



GREAT DIE CASTING TECHNOLOGY FORUM

JOURNAL FOR ALUMINIUM CASTING TECHNOLOGY

Volume 70 - June 2025



- Energy Savings
- Improved Productivity
- Better Environment
- Clean Metal
- Reduced Inclusion related rejections

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Melt treatment is an important step in foundries to ensure high casting quality. Economical aspects have also become equally important. The need to reduce metal content in the dross has increased due to high price of raw material and energy.

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- Minimum touch up required
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- Eases the casting release, produce clean and bright castings.
- Protect against soldering of aluminum on the die steel.
- Support the post cast process like painting and coatings
- Eliminates corrosion of the mold surface

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Dear Readers,
We always look forward to your
Feedback and comments on the
Journal. Please do write to us.

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.

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Note: Some images in some articles may not be clear. Interested readers may contact the author

From the Editor's Desk



Dear Readers,

Since last issue April 2025, we have started a section “In The Era of Magnesium”, that will include informative and knowledge sharing articles on Magnesium Casting Technology. These, we believe, will bring a lot of awareness amongst the foundrymen at large, about growing field of Magnesium and Magnesium Castings.

This new endeavor of GDCTECH Journal has received a very encouraging support as Dr. Martin Tauber, European Representative, International Magnesium Association (IMA), has offered to be ‘Co-ordinator’ in sharing articles for publishing in GDCTECH Journal. He has also created ‘India Activity’ area on their website where our journal will be placed. Both these, we believe, will greatly help building enduring relationship between GDCTECH FORUM and IMA.

On behalf of Great Diecasting Technology Forum, I take this opportunity to express our sincere thanks to Dr. Martin Tauber for his initiatives.

We hope that “In The Era of Magnesium” will prove to be quite beneficial to the readers and GDCTECH members.

Anand Joshi - Editor
Consultant
Aluminium Extrusion & Foundry



A review of advances in the High Pressure Die Casting technique to produce car structural parts in aluminium alloys

Madhav Athavale, Consultant, athavalemadhav@gmail.com

Part III - Continued from April 2025 issue

ANNEXURE 3 Continued

Castasil®-37 [AlSi9MnMoZr]



Areas of use

Connection nodes for space frame designs; thin-walled body parts; architecture, cars, lighting, aircraft, domestic appliances, air conditioning, automotive engineering, foodstuffs industry, mechanical engineering, shipbuilding, defence engineering; replaces high pressure die-casts with T7 or T6 with air quenching.

Distinguishing characteristics

HPDC alloy with excellent castability. Very high elongation in as-cast state as a result of which it can be used in more ways when in as-cast state. Further increase in ductility thanks to single-stage heat treatment. No distortion or blisters from solution heat treatment, very good corrosion resistance, no long-term ageing due to heat, good machinability, ideal for riveting and adhesive bonding in automotive engineering.

Chemical composition of Castasil-37 in the ingot [% of mass]

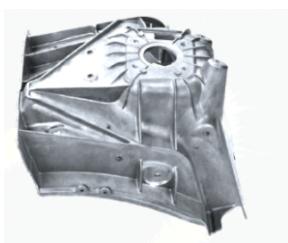
[%]	Si	Fe	Cu	Mn	Mg	Zn	Mo	Zr	Ti	Sr	others
min.	8.5			0.35			0.1	0.1		0.006	
max.	10.5	0.15	0.05	0.6	0.06	0.07	0.3	0.3	0.15	0.025	0.10

Mechanical properties

Wall thickness [mm]	YTS $R_{p0.2}$ [MPa]	UTS R_m [MPa]	Elongation E [%]
2-3	120-150	260-300	10-14
3-5	100-130	230-280	10-14
5-7	80-110	200-250	10-14

Physical data

Density [kg/dm ³]	Coefficient of thermal expansion [1/K × 10 ⁻⁶]	Thermal Conductivity [W/(K × cm)]	Electrical Conductivity [% IACS]	Shrinkage [%]
2.69	22	1.4	31.0-38.0	0.4-0.6



1 Refining	Clean furnace, crucible, treatment and casting tools to avoid impurities from unwanted elements such as Cu, Zn and especially Mg!
2 Melting down the ingots	The melt should be quickly heated to above 670 °C to avoid segregations, e.g. of the solid solution containing Mn in the melt. The temperature of melt should not exceed 780 °C. An Sr melting loss should be expected when melting and keeping warm – the higher the temperature, the greater the loss. Sr melting loss should be expected in particular when melting down returns and degassing treatment is recommended to remove the H ₂ and oxides. As the Sr content increases, so does the tendency for the melt to absorb hydrogen; this should not therefore exceed 350 ppm.
3 Flux treatment	Not needed when melting
4 Strontium burnout	Usually melting loss of 30–50 ppm per fusion; Sr should only be added if the Sr content of the melts is less than 60 ppm, add AlSr5 or AlSr10. When fusing for the first time in a new crucible or in a crucible which has not yet been used for Sr-modified alloys, the Sr content falls sharply. Strontium will diffuse into the crucible; saturation is reached after the first fusion
5 Skimming	Needed after melting down; as well as their potential for danger, cold tools may result in molybdenum segregation
6 Temperature after melting down	After melting down maximum of 780 °C for holding temperature. Don't keep the melt at temperature below 680 °C and steer melt if possible
7 Degassing and refining the melts	<ul style="list-style-type: none"> • In the transport crucible, better in casting or dosing furnace; effective refining and fastest method using quick-running rotor for gas feeding, 7–10 l/min argon or nitrogen, 6–10 min; during degassing in the transport crucible, cooling of 30–50 °C should be expected • Gas flushing lance with fine porous head, needs longer treatment times (cooling!) • Tablets for melt cleaning are inefficient
8 Skimming	Required after degassing; the metal content of the skimmings may be reduced by adding melt fluxes during or after impeller treatment
9 Pouring temperature (approx. values)	680–720 °C depends on design, flow path and wall thickness of high pressure die-cast, but also on the length and insulation of the flow channel from the dosing furnace and on use of shot sleeve heating. Temperature losses may cause initial solidification and should therefore be avoided
10 Mold temperature	250–350 °C, depending on cast and requirements of mechanical properties As a rule: the warmer the mold, the higher the elongation and the lower the strength.
11 Casting chamber temperature	Preheat the chamber electrical or with oil > 200 °C

Magsimal®- 59 [AlMg5Si2Mn]

Sequence of work when producing high pressure die-casts from Magsimal-59



1 Melting down the ingots	As quickly as possible in efficient furnaces to keep Mg melting loss, gas absorption and oxidation of melts low; replenish preheated ingots and returns in small volumes to avoid segregation; use refractory materials with a high clay content; avoid phosphorous and sodium absorption
2 Flux treatment	Prohibited to use usual flux! There is a risk of sodium (Na) pick up
3 Magnesium burnout	Normally melting loss of 0.1 % per fusion, correction not normally needed; if the Mg content is significantly below 5.0 %, add pure magnesium of maximum 0.5 %
4 Skimming	Needed after melting down
5 Temperature after melting down	Maximum of 780 °C (check temperature!)
6 Temperature in holding furnace	Holding furnace temperature: 700–720 °C Do not allow to fall below 650 °C and keep melt moving by means of: <ul style="list-style-type: none">• convection• rotor (impeller)• use bottom injection of N₂• melt pouring Do not use deep furnace with cover heating if melt is calm!
7 Degassing and refining the melts	<ul style="list-style-type: none">• Effective refining and fastest method using quick-running rotor for gas feeding, 7–10 l/min argon or nitrogen, 6–10 min• Gas flushing lance with fine porous head, needs longer treatment times (cooling!)• Gas flushing tablets do not achieve the necessary effect!
8 Skimming	Careful skimming needed! Only totally Na-free fluxes may be used to reduce the metal content of skimmings!
9 Grain refining	Prohibited!
10 Modification	Prohibited! The elongation achievable would be reduced considerably
11 Pouring temperature (approx. values)	690–730 °C, varies depending on design, size and wall thickness of high pressure die-casts
12 Mold temperature and casting chamber temperature	Mold surface temperature 250 °C to 350 °C, depending on cast and requirements of mechanical properties As a rule: the warmer the mold, the higher the elongation and the lower the strength. Preheat the chamber electrical or with oil > 200 °C
13 Quenching casts after removal from mold	Immediate quenching in water reduces the yield tensile strength and increases elongation
14 Heat treatment	Normally none
15 stress-relief annealing	Only in special cases for T5 and O; if necessary, age T5 at up to 250 °C and for up to 90 min, the yield tensile strength will increase and elongation decrease; if necessary, age O at between 320 °C and 380 °C and for up to 90 min, the yield tensile strength will decrease and elongation increase

Areas of use

Large and thin-walled structural casts; connection nodes for space frame designs; battery housings, electronic covers or shelter housings; thin-walled body parts; for architecture, cars, lighting, aircraft, domestic appliances, air conditioning, automotive engineering, foodstuffs industry, mechanical engineering, shipbuilding, defense engineering.
Replaces typical AlSi10MnMg high pressure die-casts with O/T4/T7 treatment, but also Magnesium-based HPDC.

Chemical composition of Castaduct-42 in the ingot [% of mass]

[%]	Si	Fe	Cu	Mn	Mg	Zn	Ti	others
min.		1.5			4.0			
max.	0.2	1.7	0.2	0.15	4.6	0.3	0.2	Be

Mechanical properties

Treatment state	Wall thickness [mm]	YTS $R_{p0.2}$ [MPa]	UTS R_m [MPa]	Elongation E [%]	Brinell hardness [HBW]
F	2-4	120-150	240-280	10-22	65-75

Physical data

Density [kg/dm³]	Coefficient of thermal expansion $[1/K \times 10^{-6}]$	Thermal Conductivity [W/(K × cm)]	Electrical Conductivity [% IACS]	Shrinkage [%]
2.69	25	1.4	26.0-29.5	0.5-0.9

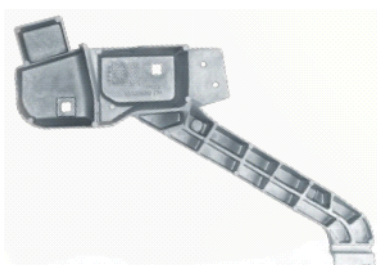


Fig. 5a: Rivet tests connecting steel sheet to HPDC in Castaduct-42, AlMg4Fe2

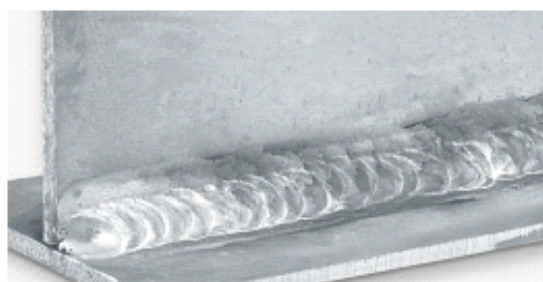


Fig. 6a: Cross-section of a welded cast-sheet-connection in Castaduct-42, AlMg4Fe2

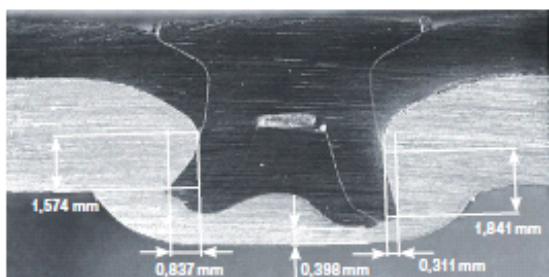


Fig. 5b: Crosssection with calculation of the HSN rivet test in Castaduct-42, AlMg4Fe2

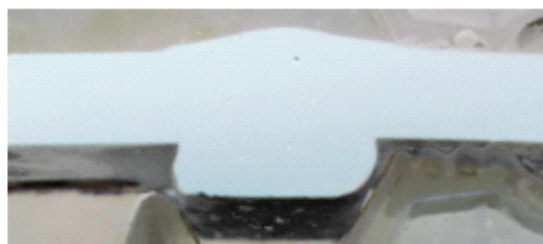


Fig. 6b: Overview from the welding beam section between Castaduct-42, AlMg4Fe2 and AW-AlMgSi0.5; filler material S-AlMg4.5Mn

Castaduct®-42 [AlMg4Fe2]

Sequence of work when producing high pressure die-casts from Castaduct-42



1 Melting down the ingots	As quickly as possible in efficient furnaces to keep Mg melting loss, gas absorption and oxidation of melts low; replenish preheated ingots and returns in small volumes to avoid segregation.
2 Flux treatment during melting down	Not needed when melting ingots; useful for avoiding oxidation when using small returns. Prohibited to use usual flux! There is a risk of sodium (Na) pickup.
3 Silicon limit and pickup	Si is an impurity and should be below 0.2% in the cast. Don't melt after AlSi alloys.
4 Magnesium burnout	Normally melting loss of 0.1–0.2% per fusion, correction normally not needed; if the Mg content is significantly below 4.0%, add pure magnesium in portion of 0.4%.
5 Iron content	Normally no correction of Fe is needed
6 Skimming	Needed after melting down
7 Temperature after melting down	Maximum of 760°C (check temperature!)
8 Degassing and refining the melts	<ul style="list-style-type: none"> • Effective refining and fastest method using quick-running rotor for gas feeding, 7–10 l/min argon or nitrogen, 6–10 min • Gas flushing lance with fine porous head, needs longer treatment times (cooling!) • Gas flushing tablets do not achieve the necessary effect!
9 Skimming	Careful skimming needed! Only special Na-free fluxes may be used to reduce the metal content of skimmings!
10 Temperature in holding furnace	Do not allow to fall below 660°C and keep melt moving by means of: <ul style="list-style-type: none"> • convection • rotor (impeller) • use bottom injection of N₂ • melt pouring Do not use deep furnace with cover heating if melt stays calm!
11 Grain refining	Not needed for thin-walled die-casts
12 Modification of Si	Silicon content is below 0.15% in the Castaduct-42. Modifying elements like Sr and P are without any influence. Na content >10 ppm should be avoided.
13 Pouring temperature (approx. values)	680–710°C, varies depending on design, size and wall thickness of high pressure die-casts
14 Mold temperature and casting chamber temperature	Mold surface temperature: between 200 and 350°C (depending on design, size and wall thickness of cast) Preheat the chamber electrical or with oil > 200°C
15 Quenching casts after removal from mold	No variation in mechanical properties either with rapid water cooling nor with cooling with air
16 Heat treatment	Normally none Up to 350°C no influence to the metallic structure!

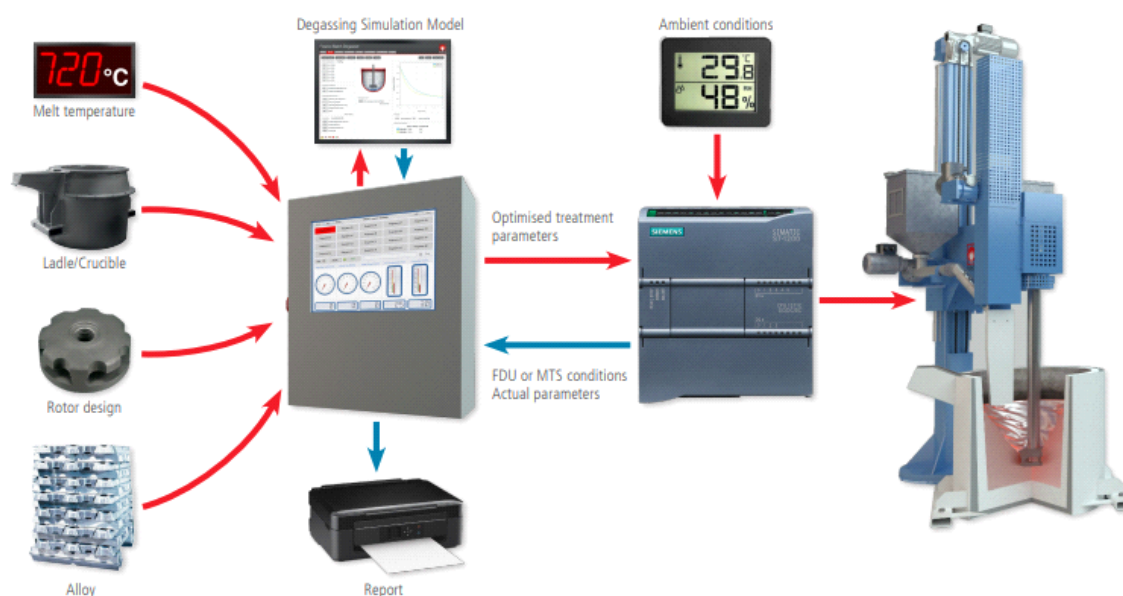
SMARTT

An innovative process control for rotary degassing of aluminium alloys



VESUVIUS

SMARTT Scheme



Overview



Mass flow controllers



Operator screen

SMARTT

An innovative process control

SMARTT is a process control tool for the rotary degassing process of aluminium alloys. It analyses all external variables and calculates the treatment parameters for degassing and upgassing processes just before each treatment. The target for the optimisation is a consistent melt quality after each treatment.

The SMARTT software is installed on a Windows PC and data exchange is carried out on a comfortable touch screen panel. The SMARTT PC is LAN connected to the Siemens PLC that controls the degassing unit.

SMARTT continuously measures humidity and air temperature while data for the Foseco rotor designs are stored in a database. The hydrogen content at the end of the treatment is always the target for the optimisation. Additionally, ingot quality, melt temperature or casting requirements influence the performance of a treatment process.

SMARTT determines rotor speed, inert gas flow rate and treatment time and transfers this data to the degassing unit before treatment begins.

Four different treatment schemes (high-speed, low gas consumption, low rotor speed or standard degassing) offer opportunities for the foundry manager to optimise his process in various ways.

SMARTT Properties

- + 20 programs on the operator screen
- + For MTS 1500 units with 1 or 2 dosing systems
- + Degassing to a hydrogen target
- + Upgassing with N_2-H_2 mixed gas
- + Data logging of all treatment parameters

Results from simulations and trials

Degassing treatment

Optimisation: Standard

BU 600 with AlSi8Cu3 at 750 °C, XSR 190 rotor

Treatment target: 0,06 ml H₂/100 g Al

Minimum treatment time: 240 s

Maximum treatment time: 500 s

SMARTT parameter for different ambient conditions:

20 °C / 25 % rh	Rotor Speed (RPM)	423		423
	Gas Flow (std. l/min)	19		19
	Process Time (s)	240		240
30 °C / 45 % rh	Rotor Speed (RPM)	431		431
	Gas Flow (std. l/min)	23		23
	Process Time (s)	240		240
40 °C / 65 % rh	Rotor Speed (RPM)	454		454
	Gas Flow (std. l/min)	29		29
	Process Time (s)	240		240

SMARTT calculates treatment parameters for different ambient conditions to reach 0,06 ml hydrogen per 100 g aluminium after each treatment. With increasing air temperature and relative humidity, the rotor speed and inert gas flow rate increase to compensate the higher moisture content in the atmosphere. If the flow rate and rotor speed are at its specific limit, the software starts prolonging the treatment time to reach the target.

Foundry trials have shown that the target was always

Uppassing treatment

Some applications in foundries require a defined hydrogen content such as in the casting of wheels. It is common practice to run very short treatment times to avoid too much hydrogen removal; often oxide removal is not sufficient. The use of a N₂-H₂ mixed gas improves oxide removal due to longer treatment times but the variations in hydrogen at the end of treatment are still high.

SMARTT now runs an inert gas treatment followed by a 2-stage uppassing. The 1st stage runs with N₂-H₂ mixed gas only; during stage 2 a mix between N₂-H₂ and inert gas gives a defined hydrogen content in treatment gas, aluminium melt and atmosphere.

Optimisation: Standard

INSURAL* ATL 1000 with AlSi7Mg at 750 °C,

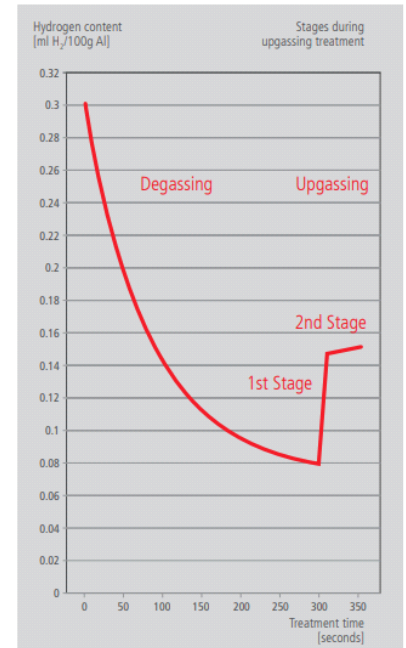
FDR 220 rotor

Treatment target after degassing: 0,08 ml H₂/100 g Al

Final treatment target: 0,15 ml H₂/100 g Al

Minimum treatment time: 360 s

Maximum treatment time: 600 s



Complete treatment cycle including uppassing

References

1. NADCA Standards for High Integrity and Structural Die Casting Process 2021 8th Edition
2. The Aluminium Automotive Manual – Body Structure - Version 2013 © European Aluminium Association
3. Ductile Aluminium Alloys for Automotive Structural Applications by RHEINFELDEN Alloys
4. Primary Aluminium HPDC Alloys for Structural Casts in Vehicle Construction by RHEINFELDEN Alloys
5. SMARTT An innovative process control for rotary degassing of aluminium alloys from Foseco



Solution to GDCTECH Crossword #8 - April 2025

S	P	H	E	R	O	I	D	A	L	S	T	R	U	C	T	U	R	E			
O	R	Y	H	E	A	T	T	R	E	A	T	A	B	L	E	A	L	L	O	Y	
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I	U	U	T	R	A	L	D	I	E	T	E	M	P	E	R	A	T	U	R	E	
F	R	T	R	S	I	L	E	M	E	L	T	I	N	G	P	O	I	N	T	H	
I	E	E	E	E	N	O	G	A	M	A	S	T	E	R	A	L	L	O	Y	Y	
C	T	C	A	G	R	Y	A	C	I	M	I	C	R	O	G	R	A	P	H	P	
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X																W		N	A		O
N	O	N	H	E	A	T	T	R	E	A	T	A	B	L	E	A	L	L	O	Y	

Financial Discipline for Enhancing Business Dialogue with Shriniwas Dandekar by Vishwas Kale

Vishwas Kale, Managing Director, Vijayesh Instruments Pvt Ltd., sales@vijayesh.net



Shriniwas Dandekar works as Financial Coach in the company: Happyness Factory, a goal-based investment platform, for the past decade. He helps people achieve their financial needs by customizing investment portfolio based on their unique needs. He has more than 30 years of experience in Banking & Financial Services having worked in leadership roles at Axis Bank and Bank of Maharashtra. During banking service, he helped agriculturists, entrepreneurs, small businessmen to build their businesses on a sound financial footing by actively conducting financial literacy campaigns with the help of District Industries Centers. He also conducts Investor Awareness Programs for impending retirees and young employees



Vishwas Kale is Managing Director, Vijayesh Instruments Pvt Ltd, Pune and has more than thirty years' experience in instrumentation. He was twice President, International Society of Automation (ISA, USA) in India, now its Honourary Senior Life Member, Advisory Member of Committee of Bureau of Indian Standards (BIS), Member of Experts Panel of NCTSI-Indian Institute of Foundrymen among many positions he holds with various organizations. He has received awards for innovative products. Author of two books: 1. Instrumentation and Process Control Techniques in Foundries 2. Management for Success

Vishwas Kale: Firstly, thanks for making yourself available for this dialogue for the benefit of entrepreneurs which are contributing to the country's wealth. To remain competitive in the present scenario where technological and behavioural issues, disruptions always loom large around the corner and on the other hand challenges like automation of operations, financial discipline are always of paramount importance. Considering all this, how would you offer solutions with your large experience of three decades in banking sector and almost a decade after that in personal and company finance?

Shriniwas Dandekar: Thanks Vishwas. I am glad to be here and thanks you for considering me eligible to speak on this topic and share my experience. I have seen your company's growth and how you have achieved it. As such you are experienced in handling all the hurdles, problems and solutions to these problems and steer your company firmly ahead. Yet for intended audience let us discuss some core issues which I have observed while working in the bank as credit assessment officer.

VK: Good, I would begin with a comment and you

take it further. Financial discipline is about getting one's numbers right. It requires setting clear goals, periodic measurement of performance, analyses of variances and taking corrective actions. Ultimately, it is about earning more than planned, spending less than necessary, saving as much as possible and investing wisely. It's just good old-fashioned frugality with the help of an expansive ERP. So, now please go ahead.

SD: Nevertheless, it is not always easy to get it right. The reason being that a business has multiple moving parts that must all come together, all the time, to make it work. This in turn, involves ensuring that the small, mundane things are addressed precisely and decisively every single day. In the push and pull of business, these small things often fall by the way side, other commitments take priority and bad habits and efficiencies creep in. Once financial indiscipline sets in, it is hard to get rid of.

VK: Exactly, I wanted to know from you which points you keenly look at any company, its promoters and financials.

SD: As a banker, we give importance to all points that

matter, but more particularly background of promoters, means of finance, how their own contribution is raised, potential of business, debt-equity ratio, possible threats and risks to the business and how these would be mitigated.

VK: Okay, I feel financial discipline and setting clear goals are of paramount importance.

SD: You are absolutely right. Financial discipline can be achieved by reviewing your performance at fixed, say quarterly interval. If you are taking regular review, you can arrest slippages if any, exercise control firmly, revise your plans, channelize your finances more effectively. It is all about will to perform better, comply standard procedures and follow timeless age-old rules.

Along with the review, a formal discussion with your banker from time to time always helps. It gives you an idea about what opinion banker has formed about you and your business. Competition drives the price of your product. At times I have experienced that, owner fixed the price under pressure from competition. This would create imbalance over the time and will inflict injustice to your capital, quality and efforts put in by you and your team. However tough may be the competition, if you are sure about your quality, ultimately buyer will go with your price.

VK: I have experienced that low profitability, delaying payments to vendors including salaries, outdated practices, not having proper operational software for account/HR etc. also contribute to failures. How would you offer solutions on these points?

SD: According to me it is a result of cashflow mismatch. Owners are constantly worried about receipts and payments and naturally their attention to other important functions of management gets diluted. They lack support of the team, trained specifically to use new software in day-to-day operations. There are other accepted ways to ensure cash-flow management are availing bill discounting and LC facility other than fund-based facilities like cash credit or overdraft. Banks are also promoting these facilities as these are less time consuming to their customers and self-liquidating in nature.

VK: I find new entrants in business spend money on

unnecessary things, divert the funds for some personal goals. This should not be done. What do you say?

SD: Temptation to divert the working funds is the biggest reason for all above problems. In order to go couple of steps ahead of the competitors, owners are tempted to divert short-term working funds to purchase long-term assets, like machinery, and consumables. Naturally they fall short of working capital. Once diversion is done which is not immediately replenished by a term loan then failure is assured. I have not only suggested but got implemented many ideas from my clients to safeguard their interests. One such method is to take out 5% of every large credit and put it in another account to create as a reserve. For any emergency this amount can be used instantly. This saves many entrepreneurs to fall prey to temptation of diversion of funds.

Entrepreneurs must ensure to update software for accounts/HR/recovery and educate their resources. Unless such cost-effective measures are taken you cannot have worry-free day or week in your schedule. I have seen many units effectively using such software to increase efficiency and output of their manpower.

VK: These are certainly helpful suggestions. However, I have seen many promoters lack the knowledge of finances, failed to measure performance objectively, prioritize liability payments, etc. What are the solutions you can suggest?

SD: Entrepreneurs many times overlook financial aspects. They consider "Finance is not my area". This is a wrong notion. When you want to run a successful business, you have to know the basics of finances. There is a big difference between an Enterprise Finance and Personal Finance. Both need budgeting and sticking to it. If you are not confident to handle this it is always better to take professional help.

It is important to run your business as well as family on financially sound base. You have to make two buckets – one for your business and another for yourself and every month you have to invest some portion of your profits in these two buckets. Many entrepreneurs feel that if business needs are fulfilled

everything is fulfilled. It is not so. Personally, you have your wishes/desires and they also need to be fulfilled. For that, investments in financial products is necessary as investment in machinery for your business. Once you learn simple rules of financial management you can definitely be a successful businessman.

I am tempted to give some points:

Watch the big costs, not the small ones. It is so common to see small costs get all the attention while the big expenses are treated as holy cows, that cannot be touched. Controlling small costs often achieve nothing except irritating internal and external constituents. Don't be scared to question the big costs and to manage them very carefully.

Measure performance constantly and objectively. Good businesses track performance against forecasts constantly, analyse variances and make changes as needed. This creates an early warning system to track slippages and take immediate corrective action

VK: Some rules come to my minds. Like Separate Personal and Business Finances, Maintain Accurate Cash Tracking, Monitor Finances Closely, Schedule Payments on Time etc. You can certainly add many more.

SD: You have given a right start! I would add Stick to

Budgets, invest for the Future, Seek Professional Financial Advice, Prioritize Debt Repayment.

The benefits of good financial hygiene are many.

I may mention:

Enhanced Cash Flow Management. Proper financial hygiene ensures that cash inflows and outflows are accurately tracked, minimizing cash flow issues and enabling better resource allocation.

Reduced Risk of Non-Compliance. Accurate record-keeping and timely payments help businesses meet tax and regulatory requirements, reducing the risk of fines and penalties.

Improved Decision-Making. With access to accurate and timely financial data, business owners can make well-informed decisions about investments, expansion, and cost management.

Greater Financial Stability and Growth. Consistent financial practices, such as budgeting and debt management, promote stability and pave the way for long-term growth.

VK: Excellent analysis. How would you like to conclude?

SD: Simple! We, at Happyness Factory offer goal-based financial solutions for creating a corpus for company and personal accounts which ensures a happy life.



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GIGA CASTING

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

Giga casting, a revolutionary method pioneered by companies like Tesla, has the potential to significantly impact the future of the aluminium industry. This method involves the use of large casting machines (Giga Presses) to produce substantial, single-piece aluminum components for automotive bodies, reducing the need for multiple smaller parts that would otherwise require complex assembly.



Here's how Giga casting is poised to shape the future of the aluminum industry:

1. Increased Demand for Aluminum

- **Automotive Sector Growth:** As automakers increasingly adopt Giga casting for producing large aluminum components, the demand for aluminum will surge. Aluminum's lightweight and strength properties make it a prime material for electric vehicles (EVs) looking to maximize efficiency.
- **Sustainability Goals:** Aluminum is recyclable, making it a key material for companies focusing on reducing carbon footprints. The shift towards more sustainable production processes, like Giga casting, aligns well with the circular economy, driving more demand for recycled aluminum.

2. Technological Advancements in Aluminum Production

- **New Alloys:** Giga casting necessitates the development of advanced aluminum alloys that can meet the structural demands of large single-piece components while ensuring durability, malleability, and resistance to cracking. This encourages innovation in aluminum smelting and alloy production.
- **Manufacturing Efficiency:** With Giga casting, the industry can achieve significant reductions in manufacturing complexity, assembly time, and material waste. This will push aluminum producers to innovate on higher quality and more efficient casting techniques to meet the new industrial demands.

3. Impact on Aluminum Suppliers

- **Shifting Industry Dynamics:** Giga casting could drive consolidation within the aluminum supply chain as suppliers seek to provide larger, more consistent quantities of high-quality aluminum. The traditional supply chains that provided smaller, specialized parts may need to evolve or risk becoming obsolete.
- **Vertical Integration:** Companies may start vertically integrating aluminum production and processing to have better control over the quality and supply of aluminum for Giga casting, leading to new partnerships and mergers within the aluminum and automotive industries.

4. Sustainability and Recycling

- **Recycling Opportunities:** As aluminum is one of the most recyclable materials, Giga casting aligns with the global push towards sustainable manufacturing. This will likely push aluminum recyclers and smelters to innovate in handling and processing larger scrap quantities from Giga casting operations, promoting a closed-loop system.

5. Potential for Other Industries

- **Beyond Automotive:** While Giga casting has mainly been adopted in the automotive industry,

its success could inspire adoption in other sectors that require large, high-integrity aluminum parts, such as aerospace, construction, and renewable energy. This could significantly broaden the aluminum industry's scope and demand.

Challenges

- **Supply Chain Constraints:** The surge in demand for high-quality aluminum could lead to supply bottlenecks if production capacities aren't ramped up fast enough.
- **Energy Consumption:** Giga casting requires substantial energy, and the aluminum smelting process itself is energy-intensive. Balancing energy efficiency with production goals could be a challenge in ensuring sustainability.

In summary, Giga casting could revolutionize the aluminum industry by driving demand for innovative alloys, increasing recycling initiatives, and transforming supply chains across multiple sectors. Its growth will create opportunities for aluminum producers to adopt new technologies, cater to the expanding EV market, and potentially reach other industries.

will this have an impact to the machinery manufacturing

Yes, Giga casting will have a significant impact on machinery manufacturing, particularly in the sectors that produce the large casting machines (like Giga Presses) and related equipment. Here's how:

1. Increased Demand for Large Casting Machinery

- **Specialized Equipment Manufacturing:** The growth in Giga casting will drive demand for companies that produce the specialized machinery, such as Giga Presses. These machines are massive and require advanced engineering capabilities. Machinery manufacturers will need to scale up their production capabilities and innovate in casting technology to meet the growing market needs.
- **Higher Capacity Machines:** As more industries adopt Giga casting, there will be a push for higher-capacity machines capable of producing even larger or more complex parts. This will require advancements in the design and production of these machines, including stronger materials, more precise controls, and better automation.

2. Shift in Machine Design and Production

- **Bespoke Machinery:** The machinery used for Giga casting may need to be customized to suit specific industries (automotive, aerospace, etc.) and their unique casting requirements. This could result in a shift from standard machinery to more bespoke, modular, or adaptable systems.
- **R&D Focus on Durability and Precision:** Since Giga casting machines handle massive volumes of molten aluminum under extreme pressure, the machinery itself must be incredibly durable and precise. This creates an opportunity for innovation in materials used for manufacturing machinery, as well as in automation and sensor technology to ensure the machines operate efficiently with minimal downtime.

3. Automation and Robotics Integration

- **Automation Demand:** The large-scale casting operations enabled by Giga casting will require significant automation to handle the pouring, cooling, and ejection of enormous aluminum components. Machinery manufacturers will need to integrate advanced robotics, AI, and machine learning into their systems to ensure smooth and precise operations.
- **Robotic Arms and Handling Equipment:** Given the size and weight of the components being produced, robotic arms and automated material handling systems will become increasingly important for moving and assembling the large aluminum parts. This will drive demand for high-capacity, durable robotics designed specifically for such tasks.

4. Supply Chain Adjustments

- **New Supply Chains for Giga Press Components:** Manufacturing Giga Presses involves large and complex parts like massive hydraulic systems, injection molds, and high-performance electrical components. The rise of Giga casting will lead to a more robust supply chain for these components, potentially benefiting manufacturers of hydraulic systems, high-pressure pumps, and large-scale industrial components.
- **Component Standardization:** As more companies adopt Giga casting, there may be a push toward standardizing certain components and systems used in the presses, such as the molds, tooling, and cooling systems. This could create new

opportunities for machinery manufacturers that specialize in these standardized parts.

5. Maintenance and Support Infrastructure

- **Service and Maintenance Demand:** Giga casting machines will require specialized maintenance and service, given their size and complexity. This opens up opportunities for machinery manufacturers and service providers to develop expertise in maintaining these systems, offering after-sales service, and potentially creating a new market for maintenance contracts and spare parts.
- **Smart Maintenance Solutions:** With the integration of sensors and IoT technologies, machinery manufacturers can offer predictive maintenance solutions. This ensures minimal downtime and extends the life of the equipment, giving rise to new products and services in the machinery maintenance space.

6. Sustainability Focus

- **Energy-Efficient Machinery:** The enormous energy demands of Giga casting machines will likely push machinery manufacturers to innovate in making their systems more energy-efficient. This could involve more efficient motors, better thermal management systems, and sustainable materials for constructing the machinery itself.
- **Eco-Friendly Manufacturing Practices:** As sustainability becomes a priority for the aluminum and automotive industries, machinery manufacturers may need to focus on eco-friendly production practices. This includes designing machines that use less material, produce less waste, and are built for easy disassembly and

recycling at the end of their life cycle.

7. Expansion into Other Industries

- **New Opportunities Beyond Automotive:** As Giga casting potentially expands into other industries like aerospace, construction, or renewable energy, machinery manufacturers will find new opportunities to develop casting machines for different applications. This diversification could lead to the development of specialized machinery for producing large parts in these sectors, further boosting demand for industrial equipment.

Challenges

- **Capital Costs:** The production of Giga casting machinery requires significant capital investment, and smaller machinery manufacturers may struggle to compete with larger firms that can afford to build and market these massive machines.
- **Skilled Workforce:** There will be a need for highly skilled workers to design, manufacture, and maintain Giga casting equipment. Training and workforce development will be key challenges as this industry grows.

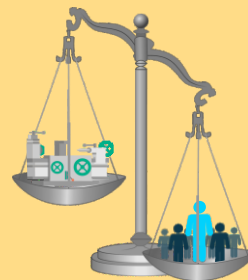
Conclusion

The rise of Giga casting will drive innovation and growth in the machinery manufacturing industry, particularly for those companies involved in large-scale casting machines, robotics, automation, and maintenance services. This trend will encourage the development of more efficient, durable, and specialized machinery to meet the evolving needs of industries adopting Giga casting technology.



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IMA 2025 WORLD MAGNESIUM CONFERENCE AT SALZBURG, AUSTRIA



- Pre Event Evening Meeting : Every chair presented the details of his committee meeting activities.
 - Inauguration Ceremony was very simple. President spoke few words of greetings and best wishes for the Conference.
 - Conference Chair narrated the whole 2 days Conference.
 - Like ours, they also had session chair, who used to introduce the speaker and thanks giving. For each paper only 2 questions were allowed. Schedule was maintained very nicely.
- The chair used to show PLACARD DISPLAYING,

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- Only 6 Table Top Display, it was very small.
- Participants were 192 nos.
- Coffee Breaks used to be for 15-20 minutes
- Lunch Break for 30-40 minutes
- Dinner used to be very simple 6pm to 8 pm mainly focused on Cocktails only 2 extra dishes as a food for Dinner.
- Conference used to start exactly at 8.30 am. Award distribution was also very simple way
- Industrial visit was good.
- We could get :
 - 2 Stalls almost Booked
 - 3 Prospective
 - 2 Catalogue Show
 - 3 Technical Papers. (2 confirmed one yet to)
- Meeting with President, Europe Chairman , Japan Chairman, China Chairman was also good.
- Our presentation was very well appreciated.
- 10 Indian representatives attended
- 1 Indian Stall was also there



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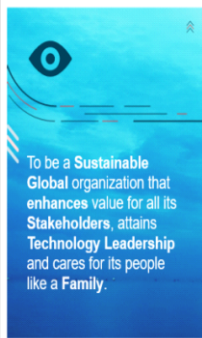
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- Implementation of Industry 4.0

- 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
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- Land: 20 acres
- Built-up: 24000 sq. mtr.
- Capacity: 4 Million Wheels p.a. , expandable up to 6 Mn



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A global view on the Magnesium market & Primary Product Technology

Dr. Ing. Martin Tauber, European Representative,
INTERNATIONAL MAGNESIUM ASSOCIATION (IMA)
martintauber3120@gmail.com

Introduction

Magnesium is a pioneering lightweight material employed across various industries. Traditionally, it has served as an alloying element in aluminium alloys and as a facilitator of weight reduction in the transport sector. Presently, magnesium finds also applications in numerous other markets and holds significant promise for future developments.

For over 80 years, the International Magnesium Association (IMA) has been a longstanding global networking organisation dedicated to promoting the growth of magnesium. In a worldwide collaborative effort to reduce carbon emissions, IMA plays a pivotal role in supporting global magnesium value chains, aiding industries in lowering emissions, and ensuring a competitive supply chain for the future. IMA's roadmap to Net-Zero is central to this global initiative.

This paper provides an overview of the global supply and demand of magnesium metal, discussing current and forthcoming primary magnesium projects and associated smelting processes. In conclusion, it offers recommendations for the Indian market to develop its own magnesium value chains, including environmentally friendly primary production, and to consider magnesium in policy discussions as a critical or strategic raw material for India.

Content:

- IMA introduction
- Al vs. Mg Factsheet
- Global Magnesium Market [Demand]
- IMA Sustainability Roadmap
- Takeaways & Recommendations

IMA introduction

The global voice of the magnesium industry, IMA

serves the industry and the membership through its Annual World Magnesium Conference, seminars, statistical programs, research and publications. Through IMA's efforts, manufacturers and consumers are increasingly aware of the numerous options and benefits the metal magnesium provides.

Founded in 1943, the mission of the International Magnesium Association (IMA) is to promote the use of the metal magnesium in material selection and encourage innovative applications of the versatile metal. IMA's members consist of primary producers of the metal, recyclers, foundries, fabricators, end-users and suppliers.

Al vs. Mg Factsheet (ref. 2023)

The aluminium and magnesium industries are closely interlinked, making a comparative analysis of these two lightweight metals insightful. Global primary aluminium production significantly surpasses that of magnesium, with aluminium output exceeding magnesium by more than 50 times. China dominates the production landscape for both metals, accounting for approximately 85% of global magnesium production and 59% of aluminium output.

In Europe, primary aluminium production constitutes about 3.8% of the global total. Notably, Europe ceased primary magnesium production decades ago, leading to a complete reliance on imports for this metal. The average plant sizes for aluminium and magnesium production differ markedly, influenced by the specific smelting technologies employed. State-of-the-art Pidgeon process smelters in China typically have an output capacity of 50 kto/year, while most current smelters outside China range between 15 to 60 kilotonnes annually. Environmental considerations are paramount, particularly concerning carbon emissions associated with

production processes. Chinese Pidgeon process smelters predominantly utilise coal-fired retorts and ferrosilicon, leading to higher carbon footprints. In contrast, many aluminium and magnesium smelters employing electrolysis have access to low-carbon energy sources, resulting in reduced carbon emissions. Aluminium smelters exhibit carbon footprints ranging from 2 to 20 kg CO₂ equivalent per kilogram of aluminium, while global magnesium smelting processes range between 6 to 22 kg CO₂ equivalent per kilogram of magnesium produced. Future projects are targeting significantly lower emissions to enhance sustainability. Both industries have developed efficient scrap recycling systems, with well-established cycles that are often interconnected. However, post-consumer or end-of-life scrap availability for magnesium remains limited, indicating potential areas for improvement in recycling and resource efficiency.

Magnesium Global Market [Demand]

The global demand of magnesium metal in all its forms reaches around 1,1 mm kto but showing only minor growth within the last years. The 2023 landmark is 1,020 kto with a slight growth expectation for 2024.

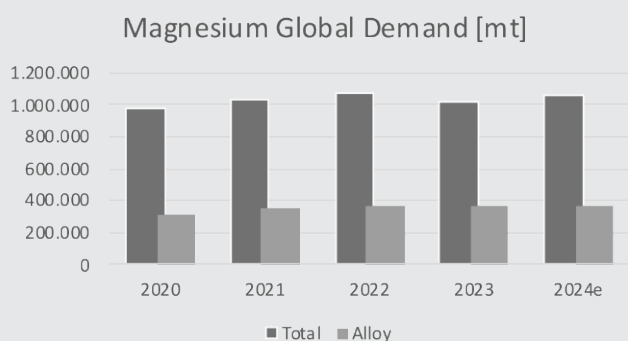


Chart 1: Magnesium Global Demand & Alloy [mt] 2020–2024e

The regional split is dominated by China but showing also constant and solid demand in all other regions. In 2023, China accounted for 45,3% of total demand, North Americas (16,6%) and Europe (15,5%). The global demand is expected to grow with 1,9% in 2024.

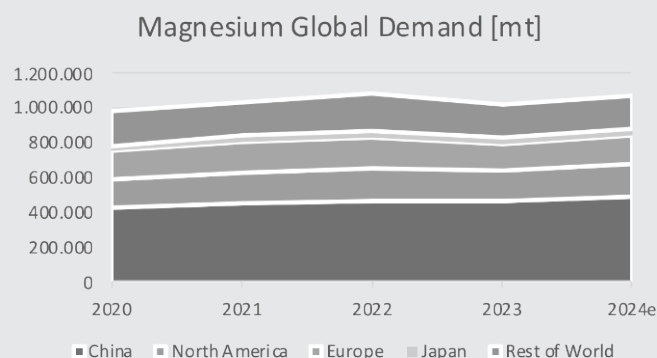


Chart 2: Magnesium Global Demand [mt] per region 2020–2024e

IMA Sustainability Roadmap

The International Magnesium Association (IMA) unveils a strategic roadmap for decarbonizing the magnesium industry, aiming for a sustainable future. This initiative aligns with global climate change efforts and envisions a significant industry transformation.

The members of the IMA are committed to make sustainability a guiding principle at all levels of operation, and to promote the same commitment to the whole Magnesium Industry.

- “The members of the International Magnesium Association (IMA) are committed to make sustainability a guiding principle at all levels of operation, and to promote the same commitment to the whole Magnesium Industry. Our mission is:
- To strive to reduce the impacts of greenhouse gases and natural resources by applying more sustainable technologies and using more renewable energy in our production processes.
- To continuously reduce the negative environmental and social impacts within the whole value chain.
- To strive to improve circular economy approaches for Magnesium to make

end-of-life secondary Magnesium a useful source of greener material.”

The roadmap spans short to long-term strategies, emphasizing collaborative stakeholder action across the globe. It highlights technological advancements and the industry's role in reducing carbon emissions, with a focus on innovative production methods, energy savings, and eco-labelling. The IMA and its diverse members are committed to propelling the industry towards a greener and more efficient future.

Decarbonising the Magnesium Industry: A Vision for 2050 with Key Milestones



Deutscher Luft- und Raumfahrtverband
DLR



International
Magnesium
Association

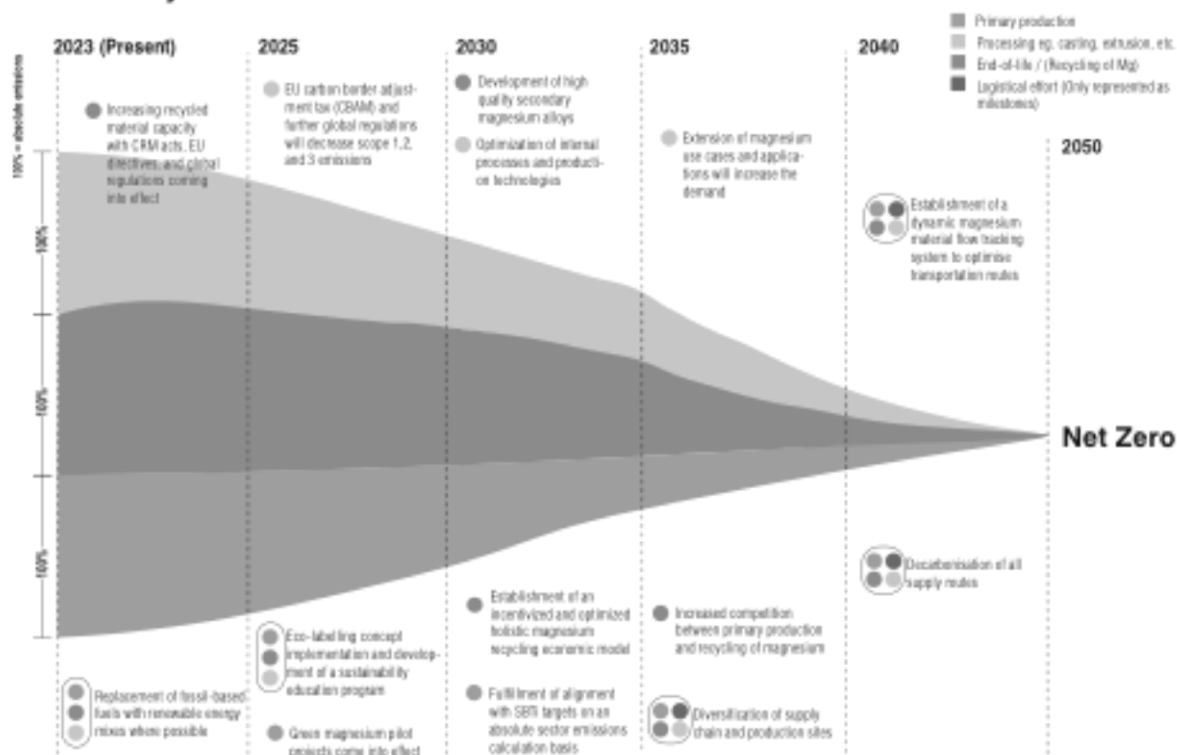


Chart 3: IMA Sustainability Roadmap

The formulation of the strategy commenced with a comprehensive assessment of prevailing hotspots within the magnesium industry. A thorough evaluation was conducted across all positions within the value chain. This strategic framework was subsequently delineated into three temporal categories: short-term, where decarbonization-strategic-roadmap-for-the-magnesium-industry.

The strategy also incorporates a global perspective that accounts for worldwide regulations and directives, and places ambitious targets for the magnesium industry. Significantly, equal emphasis is placed on all stakeholders throughout the value chain to effect meaningful change. Our recognition of the transmission effect illustrates how the upstream scope 1 and 2 emissions of one company can result in downstream scope 3 emissions for another. Consequently, the strategy underscores the importance of collective action. Lastly, emission pathways were meticulously analysed and visualized in a roadmap format, highlighting key milestones critical to the magnesium sector's decarbonization.

Global Magnesium Market [Supply]

For over two decades, China has dominated the global supply of primary magnesium metal products, accounting for approximately 86.7% of production in 2023, primarily through the Pidgeon process. Production outside China constituted 13.3% in 2023, originating from a limited number of operational facilities. The principal producing countries include the United States, Israel, Brazil, Turkey, and Russia.

Global Magnesium Primary Production [mt]

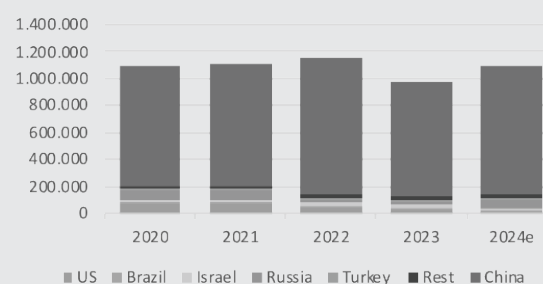


Chart 4: Global Magnesium Primary Production [mt] 2020–2024e

The Chinese production landscape is mainly allocated in 7 different regions, whereas Shanxi is most dominant with 57,7% in 2023.

Magnesium Primary Production China 2023 [mt]

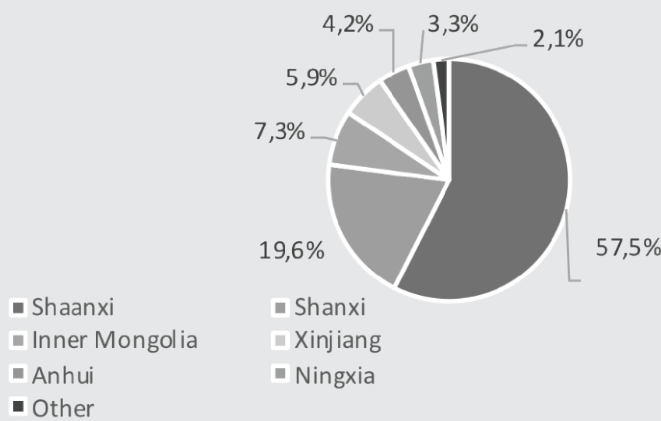


Chart 5: Magnesium Primary Production China [mt] 2023

The International Magnesium Association (IMA) keeps its stakeholders informed with regular updates on the primary production landscape. Additionally, IMA provides comprehensive overviews of carbon footprint metrics from various producers, supplemented by benchmark data from external environmental databases.

Country	Company name	Status 2024 Year End	Technology/Process
Canada	Tergeo Critical Minerals	on hold/bankruptcy protection	Electrolytic
Australia	Latrobe Magnesium	MgO production/pilot plant commissioning	Hydromet-Pidgeon
US	Western Magnesium Corporation	pilot scale reactor	Pyro-met
Romania	Verde Magnesium	planning, exploration licence	Alumino-Thermic
Romania	Mures Magnesium	planning, sample ingot production	Electrolytic
Bosnia	Magnesium For Europe (MFE)	planning, sample ingot production	Alumino-Thermic
Canada	Mag One Products	planning	Zuliani
Canada	General Magnesium Corporation	planning	unknown
US	Big Blue Technologies	pilot plant	Carbothermal reduction (CTR)/Alumino-Thermic
India	Tremag Alloys	on hold	
Australia	Pact Renewables	process development	
Australia	Magnum	planning/pilot plant building	Magsonic™ carbothermal technology
Canada	West High Yield Ressources	planning	Hydrometallurgical process
Australia	Korab Ressources (AusMag)	planning	
Saudi Arabia	ENOWA (NEOM)	planning	electrolytic/desalination
US	Magrathea Metals	planning/pilot tests	electrolytic/desalination
Iceland	Tjordur Holdings	planning	electrolytic/desalination
US	Tidal Metals	planning	electrolytic/desalination
Oman	MDO	planning	Horizontal pidgeon

Chart 5: Magnesium Primary Production China [mt] 2023

Current Mg primary producers			
Brazil	Rima	production	Silicothermal-Balzano
Israel	Dead Sea Magnesium	production	VAMI Electrolytic
US	US Magnesium	temporary closure	Proprietary Electrolytic
Turkey	KAR Mineral Madencilik	production	Chinese pidgeon
Kazakhstan	UKTMP JSC	production	Electrolytic
Russia	Solikamsk	production	VAMI Electrolytic (Russian)
Russia	VSMPO - Avisa	production	VAMI Electrolytic (Russian)
Iran	Shemsh Felez Royal Co.	production	Chinese pidgeon
Excluding China			

Chart 7: Primary Magnesium Production – Current Producers outside China

Takeaways & Recommendations

- The global primary magnesium production footprint will highly depend on the improvement of the China Pidgeon process. The current Non-China Magnesium production volumes footprint is comparable to the global primary Aluminium value
- The IMA/DLR developed decarbonization roadmap is providing a pathway for the global magnesium industry and encourages engagement of all players in the value chain
- developing the complete value chain (transport, defence) including a competitive green primary supply base, processing & recycling
- Adapt Magnesium also into all other innovative technologies, such as batteries, medical, hydrogen storage & transport,...
- Include Magnesium in national and regional strategic & priority policy making to support projects, production, education, R&D, recycling and trading.

India future market development

- The success of Magnesium participating in the growing Indian market will be based on

Chart overview:

Chart 1: Magnesium Global Demand & Alloy [mt] 2020 – 2024e

Chart 2: Magnesium Global Demand [mt] per region 2020 – 2024e

Chart 3: IMA Sustainability Roadmap

Chart 4: Global Magnesium Primary Production [mt] 2020 – 2024e

Chart 5: Magnesium Primary Production China [mt] 2023

Chart 6: Primary Magnesium Production Pipeline (Year End 2024)

Chart 7: Primary Magnesium Production – Current Producers outside China

Sources:

IMA website <https://www.intlmag.org/>

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Dispelling the Myths of Magnesium in Manufacturing: A Comprehensive Overview

Revanth Katta, Executive Director, BHAGYANAGAR MAGNESIUM PVT. LTD.
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This article is part of the series of articles dedicated to Magnesium alloys and its incorporation into the Manufacturing industry of India. In this article, let's explore the myths surrounding the use of magnesium and try to address the same.

Magnesium and its alloys stand out in the realm of materials science for their remarkably low density, a characteristic that has positioned them as highly desirable in industries where weight reduction translates directly into enhanced performance, efficiency, and sustainability. The automotive and aerospace sectors, for instance, have long recognized the potential of magnesium to contribute to lighter vehicles and aircraft, leading to improved fuel economy and reduced emissions. However, despite these compelling advantages, the wider adoption of magnesium in the broader manufacturing landscape has been hampered by a series of deeply entrenched myths.

These misconceptions often stem from outdated information or a lack of understanding of the significant advancements that have been made in magnesium alloy development and processing techniques. This comprehensive exploration aims to meticulously dissect these prevalent myths, providing a detailed counter-narrative grounded in scientific evidence and practical realities, thereby illuminating the true potential of working with this versatile and increasingly important material.

The Myth of Extreme Flammability: Separating Fact from Fiction

Perhaps the most pervasive and fear-inducing myth surrounding magnesium is its alleged extreme flammability. This misconception frequently conjures dramatic images of uncontrollable and intensely burning fires, leading many manufacturers to instinctively shy away from considering its use. While it is undeniably true that pure magnesium in finely divided forms, such as powder or thin strips, possesses a high surface area to volume ratio, making it readily ignitable and capable of burning fiercely, this characteristic does not accurately represent the

behaviour of the magnesium alloys employed in modern manufacturing processes.

Contemporary magnesium alloys are engineered with carefully selected alloying elements that significantly elevate their ignition temperatures and substantially reduce their susceptibility to combustion. **In their typical solid, cast forms used for structural components, these alloys exhibit a far greater resistance to fire than many other commonly used materials, including a wide range of plastics.** In fact, magnesium's inherent excellent thermal conductivity plays a crucial role in dissipating heat effectively, making it more challenging to reach the temperatures required for sustained combustion under typical operating conditions.

It is important to acknowledge that machining magnesium does necessitate the implementation of specific precautions to effectively manage the chips and dust generated during the process. These byproducts, due to their increased surface area, can be more prone to ignition. However, the risks associated with machining magnesium are not insurmountable and can be effectively mitigated through the strict adherence to standard industrial safety protocols and the utilization of appropriate, non-water-based coolants. Furthermore, specialized dust collection systems and proper training of machine operators in handling magnesium are crucial elements in ensuring a safe working environment. When these established best practices are diligently followed, the perceived flammability risk of magnesium becomes a manageable aspect of its manufacturing process, far from the uncontrollable hazard often portrayed in the prevailing myth.

Poor Corrosion Resistance: A Historical Challenge Overcome by Innovation

Another deeply rooted misconception that continues to impede the broader application of magnesium alloys is the belief that they inherently possess poor

corrosion resistance, rendering them unsuitable for a wide spectrum of potential applications, particularly those involving exposure to challenging environmental conditions. Historically, this perception held a degree of validity, as early formulations of magnesium alloys did exhibit a tendency towards corrosion, especially in saline environments. This susceptibility often limited their practical use in many demanding applications.

However, the field of magnesium metallurgy has witnessed remarkable advancements in recent decades. Through meticulous research and development, significant strides have been made in enhancing the corrosion resistance of modern magnesium alloys to levels that rival, and in some cases surpass, those of other commonly used engineering metals. **The strategic alloying of magnesium with elements such as aluminum, zinc, manganese, and rare earth elements has proven highly effective in creating alloys with significantly improved resistance to various forms of corrosion.**

Furthermore, the development and application of advanced protective coatings and surface treatment technologies have played a pivotal role in bolstering the corrosion performance of magnesium components. Techniques like anodizing, chemical conversion coatings, and specialized paints provide effective barriers against corrosive agents, extending the service life and expanding the applicability of magnesium alloys. It is crucial to emphasize that, as with any engineering material, proper design considerations and careful material selection based on the specific intended application and the anticipated environmental exposure are paramount for ensuring long-term performance and reliability. Modern magnesium alloys, when correctly specified and treated, can perform reliably even in demanding environments, effectively dispelling the outdated myth of inherent poor corrosion resistance.

The recent emergence and increasing adoption of **Micro arc oxidation (MAO) technology** represent a significant leap forward in enhancing the corrosion resistance of magnesium alloys. This innovative surface treatment technique creates a dense, ceramic-like oxide layer on the magnesium surface, providing exceptional protection against corrosion. In many cases, MAO-treated magnesium alloys exhibit corrosion resistance comparable to, or even exceeding, that of many common aluminum alloys.

While the widespread commercial availability and cost-effectiveness of MAO technology are still evolving, particularly in regions like India where research institutes are actively working on indigenizing and scaling up the technology, its potential to revolutionize the application of magnesium alloys in corrosion-sensitive environments is immense. The anticipated near-term commercial availability of cost-effective MAO solutions in India will further erode the myth of poor corrosion resistance and unlock new possibilities for magnesium applications

The Cost Factor: Beyond the Price Tag Per Kilogram

The cost of magnesium is another frequently cited obstacle hindering its widespread adoption in manufacturing. The prevailing myth often portrays magnesium as a scarce and prohibitively expensive material. However, a closer examination of the realities of magnesium production and its life-cycle economics reveals a more nuanced picture. In truth, magnesium is the eighth most abundant element in the Earth's crust and is readily extracted from diverse and plentiful sources, including seawater and various mineral deposits. This inherent abundance suggests a strong potential for a stable and cost-effective supply chain.

While the initial material cost per kilogram of magnesium might indeed be higher than some other common structural materials, such as steel, a simplistic comparison based solely on weight can be misleading. The true cost-effectiveness of magnesium becomes significantly more apparent when considering its exceptionally low density. For a given volume or functional requirement, a magnesium component will be significantly lighter than a comparable component made from a denser material. This lower density translates directly into the need for less raw material to achieve the same structural performance or part volume, potentially offsetting the higher per-kilogram cost.

Furthermore, the economic advantages of using magnesium extend beyond material costs. The lightweight nature of magnesium components can lead to significant downstream cost savings. In transportation industries, lighter vehicles and aircraft consume less fuel and produce fewer emissions over their operational lifespan, resulting in substantial long-term cost benefits and environmental

advantages. **Magnesium's excellent machinability, requiring less cutting force and allowing for higher cutting speeds, translates into faster cycle times, reduced tool wear, and improved surface finishes, all of which contribute to lower manufacturing costs.** The potential for part consolidation, where multiple components made from heavier materials can be integrated into a single, lighter magnesium casting or die-casting, can also streamline assembly processes and reduce overall manufacturing complexity and cost.

Moreover, the efficient recyclability of magnesium and its alloys adds to its economic and environmental value proposition. The ability to recover and reuse magnesium at the end of a product's life cycle reduces the demand for virgin material and minimizes waste. Additionally, the longer die life often experienced in magnesium die-casting compared to aluminum can further contribute to cost savings in high-volume production. **Since 2023, the price of magnesium has shown a trend towards stabilization,** providing manufacturers with greater predictability for budgeting and long-term planning, further enhancing its attractiveness as a cost-effective material choice.

Therefore, a comprehensive understanding of magnesium's cost-effectiveness must go beyond a simple per-kilogram comparison and encompass its low density, manufacturing efficiencies, recyclability, and the overall value it adds to the final product.

Difficulties in Machining: Debunking the Myth of Intractability

Another persistent myth that often discourages manufacturers from utilizing magnesium alloys is the perception that they are difficult to machine and finish. Contrary to this belief, magnesium is widely recognized for its exceptional machinability, often outperforming many other common engineering metals in terms of processing efficiency. Magnesium's inherent material properties allow for machining with lower cutting forces and at significantly higher cutting speeds (feed rates) compared to materials like aluminum or steel. This translates directly into faster cycle times in machining operations, leading to increased production throughput and reduced manufacturing costs. Furthermore, the lower cutting forces involved in

machining magnesium contribute to reduced tool wear, extending the lifespan of cutting tools and further enhancing cost-effectiveness. Magnesium also tends to produce excellent surface finishes after machining, often reducing the need for secondary finishing operations.

While it is true that the chips and powder generated during the machining of magnesium are highly susceptible to ignition due to their fine particulate nature and high surface area, the risks associated with this characteristic are well-understood and readily manageable with the implementation of appropriate safety measures. Standard machining equipment can be safely used for processing magnesium, provided that good housekeeping practices are strictly adhered to, particularly in the effective management and regular removal of chips and dust. The installation of fire detection and suppression systems in machining areas where magnesium is processed provides an additional layer of safety. Crucially, proper training of machine operators on the specific handling procedures and potential hazards associated with magnesium machining is essential for mitigating risks and ensuring a safe working environment.

In terms of finishing, magnesium surfaces readily accept a wide variety of coatings and finishes, including paints, powder coatings, anodizing, and chemical conversion coatings. This versatility in surface treatment allows for enhanced aesthetics, improved corrosion resistance, and increased wear resistance, making magnesium a preferred material for a diverse range of applications where both functional performance and surface appearance are critical. The ease with which magnesium can be machined and finished further underscores its viability as a practical and cost-effective material choice for many manufacturing applications.

Conclusion: Embracing the Realities of Modern Magnesium Alloys

In conclusion, while some historical challenges and inherent properties of magnesium have contributed to the myths surrounding its use in manufacturing, significant advancements in alloy development, processing techniques, and surface treatments have made modern magnesium alloys a highly viable and advantageous material. By understanding the facts and dispelling these outdated misconceptions,

manufacturers can fully leverage the benefits of magnesium for creating lighter, more efficient, and innovative products.

Despite past limitations leading to misconceptions, modern magnesium alloys are vastly improved due to significant R&D. Advanced alloys now boast enhanced strength, ductility, corrosion resistance, and high-temperature creep performance. Sophisticated processing techniques allow for complex geometries and tight tolerances. Effective

surface treatments have dramatically improved corrosion behavior. Consequently, magnesium offers a compelling combination of properties, including exceptional strength-to-weight ratio, excellent damping capacity, high thermal conductivity, and recyclability, making it an increasingly attractive alternative to aluminum and steel for lighter, more energy-efficient, and innovative products. Understanding these advancements is crucial for engineers and designers to leverage magnesium's potential.



26th April 2025 at GDCTECH OFFICE
Prabhat Road, Pune



Opportunities in Tariff War



The Coffee Talk Show was very interesting. The speaker, CA Manoj Lalwani, shared valuable information about U.S. tariffs and the opportunities for India. The session was highly interactive, and all participants were happy with the knowledge and insights they received. It was so engaging that it continued until 9 PM, whereas it usually finishes by 8 PM. Here is the takeaway from the Coffee Talk Presidential orders behind tariff actions .president have the power to impose tariffs to protect US Industries and enforce fair trade
Section 301 (Trade Act 1974): President can impose tariffs to counter unfair trade practices.



Proclamation 9705 (Steel) & 9704 (Aluminum) – March 2018: Tariffs imposed under Section 232 (Trade Expansion Act 1962) for national security reasons. India has a big opportunity to sign Free Trade Agreements (FTAs) to get lower tariffs, boost exports, and benefit from the China Plus One strategy as USA companies seek alternatives to China. America has a huge debt of \$37 trillion, which is 125% of its GDP. Ideally, debt should be between 25–60% of GDP. Because of this high debt and a big trade deficit (buying more than selling), the U.S. President is imposing tariffs to protect local industries and reduce imports. Because the debt is alarmingly high and America is importing much more than it is exporting (trade deficit), the U.S. economy is under pressure. To correct this, the U.S. President is imposing tariffs on imported goods. Thank you, Jitendra Lakhotia, for inviting the speaker and organizing the Coffee Talk.





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Employees Retention Strategies

31st May 2025 (Saturday) at **Mahratta Chamber of Commerce, Industries and Agriculture (MCCIA)**
Bhosari, Pune - 411026 Maharashtra, INDIA.

Panel discussion: HR professionals from top 5 die casting companies in Pune



Panellists & Moderator left to right:

Mahesh Gade

HR Manager
VICTORY PRECISIONS PVT. LTD.

Ravindrakumar Ghogare

Sr General Manager Head HR & Admin
POOJA CASTINGS PVT LTD

Jitendra Parekh

Divisional Manager – HR & Admin,
AAKAR FOUNDRY PVT. LTD.

Moderator

Jitendra Lakhotia

CEO
AAKAR FOUNDRY PVT. LTD.

Manoj Yadav

Business HR Head
UNO MINDA ALLOY WHEEL

Vivek Pattarkine

CONSULTANT



What is the most hot issue in the die casting today? It will be. How can I retain my employees...

There is no better way to work on this issue than to come together and interact. GDCTECH'S invitation was quickly accepted by all the companies to participate on the panel and as audience. It was very evident from the amazing attendance we had.

The coffee talk started with GDCTECH'S president Shri Anil Kulkarni expressing his views about employee retention Strategies and how today's panel can add valuable inputs.

The discussion ranged from how to handle GenZ, to retaining blue collar as well as white collar jobs. Excellent ideas came up like celebrating small successes, giving clarity to the employee regarding growth, salary etc., joining hands with hybrid work culture, two way commitment- from employees as well as from the company, innovative ideas of performance tracking & upskilling, quick and fast in-person meetings to address grievances, and many more.

The whole recording of this coffee-TALK session is available on GDCTECH'S YouTube channel. It will be very interesting to watch it as a group in your company.

Next coffee talk will be on 28th of June, as usual on 4th Saturday of the month. See you then.

TRAINING PROGRAMME



Two days training programme on Melting/Holding Furnaces, Fuels, Crucible Care, Molten Metal Treatment & Quality Assessment at Pune held on 22-23 April 2025. Faculties are R. V. Apshankar and Shrikant Bhat. Quiz competition was also held on 22 April at the same venue. Four teams participated and the winner was **GABRIEL INDIA LIMITED**.

QUIZ COMPETITIONS



Quiz Competition at Ahmedabad On 19 May 2025. Four teams participated and the winner was **HONDA MOTORCYCLE & SCOOTER INDIA PVT. LTD.**



Quiz Competition Gurgaon, Haryana on 22 May 2025. Five teams participated and the winner was **MAXOP ENGINEERING CO. PVT. LTD.**

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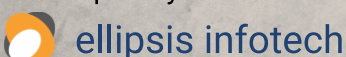
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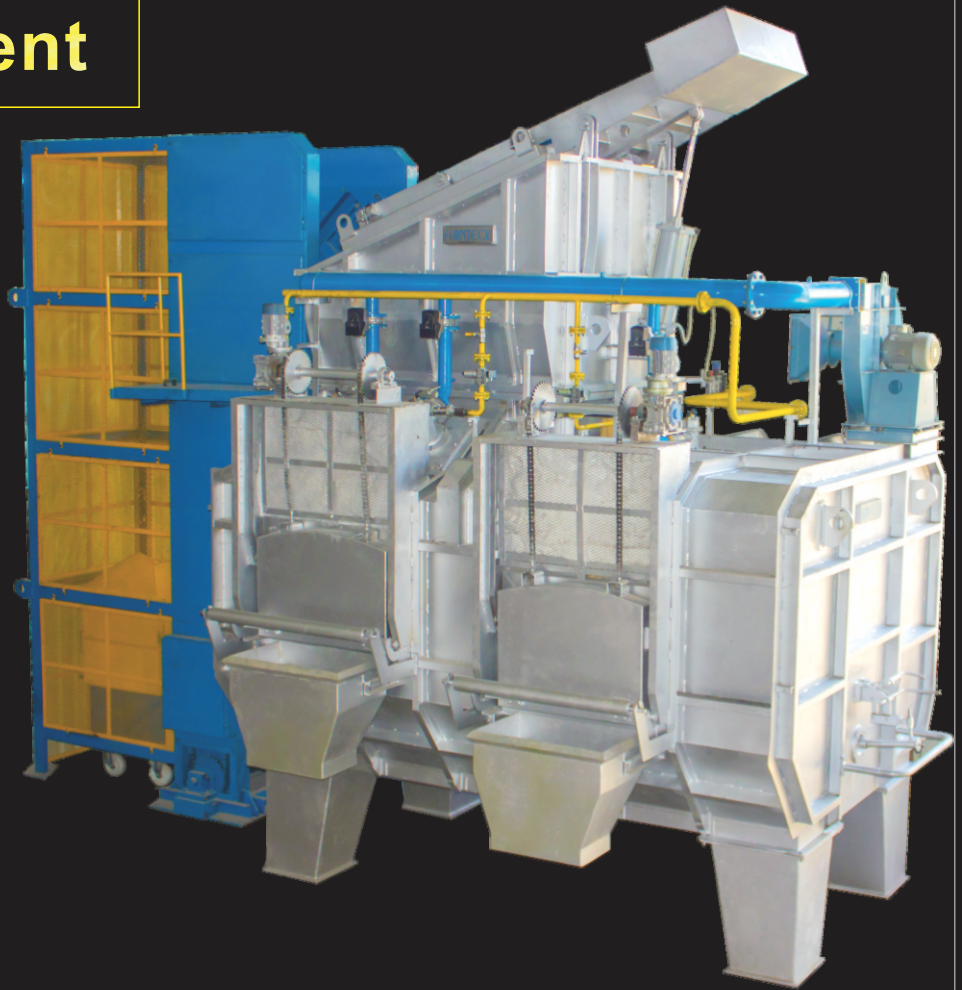
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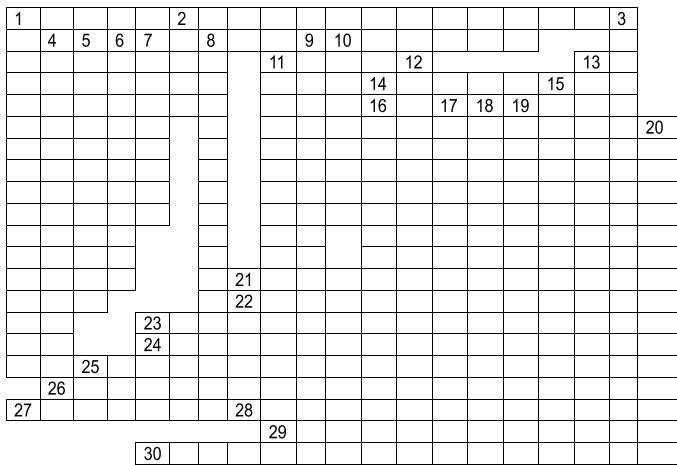
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Crossword #9 The Cue: One must know

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



Clues Along:

- 1) The temperature at which a phase transformation occurs in metals.
- 4) The density of a material, including the volume of pores and voids in the structure, as opposed to the true density, which excludes these spaces.
- 14) A semi-finished product of metal, larger than a billet, used for further processing in rolling mills
- 21) A substance having metallic properties and composed of two or more chemical elements of which at least one is metal
- 22) A semi-finished product of metal, usually square or rectangular cross-section that is used as raw material for further processing in rolling mills to make bars, rods, and wires
- 23) The ability of a material to return to its original shape after the applied stress (such as stretching or compression) is removed
- 24) The manner in which molten metal progressively fills the cavity
- 25) Any die casting alloy whose major constituent is obtained from recycled scrap metal
- 26) The combined action of cyclic stresses and a corrosive environment that leads to premature failure of material
- 27) The mass of a substance per unit volume, typically measures in gram per cubic centimeter (gm/cm³) for metals
- 28) A measure of a material's resistance to uniform compression. It is defined as the ratio of pressure applied to the relative decrease in volume
- 29) The wearing away of a surface by mechanical action involving contact with hard particles
- 30) Absolute viscosity divided by density

Clues Across:

- 1) A process in which molten metal is continuously solidified into a long strand or slab for further processing, used in steel or aluminium production
- 2) The slow, continuous deformation of a material under constant stress over time, typically occurring at high temperatures.
- 3) A system in which chemical energy is converted into electrical energy or vice versa, often relevant in the context of corrosion or electroplating process
- 4) The ability of a material to resist being worn away by friction or rubbing
- 5) Separation of a new phase from solid or liquid solution usually with changing conditions of temperature, pressure or both
- 6) Any die casting alloy whose major constituent has been refined directly from ore, not recycled scrap metal
- 7) A heat treatment process used to soften metal, improve ductility and relieve internal stresses by heating and then slow cooling
- 8) An alloy having the composition indicated by eutectic point on an equilibrium diagram
- 9) The change in shape or size of a material under influence of applied forces, which can be elastic (reversible) or plastic (permanent)
- 10) A manufacturing process in which metal is forced through a die to create objects of fixed cross-sectional profile, commonly used for producing long products like pipes and rods
- 11) The coolest part in electrically heated melting furnace, but the hottest part in conventional induction melting furnace
- 12) The maximum stress that a material can withstand without undergoing plastic deformation
- 13) The ability of a material containing a crack or defect to resist further crack propagation, a key measure of a material's resistance to brittle fracture
- 15) A type of fracture characterized by extensive plastic deformation before breaking, typically seen in materials that have high ductility
- 16) The ability of a material to undergo significant plastic deformation before failure, allowing it to be drawn into thin wires or to be stretched
- 17) The relative ease with which an alloy can be cast
- 18) Any place in the die casting part where the thickness is significantly greater than (at least double) that of the majority of the casting
- 19) Any die casting alloy that has been assigned as ASTM designation
- 20) A practice of transferring molten metal from an alloying plant directly to the die casting plant.

ALUMINIUM FURNACES

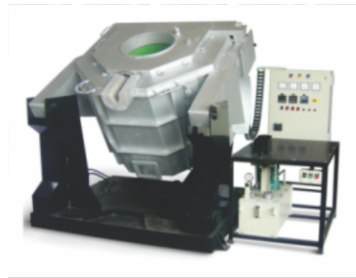


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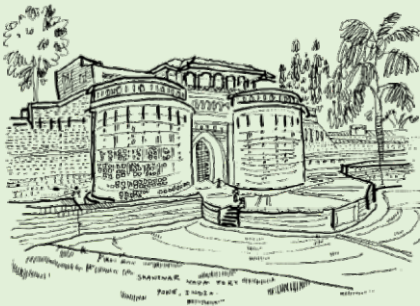
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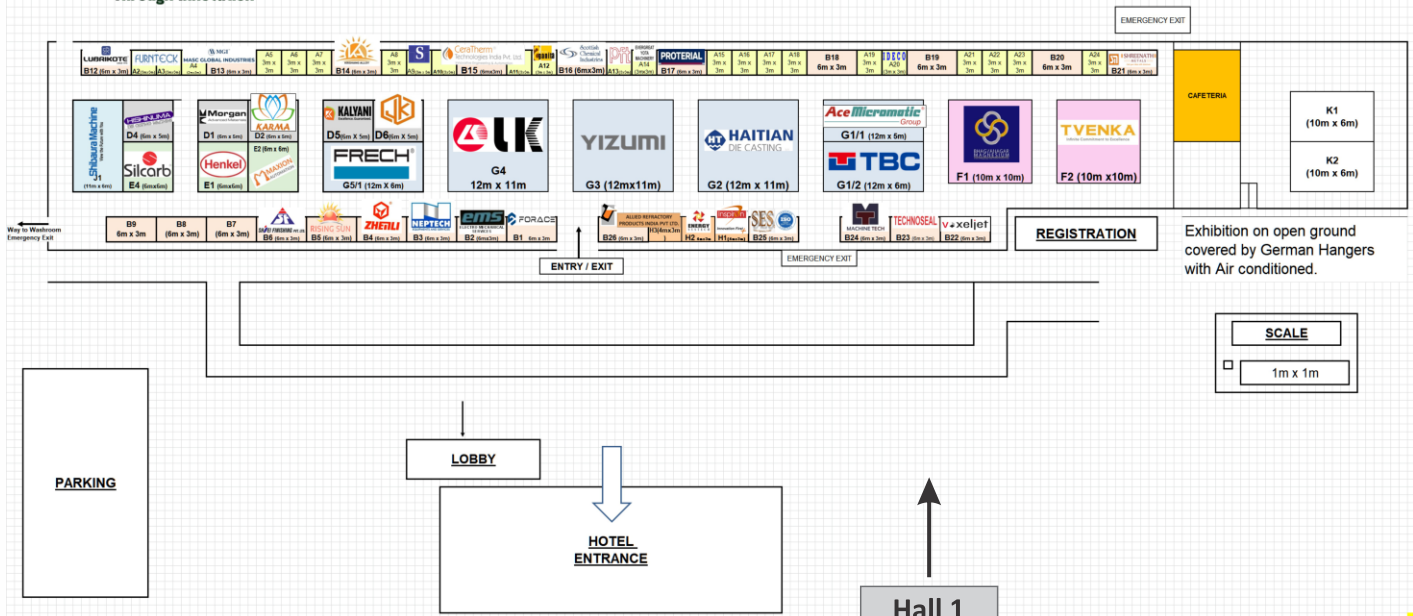
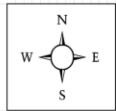
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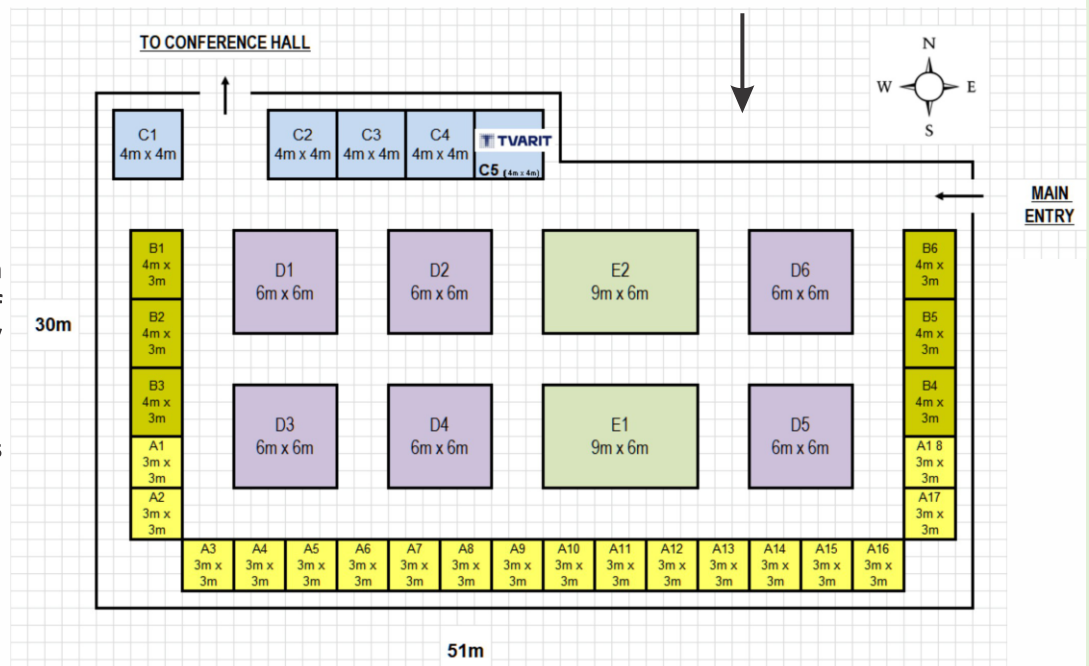
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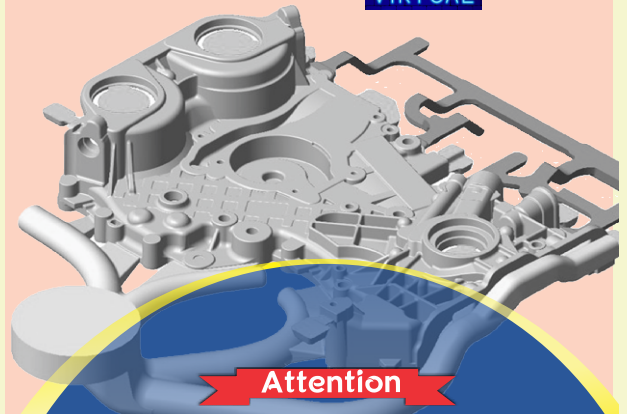


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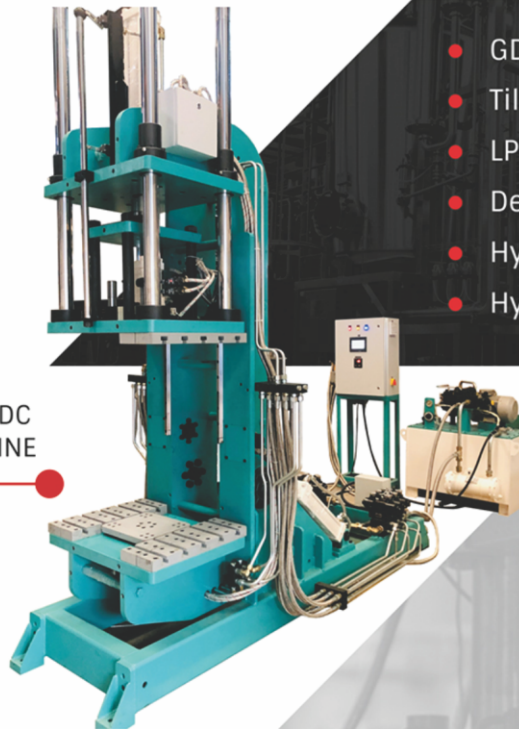


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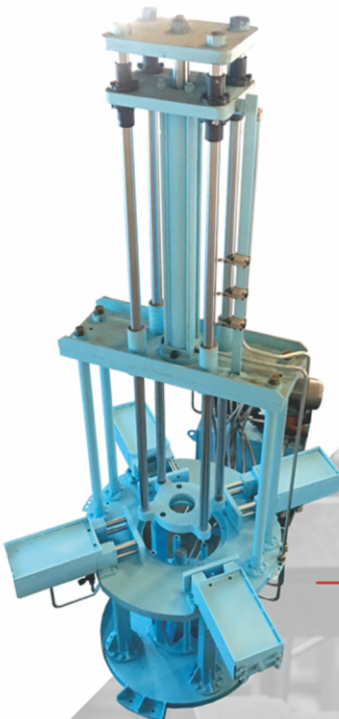
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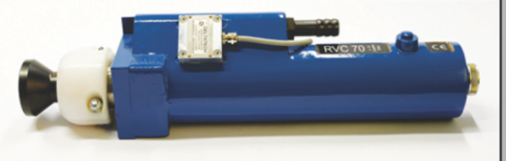


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Up to 100% higher service life than established market benchmarks



Significant increase in production output per crucible due to higher service life

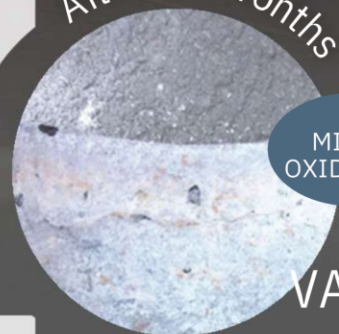


Reduction in crucible changeovers by up to 50%



Total cost savings up to 40%

After 12 Months



MINOR
OXIDATION

VALuStar™

After 6 Months



OXIDISED

Benchmarked
CIP* - Crucible

Save effort, time and money, learn more about VALuStar™ and get your offer today

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Based on the actual field trials

*Cold isostatically pressed