



GREAT DIECASTING TECHNOLOGY FORUM

# JOURNAL FOR ALUMINIUM CASTING TECHNOLOGY

## Volume 65 - August 2024



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## Improved Melt Quality for High Integrity Aluminium Castings

### Critical melt treatment practice and melt quality analysis for Aluminium foundries

- Philippe KIENTZLER, International Marketing Manager, Foseco International LTD.

- Shrikant BHAT, Head Non-Ferrous Foundry, Foseco India

### Abstract

Metal treatment is a critical part of the foundry process, which often has a significant impact on casting quality, reject rates and costs. Existing practice often consists of hand fluxing or rotary degassing, but both have important limitations in terms of costs, efficiency or automation.

Furthermore, the application of fluxes like sodium (Na) modifiers or Ti-B grain refiners, that influence mechanical properties, must be performed in a reliable way otherwise the foundry may experience variations in their process.

Cost efficient grain refining will be discussed in gravity and wheel foundries using newly developed MTS 1500 processes.

As HPDC becomes the preferred method of making aluminium casting, cost savings and inclusion removal can be successfully achieved using MTS 1500 and VMET Melt Quality assessment.

Oxide removal is the most important step in improving melt quality and MTS 1500 together with VMET Melt Quality Assessment has made a significant contribution in Aluminium pistons, wheels and chip re-melting.

### Introduction

Metal treatment is a critical part of the foundry process, which often has a significant impact on casting [1] quality [2], reject rates and costs.

Existing practice often consists of hand fluxing or rotary degassing flux injection, but both have important restrictions or limitations.

Hand fluxing can be unreliable since it is operator dependant. Variations in addition rates, treatment times can cause major differences in efficiency and melt quality when cleaning, grain refining or doing sodium

modification. This is especially true in High Pressure Die casting (HPDC) where the number of ladles or furnaces treated can exceed 100 per day.

Rotary degassing flux injection has resolved some of these issues by reducing the variability due to the human operator. It also has increased treatment consistency when performing a larger number of treatments per day. Unfortunately, the injection of flux through a rotating shaft requires a specially formulated and graded flux to prevent blockages. Fine particles smaller than 1 mm can become mushy during injection, whereas those larger than 2 mm can bridge inside the spinning shaft, which in both cases causes the



treatment to breakdown. This blockage issue will limit the injection rate of the flux and hence can sometimes increase treatment time.

Furthermore, the application of rotary flux injection is often limited to cleaning fluxes as most other fluxes like sodium (Na) modifiers, Ti-B grain refiners or trace element removal fluxes are more difficult to inject and often lead to shaft blockage which is causing troubles for the users.

As a response to these issues above, Foseco developed the MTS 1500 [3], a robust blockage- free and reliable system to achieve multiple functions in a foundry like:

- Faster degassing using more efficient XSR / FDR rotor design
- Cheaper cleaning & drossing especially in high-pressure die-casting
- Constant and repeatable sodium modification
- Cost efficient Ti-B grain refinement in gravity and wheels
- Cost saving for drossing in Aluminium HPDC
- Oxide removal in Al HPDC, pistons, wheels and chip melting using VMET assessment.

### MTS 1500 principles and technology

MTS 1500 (see Fig.1) is an automated Metal Treatment Station based on Foseco's proven FDU Rotary Degassing technology that was sold to more than 2000 units worldwide.

MTS 1500 [3] is an automated system that can perform most metal treatments.

It is a controlled and automatic addition of fluxes that (see Fig.2):

- Performs all metal treatment operations and requirements in a single process.
- Increases productivity & reduces costs
- Eliminates operator involvement
- Reduces risks and emissions
- Improves efficiency of the treatment
- Is blockage free unlike some rotary flux injectors
- can add all grades of fluxes



*Figure 1*

MTS 1500 allows for the successive or simultaneous addition of a range of newly and proprietary developed COVERAL MTS fluxes.

These granulated fluxes are typically ranging between 0 – 5mm in size.

But the equipment can be adapted to accommodate larger particles as well as metal treatment products other than fluxes.

Typical addition rates are 20g/s and as high as 1,2 Kg /min.

Upon request the MTS 1500 can be customised to an addition rate of 40g/s which amounts to 2,4 Kg /min.



*Figure 2*

The MTS 1500 technology comprises 3 major components:

### 1. The Foundry Degassing Unit (FDU): see Fig.3

Our rotary degassing unit is the basis of the system as it provides a stable platform to which all other components can be attached. Any design of FDU unit can be used to build an MTS 1500.

The primary purpose of the degassing unit is to introduce a rotating shaft into the melt through which Nitrogen or Argon gas is injected.

This produces a fine dispersion of gas bubbles inside the melt, which removes hydrogen as well as oxides and makes for better castings without porosities and inclusions.

Furthermore, degassing is always a part of melt treatment and can eliminate excess moisture that fluxes might have introduced.

The MTS 1500 can have up to 2 hoppers to add 2 different fluxes.

Each hopper has a 20 Kg capacity. The hoppers are designed to protect fluxes from the environment and to prevent moisture pick-up.

The screw-dispensing unit is mounted at the hopper outlet and is capable of dispensing accurate and consistent amounts of flux (+/- 3%) into the vortex. Adjusting the length of time the screw operates can control the required flux amount.

The end of the dispensing tube is positioned next to the spinning shaft and directly above the vortex to ensure that all the flux will be added to the metal.

### 2. The movable baffle: see Fig.4

The baffle plate can be moved up and down depending on the cycle phase.

The absence of the baffle helps create the vortex that is needed to efficiently mix the fluxes inside the melt. The presence of the baffle in the melt eliminates the vortex and creates optimum conditions necessary for cleaning and degassing.

The baffle plate is made of INSURAL, an insulating

material non-wetted by molten aluminium. It is durable and resistant to thermal shock.



*Figure 3*



*Figure 4*



### 3. The Foseco patented pumping XSR and FDR Rotors:

Foseco developed and patented the XSR (see Fig.5) and FDR rotors (see Fig.6) designed to efficiently mix the flux into the Aluminium melt while remove unwanted gas and inclusions. They are highly efficient pumping rotors, which creates a strong mixing action in the melt.

Thanks to their pumping efficiency, it allows for good reaction between the fluxes and the entire aluminium melt.

Both XSR & FDR Rotors are a key component of the MTS 1500 system and enable:

- Superior degassing efficiency compared to standard designs
- Time savings during treatment and degassing cycles
- High performance at lower RPM, typically 350 – 450 RPM



*Figure 5*



*Figure 6*

#### MTS 1500 Degassing performance

Hydrogen gas porosity is one of the primary concerns of Aluminium foundries. The MTS 1500 when used in conjunction with our patented XSR / FDR Rotors can efficiently remove gas from the melt. Figure 7a and 7b show RPT (reduced pressure test) samples @ 80mb of Al-Si7Mg before and after 4 minutes of degassing with MTS 1500. The measured density before MTS 1500 degassing is 2.34 g/cm<sup>3</sup> The measure density after MTS 1500 degassing is 2.68 g/cm<sup>3</sup>. Average data shows that MTS 1500 is able to degas any foundry alloy within 2-8 minutes at temperatures between 680°C to 780°C.



*Fig. 7a before MTS 1500 degassing*



*Fig. 7b after MTS 1500 degassing*

Laboratory scale degassing experiments:

Foseco undertook some comparative degassing measurements (see Fig.8) performed in a 500Kg crucible (BU 500) of AlSi7%Mg alloy using 18l/min of Nitrogen.

A hydrogen measurement device was used to continuously monitor the hydrogen content in the melt. Within 3 minutes the MTS 1500 + FDR rotor system can reach 0.1 ml/100g of hydrogen thus outperforming standard rotors in this demanding application. This performance is especially valuable in un-heated ladle treatments where a shorter degassing time means less temperature loss and hence energy savings.

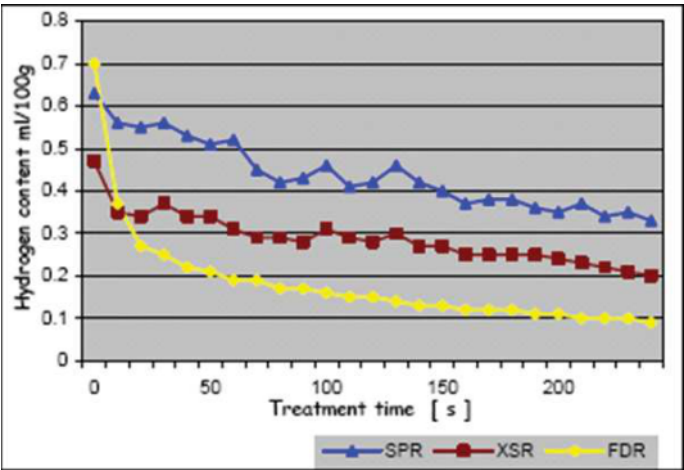


Figure 8

Reliable and consistent Sodium Modification

In the last 10 years, Strontium (Sr) modification has become the most popular modifying agent since it doesn't suffer from the fading issue linked to the use of sodium (Na).

Nonetheless, most people recognise that Sodium is a stronger modifier than Strontium in Aluminium-Silicon alloys. In sand and gravity castings, sodium modification is still used for thicker or difficult castings that are sensitive to shrinkage.

To address this issue, Foseco developed a range of powerful sodium modifiers with a low addition rate (0,1%) that is able to introduce 80 ppm –120 ppm of sodium into Aluminium-Silicon alloys.

Figure 9 presents the benefits of Coveral MTS 1572 in a gravity die foundry making safety critical components

for the automotive industry.

The Al-Si12%-Cu-Ni-Mg alloy is held between 740 – 760°C in a 300 Kg (BU 300) gas fired crucible furnace. The former practice consisted of a manual-fluxing treatment followed by a 15- minute degassing cycle.

Unfortunately, this practice is not able to achieve consistent sodium levels after degassing, as there is a +12% variation in sodium content from one treatment to the next.

Using the MTS 1500, the foundry is now able to achieve consistent sodium levels, which result in better consistency of casting properties. Additionally, treatment times and flux addition rates were reduced significantly, which is making an impact on the overall treatment costs.

Gravity Foundry	Degaser + manual flux addition	Automated MTS 1500
Flux used	Proprietary flux	COVERAL MTS 1572
Amount of flux used	890 g + 8%	270 g + 3%
Flux Addition rate	0.3 %	0.1 %
Treatment time	15 minutes	9 minutes
Density achieved after degassing	2.68 g/cm <sup>3</sup>	2.69 g/cm <sup>3</sup>
Variation in sodium content	+ 12.7%	+ 5%
Sodium (Na) content before treatment	< 18 ppm	< 18 ppm
Average sodium (Na) content after treatment	80 ppm	78 ppm

In order to better understand the savings that MTS 1500 can generate in the case of sodium modification, we undertook some extensive lab testing designed to compare sodium uptake (yield) as a function of flux quantity used both in a manual addition and an MTS 1500.



Results in figure 10 shows that MTS 1500 is 2,5 times more efficient at releasing sodium than the Standard degassing units + manual flux addition.

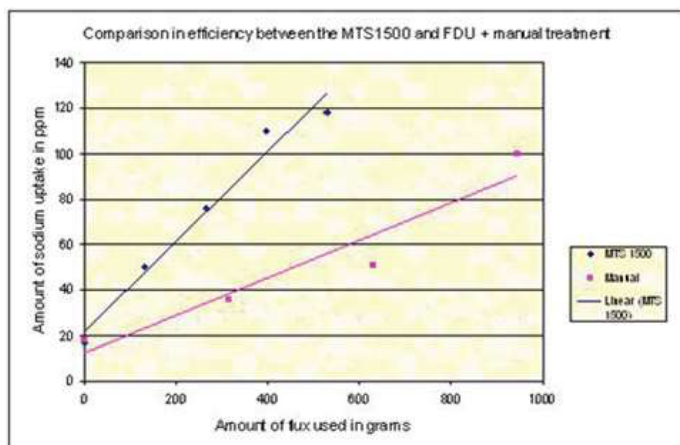


Figure 10

## Cost efficient grain refinement in Aluminium Gravity

Aluminium grain refining [4] is one the melt treatment steps that affects most the mechanical properties of castings. It increases elongation [2], resistance to fatigue, improves machinability; reduces hot tear, the size of porosities and the duration of heat treatment. It can also disperse micro-shrinkage in some difficult castings.

Al-Ti5-B master alloys have become the standard practice in foundries around the world, but they are not always the most cost-efficient solution as they contain only 5% Titanium and 1% Boron whereas the remaining 94% Al has no influence on grain refinement.

This Ti-B concentration typically requires a 0,1% addition rate to achieve optimum grain size.

To reduce the addition rate and generate some savings for the foundries, Fosco developed a range of highly concentrated Ti-B grain refining flux [4], which also has an additional cleaning effect on Aluminium melts.

Figure 11a & 11b show the macrographs before and after MTS 1500 treatment of an Al-Si7%- Mg0,3% alloy used to make suspension components for the automotive industry.

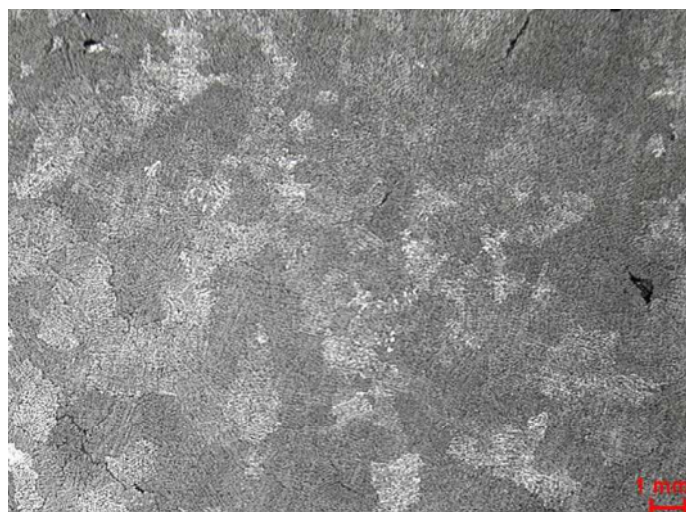


Figure 11a, as melted



Figure 11b, after Coveral MTS 1584

Using only 0,04% addition rate for Coveral MTS 1584, we can match the grain size obtained with 0,1% AT5B1 addition. This represents a 60% reduction in addition for the same grain refining efficiency.

We did a cost comparison between Ti-B rod and MTS 1584 summarised below.

MTS 1500 can reduce the (grain refining + melt cleaning) cost from 1,60 € down to 0,70 € / Tonne of Aluminium, i.e. a 56% saving for the foundry.

	Addition Rates	Addition rate / 1000 Kg Al	Grain Refining Cost / 1000 Kg Al	Other Savings	Treatment Cost / 1000 Kg Al
Al-Ti5%B1%	0,10 %	1,0 Kg	3,00 €	1,40 € *	1,60 € / Tonne
MTS 1584	0,04 %	0,4 kg	1,20 €	0,50 € **	0,70 € / Tonne

\* AT5B1 contains 94% Aluminium which is recovered by the foundry and valued at 1500 €/T

\*\* Coveral MTS 1584 doesn't require any additional cleaning flux, which is a savings of 0,50 €.

### Superior grain refining in LPDC wheels using MTS 1582 - Grain refiner

Aluminium wheels are one of the most important automotive castings made mostly using the Low-pressure diecasting process. As OEM wheels are considered safety components, it is critical for these castings:

- To be exempt of gas and shrinkage porosity
- To be free of oxides and inclusions
- To have a very fine microstructure which will ensure adequate mechanical properties

Grain refining [4] is one of the critical steps which most foundries achieve by adding Ti-B rod master alloy. The typical addition rate is usually 0.1%.

Fig.12 is showing the key parameters used in an Asian LPDC wheel foundry where A356 alloy is being treated in 700 Kg transfer ladle prior to transfer into the low-pressure furnaces.

Alloy A356.2	Ti-B traditional process	Coveral MTS 1582
Ladle Size	700 Kg	700 Kg
Ti-B Flux Quantity	-	310 g
Master alloy Ti-B rod	500 g	-
Degassing Time	9 min	9 min

*Figure 12*

This wheel foundry was using 500 g of Ti-B rod master alloy in their traditional process in order to achieve the required mechanical properties. The newly introduced MTS 1582 process [4] was able to achieve similar quality levels with only 310 g of flux addition. Fig. 13 compares the degassing efficiency and Titanium levels without & without any Ti-B master alloy addition.

Alloy A356.2	Ti-B traditional process	Coveral MTS 1582	Remarks
RPT Density @80mbar	2.65	2.65	Identical
Chemical Analysis	Ti : 0.114%	Ti : 0.114%	Same level
DAS in spoke section	45.88µm	47.21µm	Spoke Section (Hot Area)
DAS in rim section	26.09µm	27.26µm	Rim Section (Cold Area)

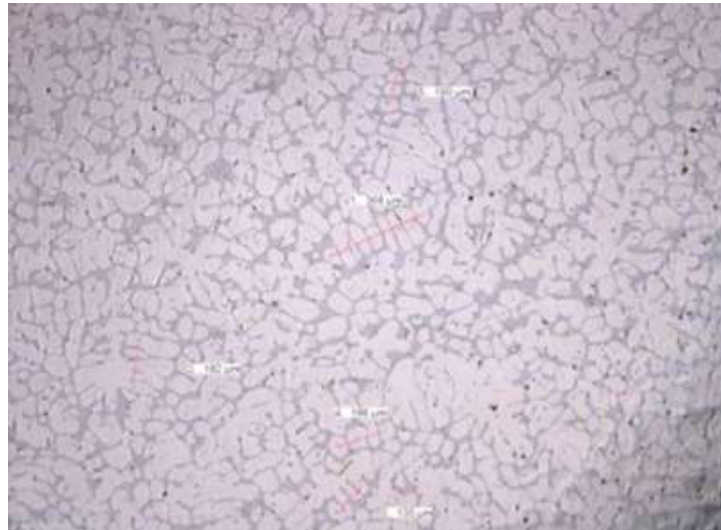
*Table 13*

Furthermore, in order to compare both grain refining processes, the foundry took samples from several wheels to measure UTS and Elongation. From Table 14, we can see a clear improvement of the mechanical properties despite addition of a smaller amount of MTS 1582 grain refiner.



Properties in Wheel Hub	Ti-B traditional process	Coveral MTS 1582
Yield Strength (N/mm <sup>2</sup> )	208,1	213,5
Tensile Strength (N/mm <sup>2</sup> )	276,0	286,7
Elongation (%)	6,8	8,0

*Table 14*



*Figure 15*

Fig.15 shows some micrography pictures taken from the wheel spoke which was treated with MTS 1582 Grain refiner. We can see the structure is very fine and homogeneous. DAS measurements gave a value of 47  $\mu\text{m}$  which is fitting the requirements of modern OEM wheels.

to be continued...

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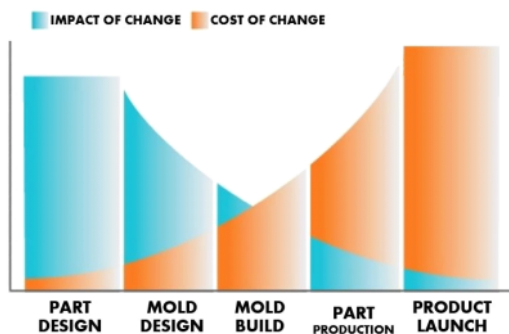


## What is DFM How to address for any product

C. Surianarayanan - Consultant, Email : c.surianarayanan@gmail.com

Principles which are examined during a DFM

1. Process
2. Design
3. Material
4. Environment
5. Compliance/Testing



Pulling stakeholders together early in the design process is easier if you're developing a new product, but even if you're dealing with an established product, challenging the original design is a necessary element of a thorough DFM.

Too often, mistakes in a design are repeated by replicating a previous design.

- Look at the original drawings
- Tear down the product
- Look at competitive and near-neighbor products, as well as lead users such as medical and automotive
- Talk to your contract manufacturer — who may have solved the problem with a different customer?
- Has someone else solved this problem a different way?
- Is there a way to make it better?

### 5 PRINCIPLES OF DFM

#### A CLOSER LOOK

##### 1 | PROCESS

The manufacturing process chosen must be the correct one for the part or product.

You wouldn't want to use highly-capitalized process like injection molding which involves building of tools and dies to make a low-volume part that could have been manufactured using a lower-capitalized method, such as thermoforming.

That would be equivalent to using a tank to squash an anthill — a classic case of overkill.

##### 2 | DESIGN

Design is essential.

The actual drawing of the part or product has to conform to good manufacturing principles for the manufacturing process you've chosen

In the case of plastic injection molding, for example, the following principles would apply:

Constant wall thickness, which allows for consistent and quick part cooling

Appropriate draft (1 - 2 degree is usually acceptable)

Texture - need 1 degree for every 0.001" of texture depth on texture side walls

Ribs = 60 percent of nominal wall, as a rule of thumb

Simple transitions from thick to thin features

Wall thickness not too small - this increases injection pressure

No undercuts or features that require side action - all features "in line of pull/mold opening"

Spec the loosest tolerances that allow a good product - and consult the trade organization for your manufacturing process on what is reasonable for that process

##### 3 | MATERIAL

It's important to select the correct material for your part/product

Some material properties to consider during DFM include:

Mechanical properties - How strong does the material need to be?

Optical properties - Does the material need to be reflective or transparent?

Thermal properties - How heat resistant does it need to be?

Color - What color does the part need to be?

Electrical properties - Does the material need to act as a dielectric (act as an insulator rather than a conductor)?

Flammability - How flame/burn resistant does the material need to be?

Again, be sure to discuss the material with your contract manufacturer, who might have access to existing materials in their portfolio which would allow you to secure lower material pricing.

#### 4 | ENVIRONMENT

Your part/product must be designed to withstand the environment it will be subjected to.

All the form in the world won't matter if the part can't function properly under its normal operating conditions:

#### 5 | COMPLIANCE/TESTING

All products must comply with safety and quality standards.

Sometimes these are industry standards, others are third-party standards and some are internal, company-specific standards.

#### FACTORS THAT AFFECT DFM

The goal of DFM is to reduce manufacturing costs without reducing performance.

In addition to the principles of DFM, there are five factors that can affect design for manufacturing and design for assembly

- 1 | Minimize Part Count
- 2 | Standardize Parts and Materials
- 3 | Create Modular Assemblies
- 4 | Design for Efficient Joining
- 5 | Minimize Reorientation of Parts During Assembly & Machining
- 6 | Streamline Number of Manufacturing Operations/Processes
- 7 | Define "Acceptable" Surface Finishes

#### THE DANGER OF TIGHT TOLERANCES IN DFM

Any engineer worth their salt is going to also take a very close look at the tolerances specified in the part's drawings.

Tolerance is the total amount a specific dimension is allowed to vary, and manufacturers often receive drawings from customers with unreasonably tight tolerances that can wreak havoc on an RFQ.

- Why you should ease up on tolerances: Lower cost for tooling
- Ease of manufacturing
- Fewer defects
- Greater yields



Your contract manufacturer will be able to give you a better idea of how long they think it will take.

Remember speed isn't the goal: a quality product is.

A good DFM hopefully concludes by reducing the complexity of the design and satisfying the customer's requirements for price, specification, material and scheduling.

In other words, the design is deemed manufacturable and ready for the next step on the road to production





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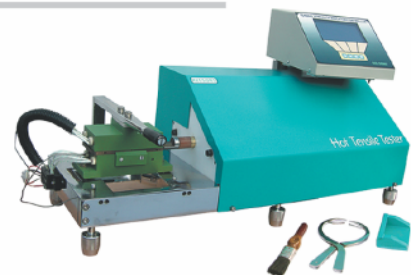
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## Maintenance

Vishwas Kale, Managing Director, Vijayesh Instruments Pvt Ltd, Pune  
vish1945@gmail.com

Maintenance function is very important for productivity. It is a science in itself. Due acknowledgement must be given to maintenance demands as much as those of production. Still, sadly in some plants production activity overrules over maintenance still today.

### What are types of maintenance ?

These are distinguished by the jobs that they include. Usually five types of maintenance have been identified. Corrective maintenance: This is the list of jobs is required to correct the defects or such issues found in different equipments. These are informed to the maintenance department by users of these equipments. Preventive Maintenance: Its aim is to maintain a satisfactory level of working service of equipment. Also another aspect is to program the interventions of their vulnerabilities in the most suitable and opportune time. Preventive maintenance is used as a systematic tool. This means that the equipment is checked on regular predetermined basis even if there are no symptoms of having any problem.

**Predictive Maintenance:** It involves understanding knowledge of equipments, making reports of the status and operational capacity of the equipment by finding the values of specific variables, which represent such state and operational ability. To use this maintenance, it is necessary to decide physical variables such as pressure, flow, temperature, vibration, power consumption etc. These are indicative of problems that may be appear in the equipment. This type maintenance is the very much technical as it needs advanced technical resources.

**Maintenance (Overhaul):** The jobs of whose aim is to review the equipment at predetermined intervals before they undergo a failure are now complex. It is now risky to make predictions of production capacity. This overall review is based on the status as if the equipment were new. These reviews will replace or repair all items subject to wear and tear. The objective is to ensure a good working time and life

**Time Based Maintenance (TBM):** This is basic maintenance of equipment made directly by the users. It consists of elementary tasks (data collections, cleaning, visual inspections, periodic lubrication, clamping pneumatic hosepipes, retightening screws etc) This does not need much training. This type of

maintenance is the based on TPM (Total Productive Maintenance).

### Difficulties in applying type of maintenance

Each equipment needs a mix of each of these maintenance types, so that it is difficult to think of applying one of them to an equipment. Thus, for a particular machine, an engineer can take care of lubrication (periodic preventive maintenance); if it is required, he will measure the vibrations or temperature (predictive maintenance); he also may qualify for an annual tune-up (overhaul) and he will repair the faults coming up (corrective maintenance). The most suitable solution will be based on the cost of production losses to the idle or stop period of equipment, the repair cost, environmental impact, safety and quality of a product or a service etc. The point to be noted is one may have real difficulty in giving a clear answer.

### About outsourcing or subcontracting maintenance

When subcontracting, one refers to an individual or a company specialized in a particular equipment. The specialist may be the equipment manufacturer, importer's technical service, or a company that has specialized in a particular type of intervention. One should have a specialist if the company has no sufficient knowledge or has lack of resources.

The subcontracted option is usually the most expensive alternative. The company offering it is aware that not they can dictate terms. You should try to avoid it as far as possible by cost increase and higher external dependence that it involves. The best way is to have specific training to employed engineers or technicians.

### Maintenance for legal needs

The administration has to meet certain legal obligations. There could be equipments that are hazardous to people or the environment. The checklist jobs must necessarily be incorporated into the maintenance plan of the equipment.

Some of the equipment subjected to this type of maintenance are compressors, installation of high and medium voltage, cooling towers, fire prevention facilities, storage tanks etc

Maintenance function is a vital organ of any establishment and must be duly respected.



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- Technical Collaborations with M/s NTC Japan



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**Rajesh Nath**  
Managing Director  
VDMA India Services Private Limited  
German Engineering Federation (VDMA)  
EMAIL : rajesh.nath@vdmaindia.org

## MY VIEWS ON "Smart Manufacturing Technologies - Revolutionizing the Future"

Friends today hardly 10% of the tasks in manufacturing process are automated. There is a potential to increase this to 20% and even 25% in the next 5 to 6 years. Manufacturing is undergoing a paradigm shift to make it smart. But what is smart manufacturing? Smart Manufacturing is an end to end solution of manufacturing right from sourcing, procurement, processing, manufacturing, distribution and warehousing – all connected together in an automated way.

This entails, communication with suppliers, communication with customers, communication amongst machines with exchange of data based on cloud technology. Infact we are merging physical with virtual to make manufacturing CESS:

- Cost effective
- Efficient
- Sustainable
- Safe

The industrial world is facing rapidly changing challenges. Our resources are finite, and we all need to do more with less. Digitalization and automation are the game changers to meet these challenges on the way to Industry 4.0. It is essential to collect, understand and use the massive amount of data created in the Industrial Internet of Things (IIoT). The Digital Enterprise is doing exactly this by combining the real and the digital worlds. As a result, the infinite amount of data allows us to use our finite resources efficiently and with that make the industry more sustainable.

Combining the real and the digital worlds makes it possible to seamlessly integrate the entire value chain from design to realization, while optimizing with a continuous flow of data. A true Digital Enterprise is able to harness the unlimited power of data by gaining valuable insights to make fast and confident decisions – and to create best-in-class products through efficient production.

The Digital Enterprise brings together processes that were previously separate. It breaks down traditional silos and helps bridge the gaps between software and hardware, IT and OT, shop floor and top floor. This offers great optimization potential – including technologies such as artificial intelligence for predictive maintenance, precise condition monitoring and improved quality.

Worldwide, Industry 4.0 is fuelling the emergence of smart factories across diverse industry verticals, including FMCG, automotive, healthcare, aerospace, defence, etc. The adoption of connected and intelligent digital technologies further enables smart factories to enhance productivity, profitability, compliance and customer delight. The digital manufacturing industry is growing and is expected to reach \$767.82 billion by 2025. India, among other countries, views manufacturing as vital to the country's digital transformation strategy. With smart factories re-imagining manufacturing jobs, there is a growing need for professionals savvy with emerging technologies to lead the digital transformation in the sector. The Fourth Industrial Revolution—or Industry 4.0—brings the digital and physical together through data. By advancing data capture and analysis at the edge and by unlocking new levels of analytic insight through High Performance Computing applications, Industry 4.0 paves the path for new advances in the manufacturing sector.

For example, autonomous smart manufacturing capabilities (such as predictive maintenance to reduce downtime and smart asset tracking for a more efficient supply chain) alongside more-powerful, in-depth, and accurate analytics for applications (such as computational fluid dynamics) mean that Industry 4.0 is primed to unlock new possibilities and business advantages for manufacturers.

Friends the industry will be focused on closing the loop between data extraction and value creation. Whereas digitization makes it easy to capture, organise and manage a variety of data, digitalization infact makes it possible to gain value from this data.

To conclude, I would like to say that in Indian context, customers are looking for cost effective solutions. Infact they would prefer Google speed but at AMAZON costs.

I am sure that the interaction of the German Industry with the manufacturers today on this very relevant and pertinent topic would be of value. Looking forward to interesting deliberations and let me conclude with this quote from the famous Jeff Bezos. He said: In Today's era of volatility, there is no other way but to re-invent. The only sustainable advantage you can have over others is agility. Because nothing else is sustainable, everything else you create, somebody else will replicate. Thank you.



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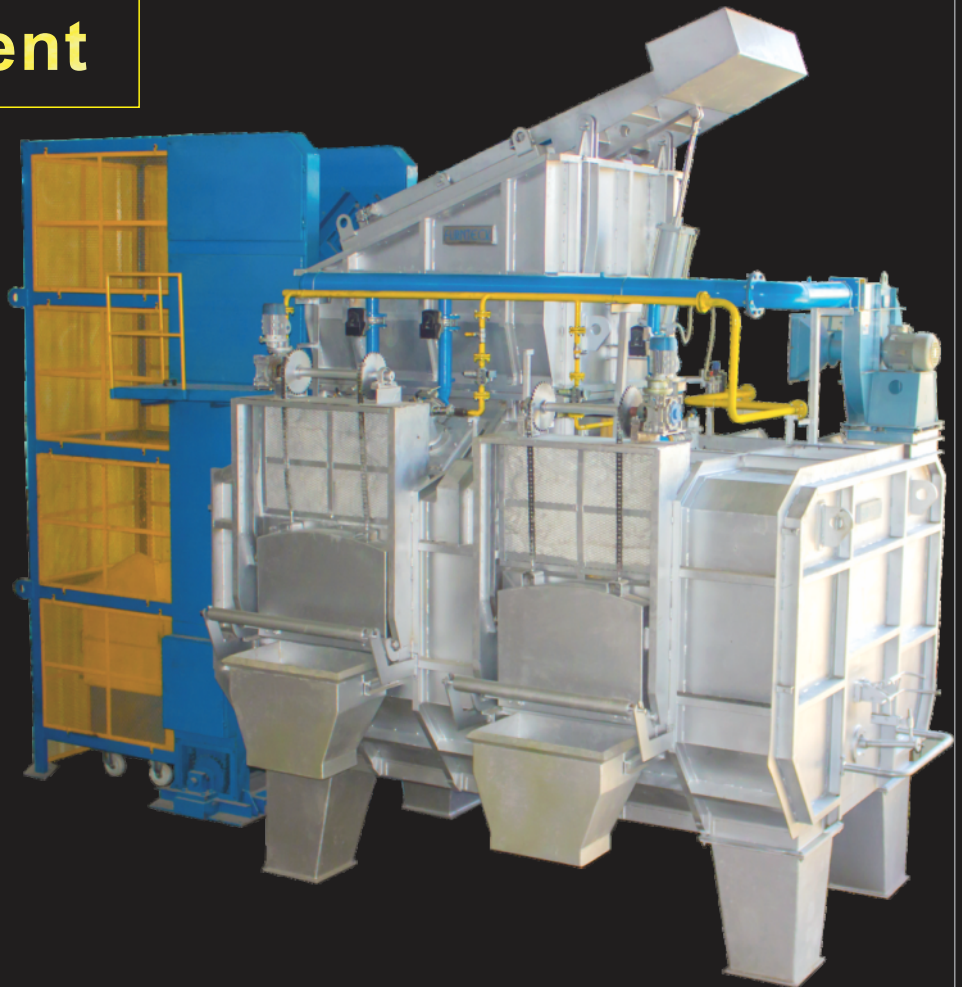
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*Complete Solution for Aluminium Industry under one roof*



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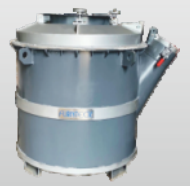
Electrical Holding (Crucible)



Top Heated Holding



Ladle Preheater



Kettle Type  
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## Sklenar-type Melting Furnace *"Bulk Melting solutions"*

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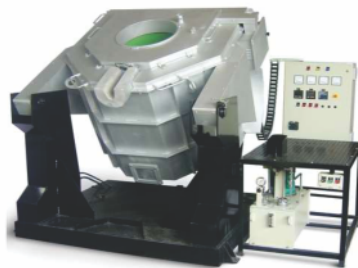
- Rugged construction with smooth & jerk-free tilting.
- Efficient combustion system.
- Easy charging of material into the furnace.

Manual or Skip Hoist type.

- Easy dross cleaning.
- Long refractory life.
- Rapid & economical melting.
- Low melt loss.



Electrical Stationary  
Furnaces



Electrical Hydraulic  
Tilting Furnaces



Nitrogen Degassing  
Machine (auto)



Density Index Unit

## Other Products for the Aluminium Industry

- Electrical Furnaces (Crucible)
- Fuel Fired Furnaces
- Electrical & Fuel Fired Tilting Furnaces
- Heat Treatment Furnaces
- Rotary Degassing Unit
- Density Index Unit

# QUIZ COMPETITION 2024



Quiz Competition held on 3rd July 2024 at MCCIA Bhosari, Pune, Five teams participated

- ★ AAKAR FOUNDRY PVT. LTD.
- ★ ENDURANCE TECHNOLOGIES LIMITED
- ★ SENTINEL MANUFACTURING INDIA PVT. LTD.
- ★ TATA MOTORS LTD.
- ★ UNO MINDA LTD.

and the winner was **TATA MOTORS LIMITED**

Mr. Pramod Gajare (Chairman - Quiz Committee), R. V. Apshankar, Vice President conducted the Quiz Competition

Quiz Competition sponsored by Sigma Electric Manufacturing Corporation Pvt. Ltd.

## GDCTECH FORUM

'Guruprasad', 1<sup>st</sup> Floor, 37/4/A, 6<sup>th</sup> Lane, Prabhat Road, Pune 411 004, India

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Chairman & Managing Director  
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Entering into North India, so now  is Pan India.

*Congratulations!*





## GDCTech Crossword #3

### The Cue: Dies and Moulds

#### Solution to GDCTech Crossword #3 - Ref: June 2024 Issue

G	A	T	E	R	U	N	N	E	R			C	O	R	E	P	I	N	S
A	I	N	G	A	T	E	J	E	C	T	O	R	P	I	N	S			T
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I	V											C	D	W	G	A	T	E	P
N	E											E	R	A	U	D			D
G	N					C	O	M	B	I	N	A	T	I	O	N	D	I	E
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Y	S					O				V	E	T	R	E	E	Z	W	B	P
S	P	M	E	T	A		S	A	V	E	R	A	C	P	L	Z	N	L	A
T	R					I				R	G	L	H	I	P	L	S	O	R
E	U					N				F	A	L	A	N	I	E	P	C	T
M	E					G				L	T	O	N	S	N		R	K	I
O	W					C				O	E	W	N		S		U		N
V	E					H				W		A	E				E		G
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## NEWS

### TRAINING PROGRAMMES & QUIZ COMPETITION - AHMEDABAD & GURGAON



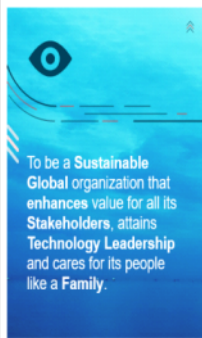
Two Days Training Programme On Melting & Metal Treatment and Metallurgy of Aluminium Cast Alloys at Ahmedabad, Gujarat, held on 23-24 July 2024  
Faculty Mr. R. V. Apshankar & Dr Kedar Nitin Bhojak  
Quiz competition was also held on 23<sup>rd</sup> July at the same venue. Three teams participated and the winner was **STEEL STRIPS WHEELS LTD.**



Two Days Training Programme On Melting & Metal Treatment and Metallurgy of Aluminium Cast Alloys at Gurgaon, Haryana, held on 26-27 July 2024  
Faculty Mr. R. V. Apshankar & Dr. Ranjan Swaroop  
Quiz competition was also held on 26<sup>th</sup> July at the same venue. Four teams participated and the winner was **MAXOP ENGINEERING CO. PVT. LTD.**

# MINDA INDUSTRIES LTD.

## (Alloy Wheel 2W Division)



Customer is Supreme



Live Quality



Respect for Individual



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Encourage Creativity and Innovation to drive people process & products



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- Minimised Material Handling.
- Raw material to finished product in one shed
- Casting movements only through conveyers or AGVs.
- Flexible production set-up for variety of models
- Training room / DOJO room for operators Training
- Implementation of Industry 4.0

- Minda Industries Ltd has set up fully integrated manufacturing facility for Alloy wheel 2 wheeler.
- Facilities include state of art infrastructure for Foundry, Machining and Painting (Powder Coating & Liquid Painting) providing one stop solution
- Flexibility to manufacture a variety of sizes (range 10-19 Inches) & surface coats
- Location: Supa Industrial Area- 86 KM from Pune Airport
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- Built-up: 24000 sq. mtr.
- Capacity: 4 Million Wheels p.a. , expandable up to 6 Mn



Robotic CNC Cells



Smart Conveyers



Auto Storage System



Product Portfolio



AGVs



CNC Robot

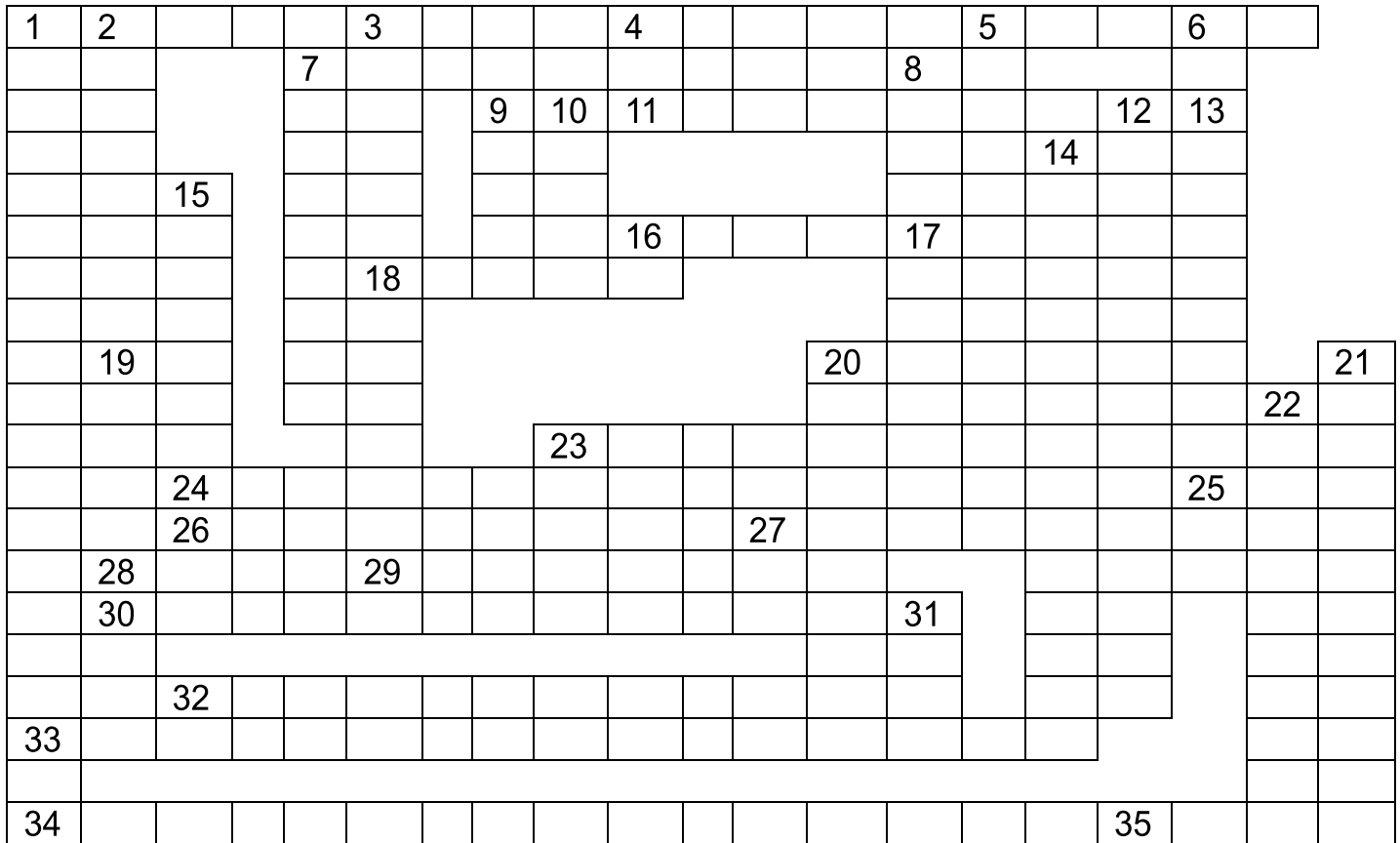


Pouring Robot

## GDCTech Crossword #4

### The Cue: Patterns, moulds, and dies

Compiled by: Pramod Gajare Consultant (pramodgajare2013@gmail.com)



#### Clues Along:

- 1) Patterns are mounted on one or both sides of this.
- 4) A pin actuated to force the casting out of the die cavity and off the cores.
- 7) An added projection on the pattern that forms a seat in the mould cavity on which pattern rests.
- 11) These are used to support the core inside the mould cavity to take care of its own weight and overcome the metallostatic force.
- 16) Intermediate moulding flask used in three-piece moulding.
- 18) The ----- pattern consists of many small patterns fastened together through gating.
- 23) An important design factor for easy removal of casting from the die cavity and cores from the casting.
- 24) A set of channels in a die through which molten metal flows to fill the die cavities.
- 26) A small amount of fine powder sprinkled on the inner surface of the mould cavity to gave a better surface finish to the casting.

- 27) It always remains at the bottom side.

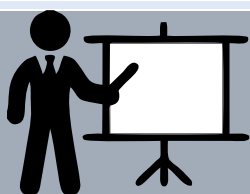
- 28) The ----- pattern consists of a board having a profile of desired mould, which is revolved around a spindle to produce a mould.
- 29) A replica of the final object to be made, with the help of which the mould cavity is made.
- 30) An eye bolt is inserted in this threaded hole during movement of the die on the shop floor.
- 32) The die features and procedures that enable die to be changed on the machine with a minimum of interrupted production.
- 33) Instead of full pattern, part pattern is used which is removed once the moulding is done at one place and rotated to adjacent region and moulding is done.
- 34) These ingates provide ideal conditions for minimising erosion in sand casting process.
- 35) Single minute exchange of dies.



### Clues Across:

- 1) The parts of the die casting die that hold and move the core.
- 2) This denotes the average size of the sand particles in the moulding sand.
- 3) A small funnel shaped cavity at the top of the mould into which the molten metal is poured.
- 5) A passage connecting a die cavity to an overflow.
- 6) A passage connecting a runner with a die cavity.
- 7) Any hole that is formed by a core.
- 8) A metal or wooden frame, without fixed top or bottom, in which the mould is formed using moulding sand.
- 9) The ----- pattern is made in two halves which are located by dowel pins.
- 10) A hollow channel through metal is poured into the mould.
- 12) A cycle of prolonged holding at a suitable temperature and cooling slowly to reduce residual stresses in a die.
- 13) A piece of sheet metal, bent to the desired radius, used to cut the gate while making moulds for very less quantity of castings.

- 14) The mould cavity formed using this pattern is either in the cope or in the drag.
- 15) A perforated disc of refractory in the runner bush or across the gate arresting major inclusions and reducing turbulence in the system.
- 17) Direct pouring unit in which an insulating sleeve containing a ceramic foam filter is used in production of variety of complex aluminium castings.
- 19) A convex arc blending two surfaces on die cavity.
- 20) A passage in the die through which a coolant (typically water, oil or gas) is forced to cool the die.
- 21) A mixture of silica sand, binders, and moisture in appropriate proportion; that binds strongly without losing its permeability.
- 22) A fairly uniform mould hardness throughout the mould can be achieved with this ramming technique.
- 25) A brace to support the second wall or surface.
- 28) A portion of a die generally arranged to move parallel to the parting line.
- 31) Always on the top side.



## GDCTECH FORTHCOMING TRAINING PROGRAMMES

**August 2024**  
**Chennai**  
&  
**Coimbatore**

**Melting, Holding Furnaces, Fuels, Crucible Care, Molten Metal Treatment & Quality Assessment, Metallurgy of Aluminium Cast Alloys**

Chennai, Bangalore Two days at each location

**6 - 7 August 2024**  
**L. K. Machinery,**  
**Chakan**

**Know Your HPDC Machines - Basics of Pneumatics/Hydraulics/ Electrical/Electronics/Software, Machine Maintenance**

**October 2024**  
**Pune**

**Design of Experiments (DoE) / Six Sigma**

**November 2024**  
**Pune**

**Disciplined Problem Solving, 10 Step Methodology, 7QC Tools, Case Studies**

**December 2024**  
**Pune**

**Product Costing, Process Costing, Cost Reduction, VAVE, Energy Conservation, OEE**



GREAT DIE CASTING TECHNOLOGY FORUM

**GDCTECH 2024**  
CONFERENCE & EXHIBITION



# SMART FACTORY FOR SUSTAINABLE GROWTH

19-20 (Thu-Fri) September 2024 | Venue : The Pride Hotel, 5, University Road, Pune - 411005, Maharashtra, India

## Inauguration Chief Guest

**Dr. Swati Mujumdar**

Principal Director,  
SYMBIOSIS OPEN EDUCATION SOCIETY, Pune

## Keynote Speaker

**Mr. Snehasis Batabyal**

Partner  
KPMG India

## Valedictory Chief Guest

**Mr. Viren Joshi**

Chairman, ODYSSEY AVENUE PARTNERS PVT. LTD.  
Ex. Vice Chairman & Global CEO, Sigma Electric

## Conference Content

### ■ BUSINESS STRATEGIES FOR GROWTH

Moderator : **Dr. Arvind Tilak**

CEO, ASCENT INTELLIMATION PVT. LTD.

#### Sub Topics :

- Competitiveness and Tech Strategies
- Preparedness Assessment of Enterprises for adoption of smart manufacturing
- Growth strategies in current environment
- Improving Foundry Performance- the Theory of Constraints way
- Enterprise IT Stack for foundries
- Leveraging AI Models for Foundry performance enhancements

#### Panelist :

- ▶ **CA Aniruddha Joshi**  
Co-Founder,  
YAGNA ENTREPRENEUR SUCCESS  
SERVICES PVT LTD
- ▶ **Prakash Raje**  
Principal Consultant, ACTINS LLP
- ▶ **Sameer Kulkarni**  
Founder, NAVAANTRIX PVT LTD
- ▶ **Sagar S. Kaushik**  
Director, VICTORY PRECISIONS PVT. LTD.
- ▶ **Kiran Deshpande**, Consultant

### ■ SUSTAINABILITY IN DIE CASTING INDUSTRY

Moderator : **Mr. Pravinkumar Narake**

Vice President-Technology, SIGMA ELECTRIC  
MANUFACTURING CORPORATION PVT. LTD.

#### Sub Topics :

- Smart foundry operations, Energy efficiency
- Automated Quality assurance
- sustainability, Worker safety and ergonomics,
- Supply chain optimization, Circular economy initiatives
- Energy efficiency and carbon emissions reduction

#### Panellist :

- ▶ **Milind Saidane**  
Co-founder and Director, INSTRON TECHNOLOGIES
- ▶ **Pravin Halkikar**  
Principal consultant,  
QLSS BUSINESS CONSULTING PVT LTD

#### ▶ Pankaj kadam

Senior manager EHS,  
VITESCO TECHNOLOGIES INDIA LIMITED

#### ▶ Uday Gupta

Director, Eco Emarket, Senior consultant,  
CENTER FOR RESPONSIBLE BUSINESS

#### ▶ Nilesh Shedge

CTO, CARBONMINUS

### ■ DIE CASTING TECHNOLOGIES IN NEW MOBILITY

Moderator: **Mr. Uday Sankar Yerramillin**

Co-Founder & Director, USPI CONSULTING PVT. LTD.

#### Sub Topics :

- Possibility & Methodology of support for development of new mobility components for electric vehicles, Auto Driving Systems etc.,
- VOC
- Integration of Electronics & Sensors
- Supply Chain Optimization and Localization

#### Panellist :

- ▶ **Udayan Pathak**  
Director - Udayan Pathak & Associates,  
(Ex. Head- World Class Quality, ERC - Tata Motors)
- ▶ **Santosh P Kulkarni**  
VP Materials-Polymer & Elastomer,  
BAJAJ AUTO LTD.
- ▶ **Avinash Arankalle**  
Independent Consultant,  
Advisor & Faculty on Materials
- ▶ **Pradeep M Kulkarni**  
AVP, KIRLOSKAR BROTHERS LTD.

### ■ SKILL DEVELOPMENT

Moderator : **Mr. Sunil Patil**

AGM - HR & Training, SIGMA ELECTRIC  
MANUFACTURING CORPORATION PVT. LTD.

#### Sub Topics :

What steps industry should take to run the industry smoothly with skilled manpower.

#### Panellist :

- ▶ **Dr. Shravan Kadvekar**  
Director, SYMBIOSIS, Centre For Corporate And  
Professional Learning

- ▶ **Vishwas Kale**  
Managing Director,  
VIJAYESH INSTRUMENTS PVT. LTD.
- ▶ **Dr. Arvind Chinchure**  
Founder & CEO, QLEAP

**Moderator : Dr. Satish Patil**

- Role of AI in Digital Twins and Future of Manufacturing
- Digitization and AI in Industry 4.0
- Digital transformation with AI
- Next-Gen AI Digital Assistants and Chatbots

**Panelist:**

- ▶ **Ms. Sujata Tilak**  
Managing Director, ASCENT,  
INTELLIMATION PVT. LTD.
- ▶ **Sumesh Surendran**  
Vice President-Digitalization,  
TVARIT SOLUTIONS PVT LTD

## Delegate Registration Fees

Category	Member	Non-Member
Individual	Rs. 9,440/-	Rs. 10,384/-
	US\$ 150	US\$ 165
Corporate (3 delegates)	Rs. 25,488/-	Rs. 28,037/-
	US\$ 405	US\$ 445

### Delegate Registration Fee Includes

- Delegate Bag, Pen, Pad, Technical Volume, One gala dinner, 2 Lunches & Teas

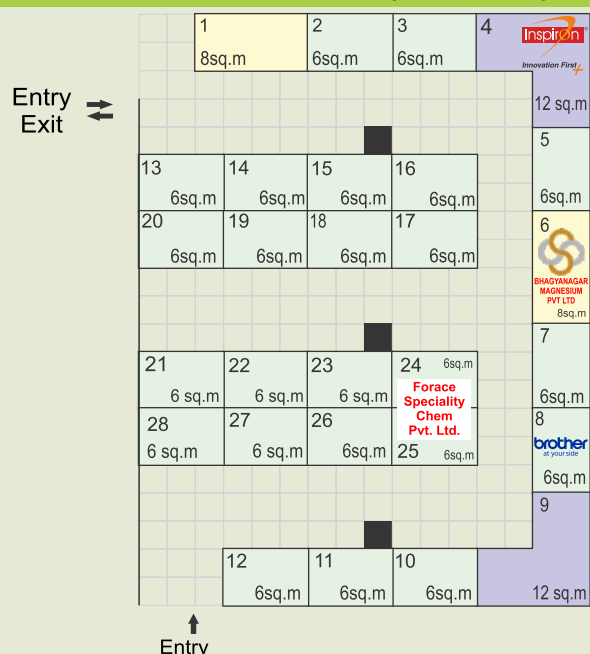
## Technical Volume / Advertisement Tariff

A technical volume is being released on the occasion, containing Technical Papers written by experts. Tariff for advertisement in the Technical Volume is as given below :

<b>Position</b>	<b>Size (cm.)</b>	<b>Type</b>	<b>Rate (Rs.)</b>
<b>Front Cover</b>	15.5 x 15	Multicolour	23,600.00
<b>Back Cover</b>	17 x 24	Multicolour	17,700.00
<b>Front / Back Inside</b>	17 x 24	Multicolour	11,800.00
<b>Full Page Colour</b>	17 x 24	Multicolour	8,850.00

## Exhibition Layout & TARIFF

### Exhibition at The Pride Hotel, Pool Side, Covered area



Stall Details (Non Ac)						
Stall Area	Stall Size	Total Stall	Total Sq. Mtr.	Constructed Stall Facilities	Rate (Rs)	Rate USD (\$)
6 Sq. Mtr.	2m x 3m	24	144	1 Table, 2 Chairs, 3 Spotlights, 1 Plug Point, Facia, Carpet, 1 Dustbin One Delegate Free & additional delegates Rs. 6000/- + GST each	40,000/- + GST	635
8 Sq. Mtr.	2m x 4m	2	16	1 Table, 2 Chairs, 3 Spotlights, 1 Plug Point, Facia, Carpet, 1 Dustbin One Delegate Free & additional delegates Rs. 6000/- + GST each	45,000/- + GST	713
12 Sq. Mtr.	L Shape	2	24	2 Table, 2 Chairs, 4 Spotlights, 1 Plug Point, Facia, Carpet, 1 Dustbin Two Delegate Free & additional delegates Rs. 6000/- + GST each	65,000/- + GST	1030
	Total	28	184			

\* Exhibitors are free to Attend Technical Conference

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## "Amazing response to 80<sup>th</sup> coffee talk" 22<sup>nd</sup> June 2024



◀ **Informative lecture delivered by  
Dr. Shravan Kadvekar,  
Director at Symbiosis Skills University**



**Topic**  
**UP-SKILLING  
WORKFORCE IN  
MANUFACTURING SECTOR**

GDCTECH's 80th Coffee-TALK received a great response. Employees and owners from many companies and institutions attended the event. Dr. Kadvekar started the talk with a brief history about Symbiosis, and its Skills University at Kiwale campus, Pune. Presently 5000+ students are registered at the campus.

The Skills University offers very sector focused degrees. It also offers students a great combination of in-class and on-job education. In addition to academic credits, students can also earn job credits. The University also offer company specific courses. In addition, the Skills University conducts many CSR funded programs. Companies like Mahindra, institutions like World Bank, government bodies like municipal corporations have conducted CSR funded programs through the

Skills University. A worth noting program sponsored by Pimpri-Chinchwad Mahanagarpalika was for COVID widows. PCMC identified 3500 women who lost their husbands in the COVID pandemic. A free program was offered to all of them so that they can start working and provide for their families. 350+ women came forward to do these courses.

Very specific courses have been designed for degrees like B.Tech., PG Diplomas; and for very specific working strata, right from shop floor workers to senior management.

Audience was very impressed. Many interesting questions came up during the QA session.

The program was attended by around 45 people. GDCTECH extends its high appreciation and many thanks to Dr. Shravan Kadvekar and to all the attendees.

### Articles for GDCTECH Journal

We invite Expert Articles on technical techno commercial and management aspects of Diecasting Industry, for publishing in GDCTECH Bimonthly Journal. We believe that these articles serve as good source of knowledge for foundry industry people.

Please contact GDCTECH office for any further information.

# GDCTECH'S 81<sup>ST</sup> COFFEE-TALK, 27<sup>TH</sup> JULY 2024



## - SPEAKER -

### Shri. Viren Joshi

Ex. Vice Chairman And Global  
Ceo, Sigma Engineering  
Solutions – Usa, And Chairman  
& Founder, nv Gen Automation

## - TOPIC -

Dramatic Impact Of  
Automation & Lean In  
Creating A World Class  
ENGINEERING COMPANY

## - SPONSOR -

VIPRA ALLOYS

This Month July, GDCTECH forum was fortunate to have Shri. Viren Joshi on its Coffee-TALK event. This 81st Coffee-TALK received a great response from GDC members and die casting community.

The thoughts Viren ji shared in his talk, were reflections of his 40 years of glorious professional life. Viren ji started the talk with a proud fact of history ,when Indian manufacturing was a global leader in 1750 with 24.5% share and current status at 2%.

What does it take to create a world class enterprise? The first thing Viren ji emphasized was having a global mindset of achieving world class excellence . Achieving cost competitiveness, upskilling your workforce and being 100% compliant in all aspects of the business are all very important .

Viren ji shared his experiences from his long tenures as CEO at Parker Hannifin, India and Sigma Electric, USA . There were substantial improvements achieved in Lean score, rejection rates, TPM, Safety, Productivity, Profitability and many more areas. Employees carried out several hundreds of Kaizens and Lean events leading to substantial improvements across many plants . TPM was implemented on over 1300 machines. A lot of focus was given to being green, saving water, energy, etc. Increasing the number of women employees helped in increasing productivity in addition to helping the society. Ensuring the plant was fully geared to support the induction of women employees is also a crucial factor. Manufacturing 'Special Purpose Machine Tools SPMs at an inhouse plant, resulted in cost saving ,enhanced quality and productivity, besides

reducing delivery time drastically. He specially emphasized the need to keep carrying out many small improvements that can add up to high returns.

He shared his experiences about the many 'acquisitions' he did in India, USA and Europe. An important factor was detailed due diligence, and post-acquisition moving quickly, to achieve synergies and growth During the QA session, a key question came from the audience was about cultural difficulties faced during foreign acquisitions. Viren ji agreed that managing cultural aspects was very important and needed to be handled with great sensitivity.

Viren ji shared his experience as a recent entrepreneur, as Chairman & Founder, nv GEN Automation. He and his partner, Nilesh Narvekar,Vice Chairman & Founder, have set up a world class company,in Automation systems, Robotics, Conveyors, SPMs. They have designed ,manufactured & commissioned several hundred systems across every market with leading customers Audience was delighted hearing & interacting with Viren ji. Many interesting questions came up during the QA session.

The coffee-TALK was attended by around 50-55 people.

GDC-TECH extends its high appreciation and many thanks to Shri. Viren ji Joshi, and to all the attendees. GDCTECH's coffee-TALKs are organized on the 4th Saturday of every month. The next coffee-TALK will be on 24th August. See you all then.



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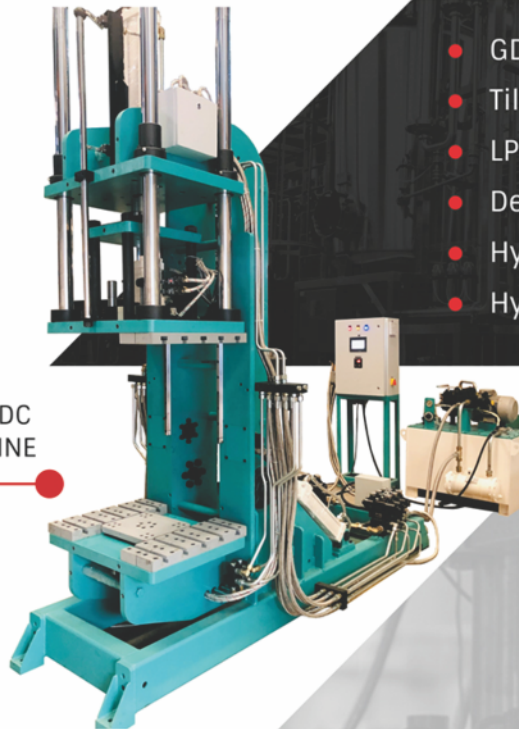


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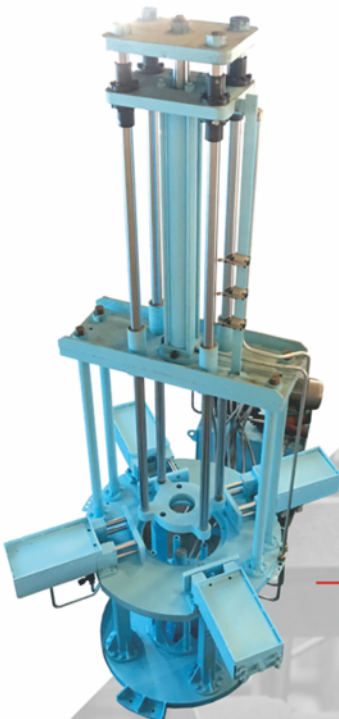
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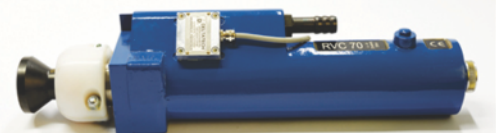


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