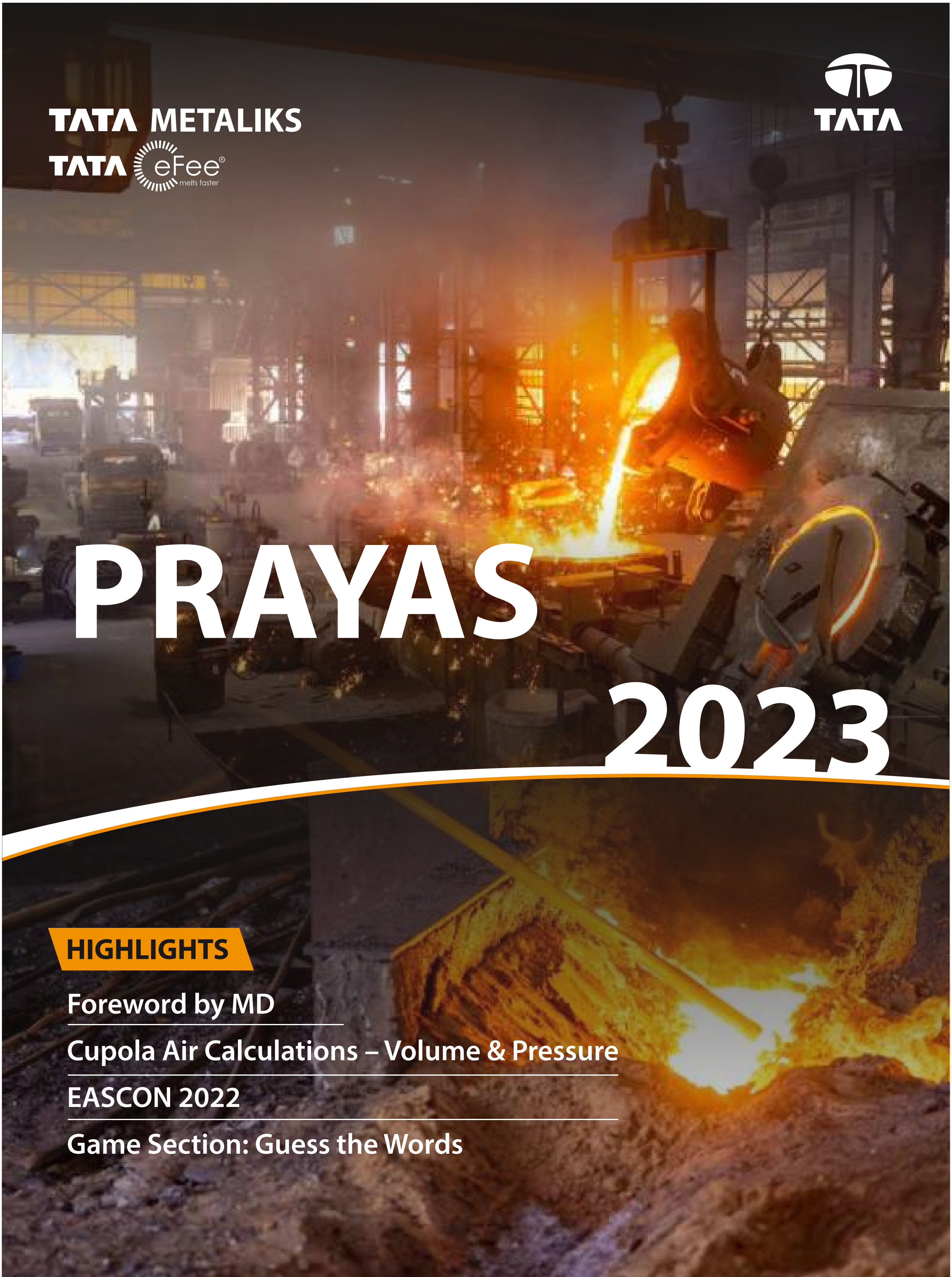

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PRAYAS 2023

HIGHLIGHTS

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Dear Customer,

Wishing you a very happy and prosperous New Year!

I, along with my team at Tata Metaliks would like to thank you for your continued support extended to us over the years.As we embrace the new year, we expect 2023 to be filled with possiblities & opportunities. Technology will continue to be the key enabler and Tata Metaliks shall put concerted efforts to keep pace with it. The early adoption of new technological interventions has not just helped TML in taking data driven decisions but is also helping us improve customer intimacy and reach.

It is a matter of immense pride that India is now the world's second-largest producer of crude steel. While on one hand, India's finished steel consumption is anticipated to almost double over the next 7-8 years, the foundry industry is expected to grow at a healthier CAGR of over 10%.

The foundry industry truly serves as the cradle for manufacturing of major engineering equipment & parts. Foundries across India are presently upgrading facilities & technologies to improve their productivity and remain competitive. TML, as part of building long-term value-added relationships with customers, has been assisting in these endeavours by providing several technical and value added services. It is indeed a privilege for Tata Metaliks Ltd. to be associated with the foundry fraternity for over 25 years, marketing our pig iron product under the 'Tata eFee' brand.

As our commitment to add value to the customers we serve, we have been meeting specific application needs of our foundry fraternity by developing customised grades of the "generally" commoditised product, which also helps in optimising energy consumption and thereby, carbon footprint in foundries.

TML aims to be a ZERO-HARM organisation through focused safety strategies & behavioural changes. As a responsible corporate citizen, TML has been working with the society and community on several impact fulinitiatives, one of them being quality school education accessible to every child with the goal of a 'child labour free community'.

I must also state that our present and future endevours should be to protect our environment by reducing the carbon footprint and simultaneously taking care of our workforce & their families. It will be our sincere endeavour to continue strengthening our relationship by working together on all fronts.

Once again, wishing you all a very happy, healthy and a prosperous 2023!

Alok Krishna
Managing Director

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CUPOLA AIR CALCULATIONS (VOLUME & PRESSURE)

A cupola furnace should aim to provide molten metal with the desired chemistry at a required rate and at the desired temperature.

Factors which affect the furnace's performance are blast rate, coke to metal ratio and correct charge mix selection.

The weight of air supplied to a cupola is approximately equal to the weight of metal charged and proper attention should be given to it. The combustion reactions take place due to oxygen in the air supply.

The melting operation's efficiency is based on the admission of the correct amount of air for the melting conditions desired.

Factors determining air volume and pressure are:

- ***Size and type of cupola.***
- ***Melting rate (normal and maximum).***
- ***Coke to metal ratio in charges.***
- ***Chemical composition of metal required.***
- ***Temperature of the metal at spout.***
- ***Height of coke bed and charges above tuyeres.***
- ***Size and quality of coke.***

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The optimum blast air volume is expected to ensure a maximum degree of molten metal overheating which in turn, depends on an arrangement of the various zones in a cupola.

The pressure required is determined primarily by the maximum quantity of air to be forced through the melting zone, nature of the coke and metal charge, height of the charge above the tuyeres, tuyere and wind box design, size, length, and nature of the blower piping.

The optimum blast air volume rises with increasing height of the charge materials column, above the level of tuyeres, with increasing coke-to-metallic charge ratio and heat transfer coefficients. On the other hand, it decreases with increasing modulus of the metallic charge lumps.

AIR VOLUME CALCULATIONS

To burn 1 kg of carbon, oxygen required = 2.67 kg.

Air contains approximately 22% of oxygen, so weight of air needed to have 2.67 kg of oxygen = 12.14 kg.

Changing 12.14 kg of air into volume: 9.48 m^3

With coke to metal ratio of 1:8, to melt 1 ton of metal, coke required = 125 kg.

Assuming, coke contains 70% carbon, so, 125 kg of coke contains carbon = 87.5 kg.

Volume of air required = 87.5 x 9.48 = 829.5 m^3 = 29293 cu.ft.

For 1 kg. of coke to burn, air required in cu.ft = 234.34.

So, for melting rate of 5 tons/ hour and considering coke to metal ratio of 1:8, we require to burn 625 kg. of coke in an hour.

Volume of air required to burn 625 kg. of air in cu.ft.= 625 x 234.34 = 1,46,462.50

Volume of air in cu.ft. / minute = 1,46,462.50 / 60 = 2,441 CFM

Considering all air leakages at tuyeres, windpipe, and wind box to 10 %,
Air required in CFM for 5 tons/hour melting with coke to metal ratio of 1:8 = 2,685 CFM

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AIR PRESSURE CALCULATIONS

The following formulas are used to calculate air pressure.

$$V = v \times 0.7854 \times D^2 \times 60 \quad \& \quad v = \sqrt{2gh}$$

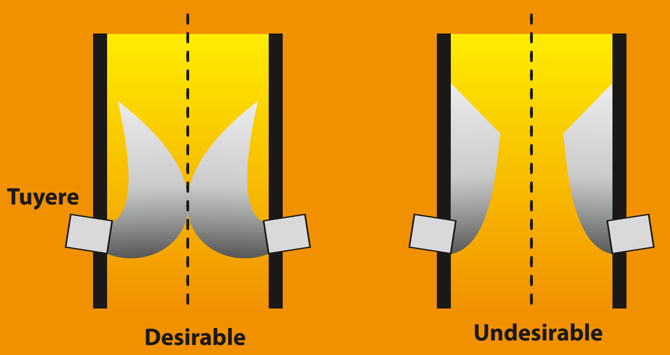
V = Volume of air in CFM

v = Velocity in ft. per second

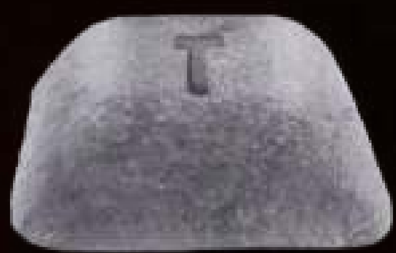
D= Inside dia. of windpipe at point of measurement in ft.

g= Acceleration due to gravity, value is 32.15 ft. per second

h = Pressure differential in inches of water



Blast Air Penetration



Higher blast rate is a common practice in major cupola operations. Its effects are:

- Higher coke consumption
- High oxidation losses

Lower blast rate of air causes the following effects in operation.

- Lower heat generation (high coke consumption)

Lower metal temperature – slower melting

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AIR VOLUME CALCULATIONS

Unfortunately, it is not possible to directly observe the conditions that exist within a cupola and detect the need for corrections in air volume, pressure or charges until conditions have deteriorated to the point where quality of molten metal is affected.

However, it is possible to obtain an early indication of impending need for correction from analysis of the effluent gases. The heat required to preheat, melt, and super heat the metal is furnished by the combustion of the fuel. Part of this heat is removed from the cupola, because of carbon dioxide being reduced to carbon monoxide in the reduction zone. The lower the percentage of carbon dioxide converted, the greater the quality heat available for effective use.

Consequently, more efficient combustion (in reality, less efficient reduction of carbon dioxide) will result in more iron being melted per kg. of coke. The efficiency of combustion is directly related to the carbon dioxide content of the effluent gas. Hence, CO_2 content may be taken as a reliable indication of conditions in the bed.

Melting efficiency (iron to coke ratio) and combustion efficiency (CO_2 content of effluent gas) are closely related and is apparent that definite savings in fuel can be made because of combustion control. Uniformly low element loss and iron tapped at consistently at high temperatures are the results of a correctly maintained stage of combustion.

Combustion in the cupola can be automatically controlled using an automatic Co_2 analyser, equipped with a compensating mechanism in conjunction with an automatic volume control equipment.

The analysis of the effluent gases is a valuable index by which the operation of the cupola can be controlled until charging has been stopped.

Due to the individual peculiarities of each cupola installation, the final setting and adjustment of various components of this automatic control, as well as of others, must be accomplished after the equipment has been completely installed, and the cupola is under actual operating conditions. After the cupola has been under blast for approx. 2 hrs to be certain that it has attained an equilibrium condition, various adjustments are made to coordinate the automatic controls to meet the demands of the desired stage of combustion within the cupola.

With caution, the automatic control should then be placed into operation, & further adjustments are to be made over several days of operation, continuously observing the cupola operation and the control mechanism's performance. Each cupola is itself an independent unit, and optimum conditions in one cupola are not necessarily same in another. Thus, it is necessary to adjust the controls for the operating conditions of each cupola.

Automatic blast control equipment should not be considered a cure for all cupola ills. The control cannot overcome poorly supervised cupola operation. Close observation and control over the selection of raw materials, charging and other details of operation are essential.

Poor distribution of charges, operation of the cupola so that it becomes necessary to melt at a lesser rate than which it was originally designed, or intermittent stopping of the blast are conditions which result in irregularities of the metal produced. It can be safely said, that if other cupola conditions are normal, use of automatic control equipment will result in uniformity of operations that is impossible to attain by hand manipulation or observation.

For further assistance in this context, please contact TML at
msambasiva.rao@tatametaliks.co.in

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EASCON 2022

The Institute of Indian Foundrymen (IIF) organized a 2-day Eastern Regional Conference on 13th & 14th December 2022 at Biswa Bangla Convention Centre, Newtown, Kolkata.

Some glimpses from the conference

Mr. Alok Krishna, Managing Director -TML, at the Tata Metaliks stall

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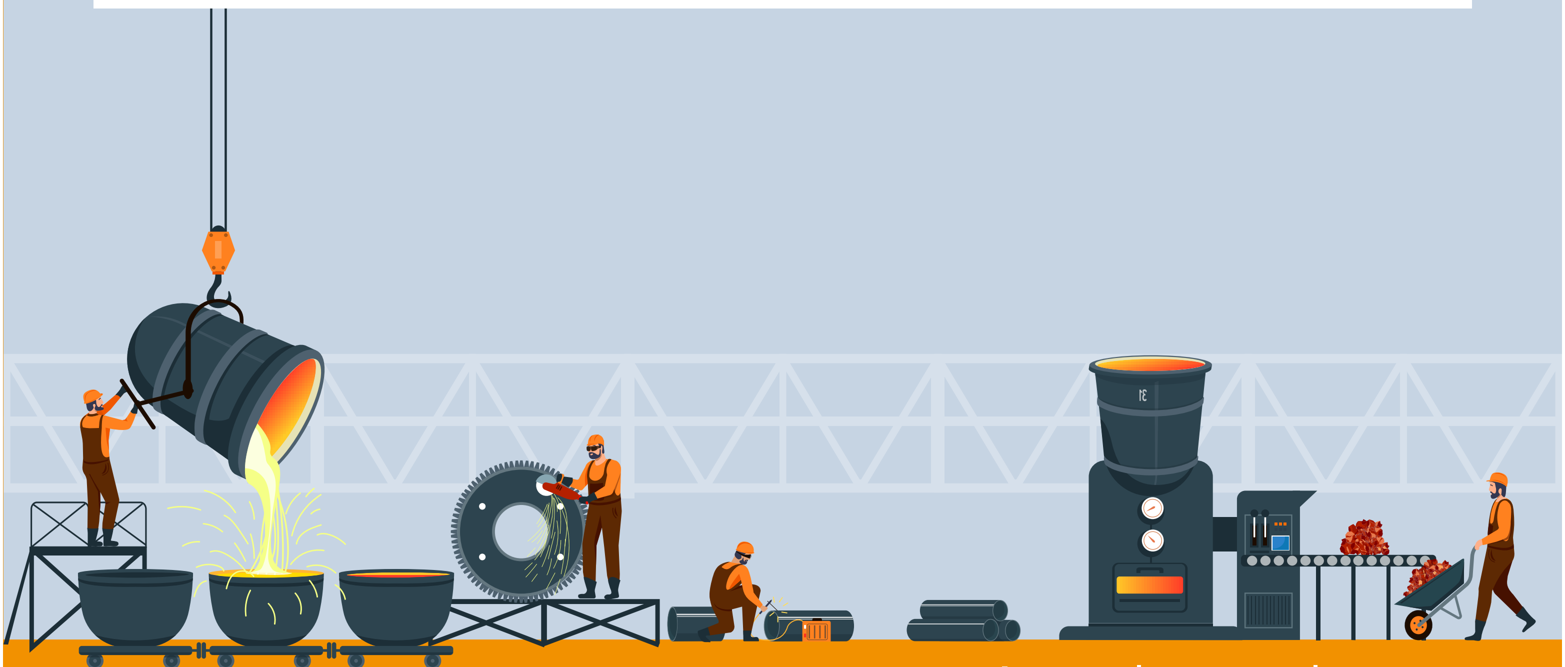
EASCON 2022

Inauguration by Dr. Shashi Panja, MIC – Industry Commerce and Enterprises, Women and Child Development and Social Welfare, Govt. of WB



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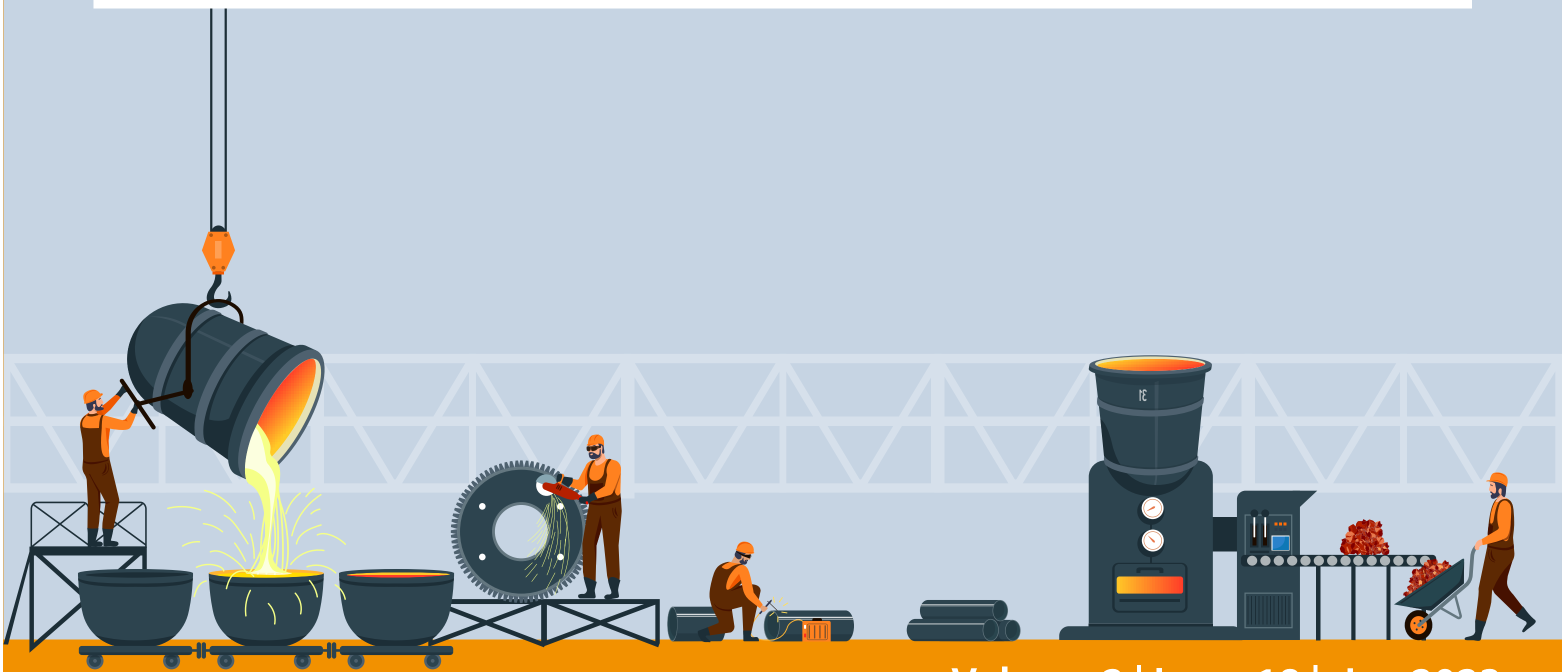
EASCON 2022

Unveiling of Souvenir by Chief Guest along with other dignitaries



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CUSTOMER SPEAK

“Thank you, Tata Metaliks, for providing us with excellent and accurate Pig Iron. We use foundry grade Pig Iron for our casting iron foundry, which helps maintain the perfect quality of our product. The chemical combinations of the Pig Iron produced by Tata Metaliks are perfect and visible on the Tax Invoice.”

Mr. Arka Hait

Ramkrishna Iron Works Pvt. Ltd., Howrah

★★★★★

“I am associated with Tata Metaliks for the past 15-20 years. Earlier, I used to take material of other brands also, but now I only take material from TML due to their superior quality. The TC (Test Certificate) which comes with the material really helps us in our manufacturing process”

Mr. T N Singh

Rameswar Iron Foundry, Howrah

★★★★★

GAME SECTION

GUESS THE WORDS

1. PCAOLU
2. ERSUSEPR
3. TMEL
4. TASLB
5. NOITSBUOCM
6. LTEAM
7. TUOSP
8. EOKC
9. AEHT
10. NBOCRA

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