2023: Issue 4 - November

Institute of Refractories Engineers

# The Refractories Engineer

PRODUCTS
APPLICATIONS
TECHNOLOGY
NEWS ROUND-UP

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## Real world problems – PRACTICAL SOLUTIONS

### IRE Annual Conference and Training Day 2023

**SAVE THE DATE: 15 -16 November 2023**

*The Mowbray, Kelham Island, Sheffield, UK*

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**Don't miss the THE REFRACTORIES ENGINEER 2024: Issue 1 - March**


Institute of Refractories Engineers

The Refractories Engineer


*Lynn Postle, FICME*

# From the editor

*It's encouraging to read in this issue of The Refractories Engineer about the many collaborative projects to help decarbonise industrial processes and strive for a greener and thus cleaner industrial sector. It's noticeable that "the talk" has ceased and "the walk" has commenced.*

Our President highlights 'relevance' (see opposite), as an important aspect of IRE membership. Indeed, the dictionary meaning of relevant – *appropriate to the current time, period, or circumstances; of contemporary interest* – can be true of society's commitment to net zero. For a company/organisation to be relevant it must also be sustainable and thus reflect the current time. The pages of this issue are packed with positive news about the efforts of our industry and the sectors we serve to make amends for our carbon intensive past. As part of an industrial supply chain, it is vital that we respond to the net zero challenge, which will inevitably involve joined up thinking and collaborative working. What better place to "tap into" collaborative working than a professional institute that is the beating heart of an industry?

There has never been a more "relevant" time to engage with like-minded people and there has never been a more critical time for manufacturing and engineering to come together to find solutions for a world that is looking to "clean up its act"!

I urge you to get involved – your contributions will help determine the future of your institute and your industry today and for future generations.

To view the draft minutes of the 62nd AGM of the Institute of Refractories Engineers visit:
https://www.ireng.org/62nd-annual-general-meeting-of-the-institute-of-refractories-engineers-2/

*Front cover image: Glass industry production – Shutterstock*


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**Advertisement Sales:**
Email: advertising@ireng.org

**Editorial Content:**
Editor, Lynn Postle
Email: editor@ireng.org

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# Message from the PRESIDENT

*I would like to start my first column in the journal to firstly thank the members of the institute for voting me into this position. I intend to continue the good work of former Presidents in trying to make the institute more relevant and valuable to its members. While on council, I have supported both my immediate predecessors, Katy Moss and Phil Walls, in this aim and will look forward to continuing this. I have a tough act to follow, they were both enthusiastic and energetic.*

Growing the membership is fundamental to the future of the institute and balancing the books.

It is a cliché, but the aim to make the IRE a successful organisation is to make it more engaging and relevant; people working in refractories should see value in being part of the IRE, and refractories companies should want their employees to be members. We have been witnessing a steady decline in the membership in the UK and sometimes it can seem as we are a little beleaguered as another company closes; but it remains strong in Australia and is slowly growing in other countries. I do see the future growth in membership to be more international and I will push the more international nature of the institute.

As I write this, the upcoming UK conference and training days – which last year proved to be a great success thanks to the hard work of many but notably Katy Moss and Georgina Nicol – are not far from my mind. This year we will be looking to learn from the feedback and make it even more of a success. We are also encouraged by the offering and quality of papers we have received – normally conference day is a struggle with frantic searches to fill space, this year we have had to turn papers down.

To meet our goals in making the IRE more relevant, the training day remains an essential component. This year marks the end of an era. Sam Franklin has done a grand job at this and become something of a legend but, with him stepping down, we have taken the decision to bring in Michael Walton from the Australasia branch to organise the session; he has run successful training sessions for many years and can be credited with being a major part in the success of the Australasia branch – I am sure we will learn much from each other.

And finally, having a technical background, it should be no surprise but I would like a more technical focus, hopefully this can be reflected in the journal.

I hope to see as many of you as possible at this year's conference and training days.

***Mike Lamkin***
***President***
***Institute of Refractories Engineers***

# Introducing our new President

*We are delighted that Mike Lamkin of Capital Refractories has been appointed President of the Institute of Refractories Engineers. Mike Lamkin is a long-time member of the IRE and says: "it is a great honour and humbling experience" to be appointed President.*

After graduating with a degree in materials science from the University of Leeds, Lamkin made the decision to continue his learning there, undertaking a PhD followed by post-doctoral work in the field of non-oxide technical ceramics.

Upon leaving university, his first role was at Carborundum as a development engineer, which, after their acquisition by Saint-Gobain, changed to the position of technical manager. After working there for eight years, he joined Capital Refractories for technical functions. Now, 23 years later, he remains at Capital as the technical manager with responsibility for foundry products.

He has been an active member of the IRE for over twenty years and a member of Council for the last five years. He was appointed to the role of Treasurer two years ago and has been focussed on the institute's finances, helping to return the institute back to a financially sustainable organisation – something that should be achieved shortly.

With over thirty years' experience in the refractories industry, he has seen many changes, both from organisations and technology. He reflects: "I see it as my duty and role to pass on my knowledge and assist the younger generations in an increasingly challenging environment, not just here in the UK, but across the industry as a whole.

"I passionately believe in the role of the IRE, and as President, I am looking to continue the good work of my predecessors in promoting the institute and delivering even greater value to its members and the wider industry."

# Update from Australasia

*Dear Colleagues and Friends*
*Since our previous editorial, there has been much activity in Australasia and beyond. The management committee has been meeting frequently. This is part of our mission to deliver the world's best refractory knowledge, services and products that increase the productivity and safety of our end users.*

The core of our discussions has been updating the website and considering the next refractory conference.

Updates to our website will be carried out by our Vice President Don Merrit and in future editorials we will document the changes that make it an informative and valuable place to visit. We want to make it far more interactive and provide useful engagement to all visitors and members of the IRE; a place to share and gain information as well as easily connect with like-minded individuals in our industry.

The other focal point of our meetings are discussions on the next *Australasia Conference*.

Though our Australasian conferences are conducted on a biennial basis, our next conference will be scheduled for December 2024, which is little more than a year away from the time of writing. Time has flown since our last meeting at Sydney Airport Rydges Hotel. Given the success of the March 2023 conference, we anticipate a minimum of eighty members will attend the next event.

Hence, we are going to the next level and are excited to have selected one of the premier 5-star hotels in Sydney CBD that will also include a tour of the local steel works and refractory department. It will be the premier refractory meeting throughout the Asia Pacific.

As a result, the title of our next conference will be *'Refractory Innovations in the Asia Pacific'*. It will be marketed broadly and we believe we can approach a record attendance with a diverse range of papers submitted.

In terms of content, there is a hive of activity locally that could fill such a conference, including the following decarbonisation projects of: BlueScope Steel $1bn investment in steelmaking, New Zealand Steel $300m investment in EAF and Liberty Steel moving to DRI EAF route at Whyalla.

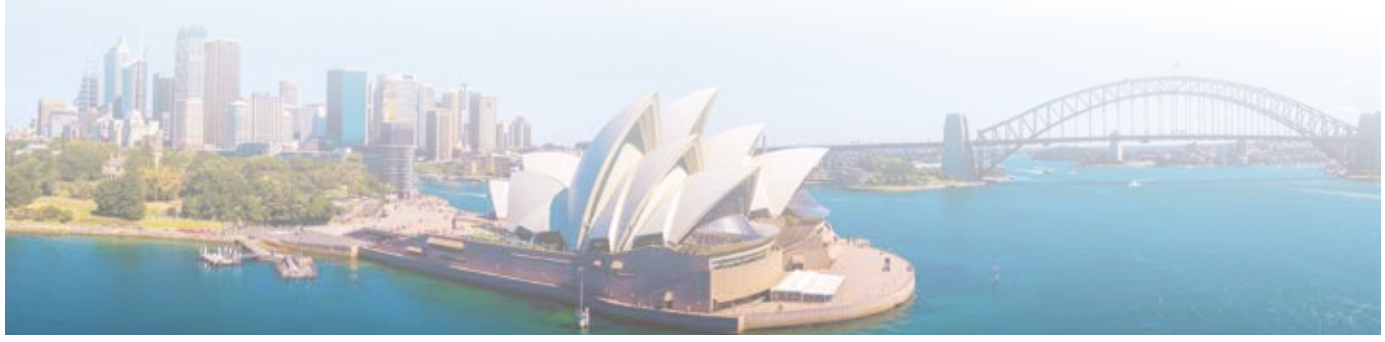
Then on the non-ferrous front we have multibillion dollar investments by Albermarle and Tanqi Lithium in lithium refining and Lynas Rare Earth spending $500m on a local refining project. This is just scratching the surface.

Manufacturing in Australasia may not be declining but it is evolving into local downstream value adding projects that are focussed on decarbonisation. It is particularly refreshing that our conference and website covers both the ferrous and non-ferrous sectors.


Beyond Australasia, we want to hear what is happening elsewhere and how we can contribute for mutual prosperity.

The future in our region is quite exciting, and we as the refractory committee will do our best to support our manufacturers to optimise their productivity and continue such investments.

***Mario Taddeo** MI Ref Eng*
***President, IRE Australasia***



# Honorary Membership

*We are pleased to announce that IRE Honorary Memberships have been bestowed on Sam Franklin and Paul Bottomley.*

Over the years, Sam Franklin has delivered countless training days for the IRE without charge. He has helped to keep the IRE engaging and has passed on a great deal of knowledge to members and fellow engineers.

Paul Bottomley was Chairman of the IRE for many years and dedicated a vast amount of time and energy to keep the institute alive and relevant and he specifically maintained this during the years when support in general was low. His dedication is undoubtedly one of the main reasons the IRE exists today.

We thank them both for the commitment they have shown the IRE and the wider industry.

The intention is to present the awards at the *IRE Annual Conference* in Sheffield (UK) in November.

*Sam Franklin*

*Paul Bottomley*

# Events Diary

*Upcoming events to be added as dates in your diary*

8-10 November 2023
**World Steel Dynamics (WSD) European Steel Conference 2023**
Venue: Melia Milano, Milan (Italy)
*Contact: www.worldsteeldynamics.com*

15-16 November 2023
**IRE Annual Conference and Training Day**
*'Real world problems – practical solutions'*
Venue: The Mowbray, Kelham Island, Sheffield (UK)
*Contact: secretary@ireng.org*

23-24 April 2024
**Ceramitec 2024**
Venue: Messe Munchen Exhibition Center, Munchen (Germany)
*Contact: www.ceramitec.com*

14-19 July 2024
**International Congress on Ceramics**
Hotel Bonaventure, Montreal (Canada)
*Contact: www.ceramics.org/event*

8-10 October 2024
**Aluminium 2024**
Venue: Exhibition Centre, Dusseldorf (Germany)
*Contact: www.aluminium-exhibition.com*

25-30 October 2024
**75th World Foundry Congress**
Venue: Deyang (China)
*Contact: www.75wfc.com*

# Membership Renewals

Membership of the Institute of Refractories Engineers offers a wealth of benefits and highlights a commitment to YOUR industry.

Remaining loyal to the Institute of Refractories Engineers shows to the wider industry that you and your company are proud of the heritage and professionalism of your leading sector organisation.

Members benefits include:

- A copy of the journal *The Refractories Engineer*, mailed direct to your door.
- Access to meetings and social media groups enabling networking opportunities with our refractories' community.
- The opportunity to submit papers for publication by the Institute.
- An IRE Membership Certificate to display in your premises.
- Discounted rates for meetings and other functions.

Make sure you don't miss out on all the latest refractory news and exciting improvements from the Institute of Refractories Engineers. Renew your membership today, or sign up by sending an email to secretary@ireng.org

Institute of Refractories Engineers

# CORPORATE PARTNERS

*The IRE thanks the following Corporate Partners for their support:*

## Bronze

Almatis, CHB South Africa, Dalmia GSB GmbH, Elkem, Robert Lickley Refractories Ltd, Setic Refractories Ltd, Trent Refractories Ltd, Velco GMbH

## Silver

Imerys Aluminates Ltd,
LKAB Minerals Ltd,
Mayerton Refractories Ltd,
Mineral Tech

## Gold

Calderys,
Capital Refractories Ltd
StudWeldoPro-UK Group

A corporate partner package is a reflection of an organisation's commitment to the refractories industry and the professional institute that represents the industry. The IRE is appreciative of the support of our corporate partners and is delighted to be working with them for the benefit of the whole sector.

*For more information on corporate partner packages refer to page 36.*


# 2023 UK Training - Castables - 50 Shades of Grey. How to not mess it up

## 16 November 2023 starting at 8.30am
## Venue: The Mowbray, Sheffield

Online attendance is available. Please email secretary@ireng.org if you wish to attend online. Lunch will be included for those attending in person.

### Training Programme – Castables 50 Shades of Grey. How to not mess it up.

| | |
|---|---|
| 8.30am | Welcome, Coffee etc. |
| 9.00am | Opening address. Safety, venue requirements. by Mike Lamkin (IRE) |
| 9.15am | Introduction: *'What are Refractories?'* by Mike Walton (IRE) |
| 9.45am | *'Raw materials for Castables'* by Ash Stevenson (Capital) |
| 10.30am | Morning tea |
| 11.00am | *'How to make a Castable 1'* by David Bell |
| 11.30am | *'How to make a Castable 2'* by David Bell |
| 12.00pm | General discussion |
| 12.30pm | Lunch |
| 1.00pm | *'Castable refractory commissioning to avoid explosions!'* by Mike Walton |
| 1.30pm | *'What are "failures", and how are they caused?'* by Mike Walton |
| 2.00pm | Coffee Break |
| 2.30pm | *'Some issues with anchor metallurgy'* by Mike Walton |
| 3.00pm | *'Use of API936 for QC/QA: a guide to good practice'* by Mike Walton |
| 3.30pm | Discussion Forum |
| 4.00pm | ML/MW - Closing remarks |

Discounts are available via our Corporate Packages. Click the link to sign up now. The IRE is also holding a UK Conference day (see opposite) on Wednesday 15 November 2023 with more information available here. Book your place below or email secretary@ireng.org

- Dinner is 7.00pm to 11.00pm on 15 November 2023 (the evening before the training day)
- Guest speaker: Sebastian Klaus - Almatis - *'ECO-TAB - a new alumina aggregate for steel ladle lining'*
- Entertainment: An evening of seasonal feasting and networking with the Sheffield String Ensemble playing some classics from recent decades.

### Standard Pricing (members discount available)

- UK Conference Day – £120.00 – Click here to Register https://www.ireng.org/register/2023-uk-conference-day/
- UK Training Day – £100.00 – Click here to Register https://www.ireng.org/register/2023-uk-training-day/
- UK Dinner Event – £99.00 – Click here to Register https://www.ireng.org/register/2023-uk-dinner-event/
- UK Conference & Dinner – £160.00 – Click here to Register https://www.ireng.org/register/2023-uk-conference-dinner/
- UK Training & Dinner – £140.00 – Click here to Register https://www.ireng.org/register/2023-uk-training-dinner/
- UK Conference & Training – £200.00 – Click here to Register https://www.ireng.org/register/2023-uk-conference-training/
- UK Conference, Training & Dinner – £250.00 – Click here to Register https://www.ireng.org/register/2023-uk-conference-

Corporate Package holders receive discounts on these prices as per the following (excluding the student rate).

- Bronze 10 per cent
- Silver 12.5 per cent
- Gold 15 per cent


# Real world problems – PRACTICAL SOLUTIONS

## Institute of Refractories Engineers

## Annual Conference and Training Day 2023

## 15 -16 November 2023

***The Mowbray, 118 Mowbray St, Neepsend, Sheffield S3 8EN, UK***

IRE's 2023 conference on 15 November 2023 in Sheffield (UK) offers the chance to come together to listen to industry experts impart their knowledge and is an ideal networking opportunity. A full day of technical presentations and a workshop will be supported by the chance to unwind at a sociable dinner in the evening. Following this a training day will be held on 16 November which will offer more in-depth information on: raw materials and their properties; castables formulation and properties.

Delegates can attend a selection or all of the events and attendance pricing is offered accordingly.

**Conference details:** Online attendance is available. Please email secretary@ireng.org if you wish to attend online. Lunch will be included for those attending in person.

**Dinner:** 7pm-11pm

**Dress Code:** Smart/Business Casual (no jeans or trainers).

**Special Guest Speaker:** Sebastian Klaus - Almatis.

**Entertainment:** Sheffield String Ensemble.

### CONFERENCE TECHNICAL PROGRAMME – 15 November 2023

8.30am doors open (30 mins networking)
9.00am Welcome and Introduction

### First Session

9.05am *'Future needs for refractory minerals in hydrogen atmospheres'* by Chris Parr
9.35am *'Observation of material behaviour and characteristics within hydrogen atmospheres'* by MPI.

### Second Session

9.55am *'Next generation carbon filters – best of both worlds'* by Iain Andrews.

10.20am – Coffee break

### Third Session

10.45am *'From collapsing glass furnace regenerators to H2 combustion – how refractory permeability can save the day'* by Chris Windle
11.15am *'In-furnace thermal imaging for hot refractory inspection'* by Neil Simpson
11.40am *'A day in the life of a steel making ladle'* by Dave Bell

12.00pm – Lunch

### Fourth Session

1.00pm *'HSE and silica dust'* by Natalie Tinsley, HM Inspector of Health and Safety, Engagement and Policy Division – Manufacturing Sector, Stone, Brick, Concrete, Glass
1.30pm *'The role of the consultant in the modern refractories industry'* by Michael Walton
2.00pm *'Shocking bricks'* by Matthew Davies of TATA Steel UK, Port Talbot
2.30pm *'An enhanced fibre insulation in the face of escalating energy costs'* by Chris McMahon, Alkegen

3.00pm – Break

### Workshop

3.15pm *'Unlocking opportunities through collaboration'* – workshop hosted by TransFire

4.00pm – Networking

*Note: All speakers and titles are subject to change*

### Dinner

7.00pm to 11.00pm

# RHI Magnesita completes acquisition of REFRACTORIES COMPANIES

*RHI Magnesita has expanded its global network by completing the acquisition of Seven Refractories.*

Seven Refractories is a specialist supplier of alumina refractory mixes, serving customers in the iron and steel, cement, aluminium and non-ferrous metals industries, with a proven track record of consistent growth in these sectors. Alumina refractory mixes are expected to become increasingly important in the development of new low CO2 emitting manufacturing technologies within RHI Magnesita's key customer industries. With the acquisition, around 240 employees at three production sites in Slovenia, India and the US and at sales offices and service centres in Germany, Italy, the United Kingdom and Cyprus, are joining RHI Magnesita's global network. The acquired businesses of Seven Refractories recorded revenues of €105 million and profit before tax of €11.4 million in 2022.

On 20 July 2023, Stefan Borgas, chief executive officer RHI Magnesita and Erik Zobec, chief executive officer Seven Refractories, sealed the acquisition in an official ceremony at the Seven Refractories plant in Divaca, Slovenia, in the presence of Seven Refractories employees. Commenting on the acquisition, Stefan Borgas said: "Today we celebrate a milestone as RHI Magnesita completes the acquisition of Seven Refractories. The synergy of our expertise, innovation, and unwavering commitment to sustainability will empower us to deliver even more compelling solutions to meet the evolving needs of our customers. I am pleased to welcome the exceptional team from Seven Refractories to RHI Magnesita. With our collective knowledge and passion, we will develop advanced sustainability offerings and leverage cross-selling opportunities and supply chain optimisation potentials to set new benchmarks in the refractory industry as we continue to execute our strategy of growth through consolidation."

Erik Zobec added: "It is with great pride that we are joining RHI Magnesita. Only twelve years after the company was founded, this step is a strong confirmation of our achievements: our innovative product portfolio, our cutting-edge production technology, and our dedication to customer service. In addition, the global presence and capabilities of RHI Magnesita will enable us to provide an even larger product portfolio and enhanced services to our customers."

Together, RHI Magnesita and Seven Refractories will continue their strong commitment to sustainability to serve the growing needs of global industries by offering advanced technological solutions.

*RHI Magnesita has acquired P-D Refractories. The acquisition leads to a step change in RHI Magnesita's process industries business, in particular strengthening the company's market position in the glass and aluminium industries.*

RHI Magnesita, the leading global supplier of high-grade refractory products, systems and solutions, has completed the acquisition of the Germany, Czech Republic and Slovenia-based refractory businesses of the Preiss-Daimler Group (P-D Refractories). P-D Refractories is a producer of high quality alumina-based refractories for industrial applications in process industries, with a leading market position in the glass and aluminium sectors. The product portfolio of P-D Refractories ranges from high-alumina specialties to bauxite, andalusite, silica, fireclay or magnesite bricks. In 2022, P-D Refractories recorded revenues of €171 million.

The acquisition offers multiple growth opportunities, not least through enabling RHI Magnesita to offer a significantly expanded product and service portfolio to an extended customer base. Customers of P-D Refractories comprise a large range of customers in process industries, especially the glass and aluminium industries. While the production facilities of P-D Refractories are based in Europe, the company has a global market presence, with well established brands (e.g., Dr C Otto) and top-performing products for global customers.

Through the acquisition, four production facilities (in Germany and the Czech Republic) and two raw material mines (in the Czech Republic and Slovenia) are added to the global production network of RHI Magnesita. The company says the vertical integration of P-D Refractories "represents a unique advantage and weaves seamlessly into RHI Magnesita's existing production footprint in Europe." Substantial benefits are also expected through leveraging RHI Magnesita's leading position in the field of recycling by integrating the company's know-how into the operations of P-D Refractories. Additional considerable synergies are targeted through leveraging cross-selling opportunities, procurement efficiencies and streamlined logistics.

Commenting on the acquisition, Stefan Borgas, CEO RHI Magnesita, said: "The production capabilities and vertical integration of P-D Refractories, combined with RHI Magnesita's know-how and renowned R&D capabilities, will complement our product portfolio and enlarge our production footprint and sales channels on a global scale. This acquisition is our sixth transaction to close in the year to date and marks a major milestone for both companies in the process industries sector. Together we look forward to expanding our footprint and strengthening our market presence by offering high-grade refractory products and solutions to an enlarged customer base."

# New mixer investment at UK refractories company

*Trent Refractories has invested in a THT Teka mixer to "help revolutionise" how the company's products are manufactured.*

TEKA Turbine Mixers THT offers a unique mix-turbine mixing system for the highest-standard premium concrete products as well as for the most difficult mixing tasks. Turbine mixers are custom-built to the individual requirements and the specific mixing task. The drive power, the diameter of the mixing pan and the number of mix turbines are variable and specifically chosen for each single mixing task. The THT is ideally suited for face, fibre, foam, self-compacting-colour and ultra-high strength concrete. The turbine mixer is also optimally suited for the absolute smallest batch sizes and therefore extremely variable, which Trent Refractories says is "perfect" for them. Features and benefits include:

- Swing and throw effect to ensure optimal material flow and intensive mixing action.
- Ideal for the smallest batch sizes.
- Optimal energy insertion into the batch with various filling capacities.
- Minimal contamination inside the mixing zone.

ConSpare Ltd, Altida Ltd and Spavin Pallets Ltd were involved in the installation.

# Intocast acquires flow control expert EXUS Refractories

*Intocast AG, one of the world's leading specialists in refractory products, has acquired EXUS Refractories SpA, based in Avezzano, Italy. The completion of the transaction is still subject to obtaining the authorisations required by applicable law. The acquisition represents another important step in the corporate group's global expansion strategy and strengthens its position as a full-range supplier of refractory products.*

For over forty years, Intocast AG has been a global leader in shaped as well as unshaped refractory products, casting auxiliaries and metallurgical slag conditioners. With the acquisition of EXUS Refractories SpA, the company completes its portfolio in the casting solutions sector.

Through the acquisition Intocast will secure access to one of the most modern facilities of its kind, including an expert team with decades of experience. This expertise enables the company to achieve outstanding performance excellence in the field of flow control products and take the groups's entire casting solutions business to the next level.

Until now, Intocast had to rely on an external co-operation for isostatic products. Vertical integration now allows the company to exert control over development, production and availability of the products, realising the potential to significantly improve all performance parameters.

"Our casting solutions product portfolio is now complete. It is a game changer and allows us to elevate our performance contribution to our customers to a new level, enabling constant high-quality steel production with our products," summarises group CEO Matthias Normann. "In the future, our customers will benefit from product development tailored specifically to their needs, ensuring optimal performance and quality requirements for the casting process."

The central logistical connection of the facility in Italy also enables synergies with existing locations of the Intocast Group. This ensures efficient global transportation scheduling and flexible response to individual customer requests. As a result, Intocast can now comprehensively and quickly support its customers from trial stage to constant supply with its own products and services.

"By joining Intocast, our highly qualified EXUS team will benefit from global market access and the established structures of one of the leading companies in the refractory materials industry. As a result, I am confident that EXUS capability in terms of operational, human and financial resources will significantly improve," says EXUS's managing director Jorge Irusta.

Intocast AG is strongly committed to further expanding its growing position in the refractory industry and serving its global customer base through local service offices, high quality, and complete solutions.

*www.intocast.de*

# Calderys inaugurates its first Foundry Service Centre in Sweden

*Following the growing demand for outsourced refractory services in Sweden and as part of its customer-centric approach, Calderys has inaugurated a foundry service centre in Mariestad in the presence of major Swedish foundry customers, elected officials and local stakeholders.*

Mariestad is a strategic area for Calderys because of its proximity to many of the group's clients. The foundry service centre will enable Calderys to provide 'one stop shop' services to its Swedish and Scandinavian customers. It includes all the installation and equipment needed to improve flexibility and lead time. The company will be able to offer special solutions for customers' equipment such as prefabrication (or precast) for ladles, runners and coreless induction furnaces (CIF). Outsourcing these services will free up the availability of end-users' own equipment in production, and the centre's solutions will allow them to reduce their $CO_2$ emissions and improve the work ergonomics for installation.

Calderys will also offer full on-site installation of press pour furnaces and dry-out operations. Additionally, practical training on customers' sites will be proposed.

A dedicated team with a broad level of expertise, gathered from various sites across the group, has been formed to work at the centre.

Aurélien Cadars, senior vice president EMEA of Calderys, said: "Thanks to this new facility, we will be able to respond to our Nordic foundry customers' requests in a shorter time with tailor-made and turnkey solutions, including design, engineering, supervision and installation. I'm confident that this new set-up will strengthen our long-term partnership with our key Swedish and Scandinavian customers and help them improve the reliability of their operations. The local team played a key role in this project and I would like to thank them all for their dedication and support."

Harald Zender, Calderys foundry vice president for the EMEA region, added: "We wanted to have our tools, equipment and people closer to our Swedish customers to fulfil increasing demands more efficiently. Therefore, we have strategically positioned ourselves in a key foundry area, close to seventy per cent of our main clients. The new premises encompass a total surface of 1,500m², and there are also possibilities for future development of our business."

# Research to investigate hydrogen's impact on refractories

*Work is due to start on research examining the potential impact on industrial processes when using hydrogen as an alternative fuel source. The UK's Materials Processing Institute will partner with Trent Refractories and Kanthal to examine the potential impact on refractories of using hydrogen.*

More detailed information will be announced over the course of the project.

Speaking about the programme, Chris McDonald, chief executive of the Teesside (UK) headquartered Materials Processing Institute, said: "The results of this collaborative research programme could have far-reaching effects given the range of industries that depend on refractory solutions, including iron and steel, aluminium, glass, power generation, petrochemicals and chemicals, and cement. Hydrogen is widely used here at the institute, and it is crucial that we assess how it is used to help deliver long term solutions that shape and support the UK's transition to a low carbon economy."

Bob James, technical collaboration lead at the institute, added: "It's already proven that hydrogen is an alternative clean fuel source capable of powering the majority of industrial processes. However, research is essential to assess how hydrogen may impact on the processes themselves, including its effect on refractory lining systems, the corrosion of certain compositions, and accelerated wear."

Managing director of Trent Refractories Ltd and past president of IRE, Katy Moss, said: "We are very much looking forward to working with such dynamic partners. It means a lot to the team here at Trent Refractories, to be part of the solutions that enable our foundation industries not only to survive but to sustainably thrive."

R&D manager of Kanthal, Jesper Ejenstam, added: "Industry is entering a new age of decarbonisation with a mass shift towards electrification and the use of clean fuels such as hydrogen. Kanthal is proud to be part of the research that will ensure such innovations are industry ready."

*Contact: Materials Processing Institute, www.mpiuk.com*

# New website sets out ambition for a materially better world

*Lucideon has launched a new website as a platform for the stories behind the company's pioneering work in advanced materials.*

With a focus on explaining how Lucideon is making the world a materially better place, the website, designed by Stoke-on-Trent based digital marketing agency Plinkfizz and built by Pepper Digital, draws on a range of resources, including the expertise and insight of its international staff.

Richard Goodhead, Lucideon's chief marketing officer, said: "We wanted to showcase, through the use of stories, how we are striving to make the world a materially better place.

"We've put a strong focus on trying to inform in an engaging way, communicating the vast breadth of our capabilities in a way that is both easy to assimilate and navigate, and also offers an enjoyable experience for viewers."

Operating at the heart of the global, multi-billion-pound advanced materials sector, Lucideon specialises in materials science, offering consultancy backed up by proprietary technology platforms and a deep testing and characterisation capability, as well as offering colour standards, technology partnerships, and assurance. *www.lucideon.com*

# Production capacity expanded in Germany to meet electrification demand

*A growing demand for electrification within several industries like steel, solar and semiconductors has led to Kanthal expanding its production site in Walldorf, Germany. The aim of the investment is to capture the growth within electric industrial heating and drive operational improvements through increased automation.*

At the Walldorf site, Kanthal manufactures products such as Fibrothal® heating modules, flow heaters, metallic heating elements, and diffusion cassettes; all products enabling industries to make the green technology shift.

The investment includes expanding the current premises with 2,500m² manufacturing area through a lease agreement with a nearby facility, as well as new equipment and automation improvements, plus up to ten additional employees.

"The investment ensures that we can capture the growth in electrification of industrial heating, which will require a ramp-up of our operations globally. We expect a rapidly growing demand for our traditional heating solutions, but also for our newly developed high temperature process gas heaters that are currently being tested in a number of pilot projects," says Aaron Roy, president of business unit heating systems at Kanthal.

"This will benefit customers with better availability and faster delivery of products that will be key in achieving their sustainability goals. In addition, the expansion shows the local community that we are investing in Walldorf and offering new and attractive jobs."

The initiative started in May and is expected to be fully implemented in Q1 2024.

Kanthal is an Alleima company and a world-leading brand for products and services in industrial heating technology and resistance material. *www.kanthal.com*

*Picturd above: Fibrothal® heating modules are being produced in Kanthal's site in Walldorf*

# Multi-million-dollar project in Rotterdam aggregates operations

*A global leader in specialty alumina, has announced a major investment in its Rotterdam sintered aggregate operations. The multi-million dollar and multi-phase project for Almatis marks a significant milestone in the company's commitment to process improvement, efficiency, and enhanced customer satisfaction.*

The primary focus of the project is to bring increased flexibility to operations and facilitate a swift response to market fluctuations and evolving customer demands. Through the implementation of process improvements, design flexibility, and cutting-edge technologies, the company says the Rotterdam plant will be equipped with state-of-the-art infrastructure. These enhancements will enable Almatis to operate at peak efficiency, optimise resource utilisation, and deliver products that adhere to the highest quality standards.

Almatis anticipates the completion of this project in 2024.

"We are delighted to embark on this transformative journey to enhance our operations in Rotterdam," said Anil Sönmez, chief executive officer at Almatis. "This investment demonstrates our unwavering commitment to providing our customers with the highest quality specialty alumina products while also reinforcing our position as a trusted partner in the industry."

Almatis Operations in the Netherlands is in Botlek, Rotterdam. The company made its alumina footprint global in 1968 with the establishment of a tabular alumina plant in Rotterdam. In 1980, the Rotterdam facility was expanded with the addition of a cement plant. *www.almatis.com*

# Top score for excellent ESG reporting

*Elkem has received an 'A+' score in Position Green's analysis of ESG (environmental, social and governance) reporting for the one hundred largest companies on the Oslo Stock Exchange.*

The ESG100 analysis examines the degree to which the corporate ESG reporting of the one hundred largest listed companies in Sweden, Denmark and Norway (three hundred companies in total) provides valuable information for decision makers of both the financial and non-financial kind. The 'A+' score is only given to the top five per cent of companies in the analysis.

This year's ESG100 report marks the sixth edition and presents an analysis and review of how prepared the three hundred participating companies are for the introduction of the European Sustainability Reporting Standards (ESRS).

The ESG100 analysis is produced by ESG software and sustainability advisory firm Position Green. *www.positiongreen.com*

# Setting out sustainability strategy and goals to reduce environmental impacts

*ASK Chemicals Group, a global supplier of high-performance industrial resins and materials, has announced its sustainability strategy and targets. On the way to climate neutrality in 2050, ASK Chemicals will steadily reduce its greenhouse gas emissions, such as by decreasing its Scope 2 emissions by thirty per cent until 2030. As part of its sustainability strategy, the company is continuously working to improve its environmental footprint, for example by implementing closed water cycles. ASK Chemicals' sustainability strategy covers all three pillars of sustainability: environmental, social and corporate governance.*

In a true bottom-up approach, various departments appointed internal experts to spearhead the initiative and establish a sustainable strategy based on a thorough materiality analysis. This assessment identified the most significant positive and negative impacts the group could address to create an effective and achievable ESG roadmap. The strategy is receiving the full support of the ASK Chemicals Group's management: "We are happy and motivated to have achieved this important milestone – an important step forward to further strengthen ESG within our company," says Jens Müller, CTO at ASK Chemicals and responsible for ESG. "We will now transfer our strategy into the different regions as a holistic global approach, of course with adjustments to local challenges and consonant with cultural diversity."

The company's primary focus on sustainability is closely linked to efficiency, as efficient chemicals and materials make a significant contribution to reducing raw material inputs and emissions. This applies not only to ASK Chemical Group's internal manufacturing processes, but also to R&D and product development.


*The sustainability wheel shows the material topics of ASK Chemicals' ESG strategy*

"Our sustainability strategy demonstrates ASK's commitment to reducing its environmental impact and ensuring responsible business practices," says Frank Goede, CEO of ASK Chemicals Group. "I'm very proud to see that our efforts and achievements are creating a solid foundation and paving the road for a global sustainable strategy for ASK Chemicals Group going forward."

# Analysing carbon footprint of products

*Alleima has begun analysing its products' carbon footprints, from raw material to released product.*

In over one hundred years, Alleima has reused steel scrap in its production. With the use of electric arc furnaces there is a strong focus on reducing the carbon footprint through the whole organisation.

The company is now implementing life cycle assessment (LCA) that has become an increasingly important methodology in modern industry to quantify environmental impact and identify hotspots in a product's life cycle. LCA will measure and calculate the carbon footprint of both materials and products. With third party verified LCA data, Alleima will support customers to reduce their own environmental footprint, with providing accurate data.

"Alleima strives to be transparent and report their LCA results and sustainability efforts to strengthen trust among customers and stakeholders. The collaboration with customers and implementation of sustainable solutions will contribute to make greener choices for the industry. It will also ensure that the company can remain competitive and meet customer demands. Sustainability is of crucial importance for the society around us as well as for our customers and LCA will be important for businesses in the future", says Nicole Holmgren, LCA specialist at Alleima.

One key advantage of LCA is that it pinpoints areas within a product's lifecycle with the most significant environmental impact. With this information, Alleima can specifically target areas for improvement, and by that effectively reduce the product's carbon footprint. It is also possible to optimise the utilisation of resources, such as switching to materials with lower carbon footprints. Customers will be provided with third-party verified and precise data, which supports them on their own journeys to reduce environmental footprints.

Initially, Alleima will release LCA data for its rock drill steel products, supporting the sustainable shift in the mining industry. The next step involves expanding this approach across the entire production chain, verifying downstream products in the production flow. Each product will have a third-party verified carbon footprint added to the material certificate – like the information currently provided on recycled materials.

Alleima AB is a global manufacturer of high value-added products in advanced stainless steels and special alloys as well as solutions for industrial heating.
*www.alleima.com*

# Blastcrete Equipment appoints new business development manager

*Blastcrete Equipment LLC, a global leader in the manufacturing of concrete pumping, gunite and wet shotcrete equipment, has appointed Patrick Bridger as their new business development manager. Bridger will work with the Blastcrete team to support new and existing customers and help them find solutions for their specific concrete pumping and wet/dry process shotcrete applications.*

"Patrick is well-known in the shotcrete industry and has a unique understanding of what our customers face every day," said Tripp Farrell, Blastcrete Equipment LLC co-CEO. "We've worked in the same circles for many years, so it's exciting having him join our team and adding his experience to our business. Coming together gives us the opportunity to offer our customers decades of combined knowledge to help provide the best solutions coupled with industry-leading customer service."

Bridger, who lives in Allentown, Pennsylvania (USA), boasts more than 35 years of experience in the shotcrete industry. He most recently worked as the general manager and business development manager for another shotcrete equipment manufacturer where he worked to create and maintain relationships with customers in tunneling, mining, concrete repair and refractory installation industries.

In 1998, Bridger worked with other industry professionals to create the American Shotcrete Association (ASA). He remained an active member of the organisation for more than twelve years serving as ASA secretary, vice president and president. He helped develop the first shotcrete nozzleman certification program, which consists of a guidebook, training, written exam and performance exam for all industry professionals.

"My commitment through all these years has been to the customers. The customers make our business; and I strive to keep that in mind while I'm serving the community, whether that's through my current position or in my role as a member of the ASA," Bridger said.

Blastcrete Equipment, LLC has been manufacturing safe, reliable, and user-friendly solutions for the refractory and shotcrete industries for more than 73 years. With a complete product line consisting of concrete mixers, pumps, mixer/pumps and rotary gunite equipment, the company serves the commercial and residential construction, refractory and underground markets. *www.blastcrete.com*

# Expanding portfolio in construction chemicals

*Saint-Gobain has entered into a definitive agreement to acquire Adfil NV, a top international company specialised in fibres for concrete reinforcement.*

Operating globally in the construction industry thanks to a commercial presence in over sixty countries, Adfil employs around seventy people, operates two plants in Belgium and generated revenues of close to €40 million in 2022. In addition to Chryso and GCP's admixtures, Adfil's performance fibres contribute to the reduction of reinforced-concrete's $CO_2$ footprint, the improvement of lead times and productivity for construction projects, and an increased lifespan for concrete.

Adfil will be consolidated within the construction chemicals segment in high performance solutions.

Thanks to this acquisition, Saint-Gobain will be able to offer its clients an enlarged range of solutions including concrete admixtures and fibres accelerating the development of sustainable and high-performance concrete.

Closing of the transaction is subject to antitrust approvals and satisfaction of other customary closing conditions; it is expected by year-end 2023.

The acquisition of Adfil is in line with Saint-Gobain's 'Grow & Impact' strategy aiming to both strengthen the group's leadership and accelerate its growth by enriching its range of solutions for light and sustainable construction. *www.saint-gobain.com*

# Developing sustainable construction solutions

*Imerys has announced a partnership with VINCI Construction to develop sustainable construction Solutions in the form of low-carbon concrete.*

Low-carbon concrete is based on the formulation of a binder composed of different minerals to replace Portland cement. Imerys has two mineral solutions: metakaolin and calcium carbonate. "The partnership with VINCI Construction marks a major step forward in our commitment to sustainable development and the reduction of $CO_2$ emissions within the construction industry. Imerys holds the key products needed in France to produce low-carbon concrete, such as Argical metakaolin and calcium carbonate, as well as other innovative solutions for sustainable construction, which are also produced in France," said Jérôme de Lièvre, vice-president building and infrastructure Imerys.

This collaboration began two years ago in the research laboratories of Imerys and VINCI Construction and has given rise to a product designed for low-carbon concrete formulations used in construction called ARGICAL M1000C. By exploiting the reactivity of metakaolin produced by Imerys at Clérac in France, ARGICAL M1000C replaces traditional cement in concrete formulations. This innovation not only improves the density of concrete but also significantly reduces its carbon footprint.

The partnership between Imerys and VINCI Construction is now taking shape with the construction of the Nantes hospital. The successful implementation of this project will serve as a model for future sustainable construction projects.

"We are proud to report that on the Nantes University Hospital construction, our metakaolins are giving full satisfaction in the composition of low and very low carbon concretes. This is a material with a number of advantages that encourage us to develop this sector in France: the excellent performance of the mixes developed in collaboration with VINCI Construction's materials laboratories, the availability of this material in several regions of France, its strength at an early age, which makes it easier to use in winter, and the aesthetically pleasing colour it gives to concrete," says François Saucier, infrastructure project specification director, Imerys.

"The market for metakaolins for the construction industry is set to grow over the coming years as an essential alternative to blast furnace slag in the composition of low-carbon concrete. With its many locations in France and abroad, Imerys has the capacity to support VINCI Construction in its drive to make low-carbon concrete the norm on its worksites," says Bruno Paul-Dauphin, director of EXEGY low-carbon concrete solutions, VINCI Construction.

Building on this success, Imerys will also be working with VINCI Construction on a number of future projects. These collaborations demonstrate the growing recognition and adoption of low-carbon concrete solutions in major construction projects. *www.imerys.com*

# New Manufacturing Energy Toolkit to help SMEs slash energy costs

*The High Value Manufacturing (HVM) Catapult has launched its pilot Manufacturing Energy Toolkit nationwide to support UK manufacturing SMEs with their energy costs.*

As the winter sets in, the cost of energy will be a key concern for businesses of all shapes and sizes across the UK. With the *Manufacturing Energy Toolkit*, the HVM Catapult is opening its doors to help manufacturers make their processes more energy efficient, cutting their energy costs and greenhouse gas emissions while improving profitability.

The toolkit is a guided assessment or roadmapping process undertaken by HVM Catapult experts. The aim is to build a full understanding of an SME's energy usage and energy sources in production, as well as potential efficiency-boosting solutions.

HVM Catapult experts begin with a fully funded visit to an SME production site for an in-depth assessment of its energy mix and usage. Using technology from the pilot's supplier Pressac, the experts identify key energy inefficiencies in the production line and offer energy saving suggestions. HVM Catapult also analyses the greenhouse gas emissions of an SME's energy usage, providing data that can help build a stronger market position on sustainability.

In a regional pilot run by WMG, an HVM Catapult industry innovation centre based at the University of Warwick, the *Manufacturing Energy Toolkit* saved SMEs between twelve and 46 per cent of their energy costs. Manufacturers save on average 21 per cent of their energy costs, and in one notable case, HVM Catapult experts achieved a ninety per cent energy saving from a single machine.

Katherine Bennett CBE, CEO of the High Value Manufacturing Catapult, said: "SMEs are the backbone of the UK economy, but they often have to shoulder the greatest burden under external pressures like seasonal energy price rises. That's why the HVM Catapult is offering free support to help manufacturers become more efficient – both environmentally and financially.

"The *Manufacturing Energy Toolkit* will give SMEs the expert insights they need to make smarter, more sustainable choices in their factories and on their production lines. The results speak for themselves, with companies saving over twenty per cent of their energy costs on average.

"The HVM Catapult is ready to help manufacturers up and down the UK to save money and become greener with easily-adopted, cost-effective solutions."

Director of strategic accounts at Pressac, Mark Lawrance, said: "Pressac are pleased to be involved in this great initiative and firmly believe the use of our technology combined with the expertise of HVM Catapult will deliver tangible benefits. This is a great example of British technology supporting and strengthening British manufacturing in the global transition to the net zero economy."

*For more information visit: www.hvm.catapult.org.uk/manufacturing-energy-toolkit/*

# Manufacturing growth: building a competitive business environment

*Manufacturers are calling on the Chancellor to announce a major reform of the UK's uncompetitive business tax and regulatory environment in the forthcoming Autumn Statement to boost business investment planning.*

In *'Manufacturing Growth: Building a Competitive Business Environment,'* Make UK and RSM outline the daunting challenge to reform the UK regime of taxation and regulation, with almost half (44 per cent) of companies believing the current system is unfavourable and more than a quarter saying it is worse than China and other major competitors.

Reforms would look at measures, such as Business Rates, the research and development (R&D) tax credits, the Apprentice Levy and the Capital Allowances and Full Expensing system, and whether they are fit for an economy undergoing huge transformational change and in the need of long-term investment. *www.makeuk.org*

# Metals sector embraces new trading innovation

*One of the biggest innovations to boost the metals industry in more than fifty years has reported a promising first nine months.*

SteelBuy, an easy-to-use online marketplace where businesses can buy and sell metals quickly and securely, has recorded over three hundred transactions and £1m+ sales revenue since it was launched at the start of the year.

Users from across the UK are leveraging the technology to achieve faster and more efficient deals for their mild steel, stainless steel, and aluminium, with all the logistics and invoicing managed through the encrypted platform.

Sellers can post their material with product specifications, test certificates and price per tonne and these can be found by potential buyers within seconds. With listings taking just one minute to complete, it is estimated that 37 hours can be saved each week in the average purchasing and sales function.

Importantly, all transactions are anonymised so buyers and sellers do not know who the other party is, essential when sensitive data, such as prices and stockholding, must remain confidential.

"SteelBuy enables users to effortlessly digitalise their purchasing and sustainably modernise their business and this is just the start – there's so much unexplored potential in materials trading and distribution, through the power of digitalisation," said Terry Sargeant, CEO of SteelBuy.

"The metals sector is traditional by its very nature, yet just eight months after our launch and we have proven time and time again that we can reduce costs, boosts sales and speed up what can be an extremely time-consuming process."

SteelBuy was the original idea of Cameron Sargeant, who came up with the idea of selling material online whilst working in sales for thyssenkrupp.

Then 22 people were recruited for the new venture – a mix of software, marketing, sales and engineering experts, who all share a passion for harnessing the power of digitalisation in the metals industry.

Sargeant, who has been involved in the sector for more than forty years, added: "We've got producing mills, steel service centres, stockholders and even traders using our platform, with the average delivery time of metal, from listing to arriving at the buyer, at just three days.

"This is transformative for both parties. When it comes to buying steel and aluminium, deals often take too long to complete, with lead times traditionally excessive (up to twelve weeks for mill production) – we can reduce this by almost ninety per cent by matching supply and demand."

UK-based SteelBuy has ambitious plans to take its technology into the European marketplace, as well as rolling out new features that reflect user feedback to make the process even easier.

# Multi-million-dollar project for new steel mill in India

*ABB is partnering with SMS group in a multi-million-dollar project to supply all the medium-voltage (MV) motors and MV drives for a new hot strip mill at Hazira, in Gujarat. The new plant will produce around 5.5 million tons of steel strip per year.*

ABB is working in partnership with SMS group, a specialist in plant construction, mechanical and electric and automation engineering for the metals industry, to provide all the MV motors and MV drives for ArcelorMittal Nippon Steel's new hot strip mill in India. The scope also includes a large number of low voltage (LV) drives. The project at Hazira, an industrial hub in Gujarat, is part of a major expansion of the site, which is already India's fifth-largest producer of crude steel. When it becomes operational in 2025, the new mill will increase Hazira's production capacity by around 5.5 million tons per year.

The hot strip mill will roll thick slabs of cast steel into thin strip suitable for industrial customers. ABB is supplying and installing thirteen MV drives and sixteen large MV motors. These will form the drivetrain for the two key elements of the operation, the roughing mill and the finishing mill. The former receives steel slab at a temperature of around 1,240°C and makes the initial reduction in thickness. The steel will then go to the finishing mill, one of the largest of its kind, where it will be reduced to its final thickness. In addition to the MV equipment, ABB is also supplying fourteen LV multidrives line ups and 256 LV inverters to support auxiliary services.

The well-established direct torque control (DTC) technology embedded in ABB's drives will deliver a very fast and accurate response to any changes in the load on the motors during the rolling operations. This precision control will ensure the optimal quality of the finished steel product. The multidrives capability of the MV drives will be employed in some parts of the operation to control four motors in parallel, reducing the installation footprint and saving energy.

A major technical challenge for ABB has been the design of the gearless drive system for the roughing mill. This provides greater control over the process while reducing the number of moving parts for increased reliability. According to SMS group the expansion of the Hazira plant is a very high-profile project that will enable the future transfer of carbon-neutral steel technology, which is currently under development by ArcelorMittal Nippon Steel.

"This project for SMS group and ArcelorMittal Nippon Steel is a key reference for ABB in India's fast-growing metals sector. India is the second largest producer of crude steel in the world, with 120 million tons produced last year. ABB has a particular advantage as a supplier of both large MV motors and drives. Not only do these help to improve energy efficiency, performance and product quality, but we can also support clients with our specialised commissioning and installation services. For example, motors like the AMZ2000 we are deploying at Hazira are so big that they have to be assembled onsite with the stator and rotor delivered as separate lots," said Chris Poynter, division president for system drives, ABB Motion.

# Heavy clay ceramists together again at CERAMITEC

*The next ceramitec will be held from 9-12 April 2024, at the exhibition grounds Messe München in Munich, Germany. This leading international trade fair for the ceramics industry is already expected to attract a higher turnout than at the previous event.*

Re-registrations from the heavy clay ceramics sector – which was still somewhat weaker in 2022 – are particularly impressive, with renowned companies such as Tecnofiliere, Bongioanni, Händle, Refratechnik, Rieter, Equipceramic, VHV, Ceramica do Liz and Talleres Felipe Verdes taking part.

Numerous companies in other sectors will also be back in Munich next year. In addition to a reinvigorated participation from China, industry giants such as Kobayashi Industry Co Ltd, Röders GmbH and D3-AM have registered.

As usual, the joint stands are once again strong. France and China, for example, have planned a national participation. In addition, there will be a joint stand for young innovative companies from Germany with funding from the Federal Ministry of Economics and Climate Protection (BMWK) in Hall A6.

The newly created special show *'Smart Materials & Energy Hub'* will also be located in Hall A6. This will be organised in conjunction with the new nomenclature *'High Performance Materials'*, *'Composites'* and *'Solutions for Energy'*, which will be listed as exhibition segments for the first time at *ceramitec 2024*.

*An overview of all the companies registered is also available online in the exhibitor directory. https://ceramitec.com/en/munich/exhibitor-directory/exhibitors-brands/*

# Supporting the recovery of the Ukrainian steel industry

*The Ukrainian government and Primetals Technologies have signed a letter of intent (LOI) for rebuilding the Ukrainian steel industry.*

Collaboration aims to support the realisation of green iron and steel production projects. Focus is on the full green value chain: agglomeration, ironmaking, and steelmaking as well as the supply of raw materials – for example, hydrogen.

The platform for recovering the steel industry in Ukraine brings together major players in the iron and steel sphere to support the reconstruction. Even before the start of the war, there were plans for upgrading the Ukrainian steel industry. The country's geographical position will make it possible to feed European and global supply chains with low-carbon-emissions feedstock and steel products.

As a first step, Primetals Technologies will contribute to a feasibility study scheduled to complete in 2024.

"We are very pleased to support the Ukrainian government for the recovery of the Ukrainian steel industry," said Dr Alexander Fleischanderl, head of green steel and senior vice president at Primetals Technologies. "The steel plants in Ukraine have long played an important role on a European and a global level, and the iron and steel sector is central to Ukraine's economy. With the projected investments targeting the entire value chain, Ukraine is poised to become a global hub for green ironmaking and steelmaking."

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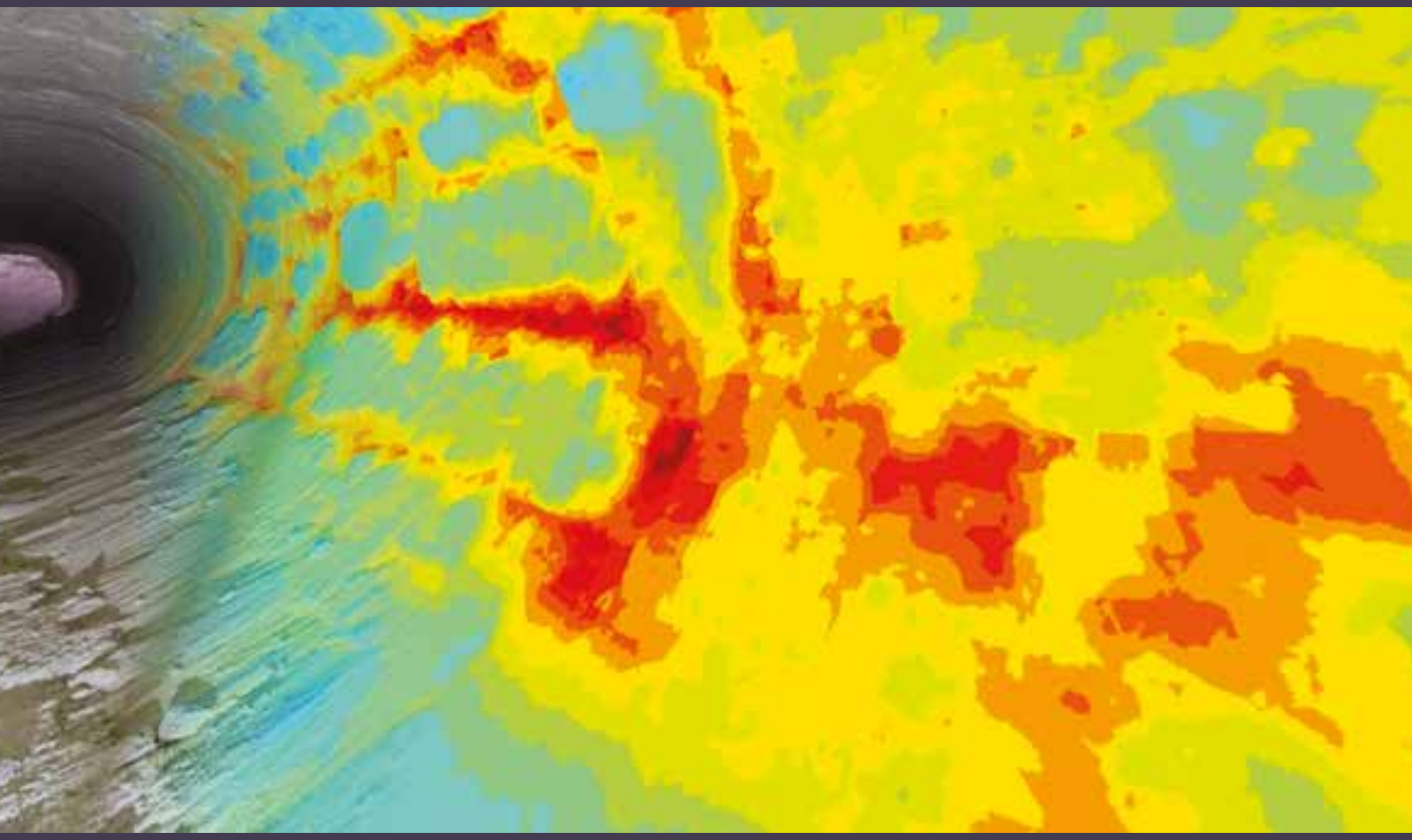


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# Record breaking ladle usage

*TATA Steel Port Talbot's Steel and Slab has been celebrating a record-breaking high, as the team achieved a remarkable 1,314 uses – or lives – from one of its new hot metal ladles. The usual expectation is around 1,100. The longevity is in part due to laser scanning – a revolutionary way to manage ladle life.*

Senior process specialist (refractories), Matthew Davies, explained: "This is a proud moment and a really significant achievement. We've continuously fine-tuned and improved our processes, pioneered new technologies, and managed our fleet of ladles brilliantly – with the end result being this record performance.

"It's taken a massive team effort to reach this point – Monolithic Refractories has been relentless in their drive to improve the way they brick a ladle; Minerals Technologies, supported by Harsco, utilised new methods and technologies to help increase the longevity of the ladle; and our own shift teams have excelled in their daily management of the asset.

"The game-changer for us has been laser scanning our hot metal ladles. We're really leading the way in this area, as we're one of only a handful of businesses in the world to carry out this practice."

Another major factor in extending the ladle's campaign was the introduction of an additional 'pit stop', where a protective veneer coating is applied to the ladle.

Refractory engineering department team leader, Mark Treharne, said: "We usually do these repairs every four hundred lives – so twice during a ladle campaign. This time, however, we carried out a third 'pit stop' shotcrete repair, which increased lives and productivity of the ladle, and saved money on refractories.

"We will continue to closely monitor our fleet of ladles and, provided everything goes well, we can look at introducing a fourth shotcrete repair, which would push us to new levels again."

"Using our specialist products, our role is to get these ladles to as many lives as possible in a safe manner," said Brandon Sailes, supervisor for Minerals Technologies.

"It's really rewarding when you see these record-breaking

results. If we can carry on pushing boundaries, there's no reason why we can't break the record again."

Davies summarised: "This is a key project for us. We've moved the target ambitiously from 1,100 lives in annual plan to 1,400. The groundwork to improve our management and maintenance systems, and embracing new technology like laser scanning, has really driven us forward.

"This is the new standard for us now and I'm sure we'll be getting 1,400-plus lives from our ladles consistently in the future."

# Report investigates impact of global conflict on the UK aluminium industry

*ALFED, the aluminium federation, has launched a new report examining the impact of the Russia/Ukraine war on the UK aluminium industry. Developed in partnership with CRU International Ltd, the document explores the short, medium and long-term consequences of government import sanctions, as well as suggesting alternative future options to maintain primary aluminium supply.*

With the objective of protecting the UK's thriving aluminium supply chain, supporting domestic production and minimising the effects of geopolitical issues, the report considers how removing Russian material from imports will directly impact UK businesses, as well as how changing market dynamics will likely hit future export demand.

The opportunities to increase uptake of recycled content and reduce the industry's carbon footprint are also covered in detail, alongside the wider supply chain issues presented by a weakening global forecast.

Tom Jones, chief executive officer of ALFED, explained: "Politically, and morally, pressure is increasing to ensure that all materials used within the UK have a clear path of origin and do not – in any way – support the Russian state. While Russian-sourced aluminium was only ever responsible for a small fraction of the import market, it is still important to consider the longer-term picture to ensure minimal disruption to the supply chain.

"Our latest report investigates the widespread impact of global conflict, identifying both challenges and opportunities, but also raising a number of highly pertinent questions. Firstly, what does a viable future solution for material sourcing look like? Secondly, what support should the UK government offer to support the wider agenda? And, finally, what are the immediate priorities that we – as an industry – must be tackling to maintain global competitiveness?

"It's fair to suggest that this report is a hugely important resource for any business involved in the UK aluminium supply chain and I'd implore industry professionals to take the time to read it in further detail."

*'Impacts to UK aluminium industry following Russia/Ukraine war' is available for members to download at www.alfed.org.uk where details of how to become a member of ALFED can also be found.*

# Waste sand could be saved from landfill with new form of concrete

*Up to one hundred million tonnes of waste foundry sand could be averted from landfill worldwide and used to make a new form of concrete, research shows.*

A study by Nottingham Trent University (NTU) shows that waste foundry sand – which is a by-product of the metal casting industry – could be used to make concrete that is suitable for withstanding lighter loads.

Led by professor Amin Al-Habaibeh, an expert in intelligent engineering systems, the research shows that with a substitution ratio of up to thirty per cent, recycled waste foundry sand-based concrete has a compression strength of up to 78 per cent of normal concrete.

This makes it strong enough to use in concrete products such as curb stones, garden slabs, cycling pavements and other lighter loadbearing concrete products.

Professor Al-Habaibeh, of the School of Architecture, Design and the Built Environment, said: "The results suggest that waste foundry sand can be used in the production of concrete products when a reduction in strength is not critical.

"This is good news for the environment, as it shows that the use of natural sand can be reduced, and therefore so can the need for sending waste foundry sand to landfill.

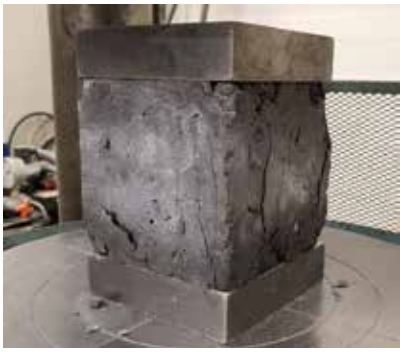
"By using waste foundry sand, the overall cost of concrete can be cut and $CO_2$ emissions can be reduced during transportation also."

Concrete is one of the fundamental materials in the construction industry. Typically, it is composed of sand, cement, aggregate and water.

The research by NTU shows that concrete made with waste foundry sand has a compression strength of around 23 newtons per square millimetre ($N/mm^2$).

PhD candidate Sirwan Faraj, a researcher in the School of Architecture, Design and the Built Environment at NTU, said: "In many sectors, recycling waste foundry sand, instead of using virgin materials, can result in a slight decrease in the technical performances of the final products.

"But this reduction could still be perfectly acceptable for a range of concrete products, depending on the needed application. It could be used effectively as a partial or complete replacement of standard sand in suitable quality mortars and concretes."



# European Foundry Industry Sentiment

*The European foundry industry continues to decline and face ongoing challenges, says the European foundry association CAEF.*

The concern remains following the latest results of the *European Foundry Industry Sentiment Indicator (FISI)*, which has recorded further decline, reinforcing the negative trend observed in August. With a decrease of 3.1 index points, the index now stands at 92.9, down from 96.0 in July.

The foundry industry is contending with a multitude of challenges, each contributing to the observed decline. Primarily, the notable reduction in overall production levels evident in recent months. Moreover, the scrap index, though showing a slight decrease in recent months, is still maintaining an elevated level. CAEF reports that "many foundries are greatly concerned" about the uncertainty surrounding the pricing and availability of raw materials and scrap in the coming months and years.

Furthermore, the possible effects of regulatory measures like the *Carbon Border Adjustment Mechanism (CBAM)* are not clear yet, adding to the worries of the industry. These combined factors collectively underscore the existing pressures on the foundry sector.

Meanwhile the *Business Climate Indicator (BCI)* stands at -0.36 index points in September. This marks the third consecutive time that the BCI is below the critical threshold of 0 index points. The prevailing conditions echo those experienced in August, with an evident feeling of uncertainty in the air. *www.caef.eu*

# China Steel Corporation (CSC) places large order to ramp up ELECTRICAL STEEL PRODUCTION

*China Steel Corporation (CSC) has signed a contract with Primetals Technologies for a pickling line and tandem cold mill upgrade at its plant in Kaohsiung, Taiwan. Startup is scheduled for September 2025. Primetals Technologies is responsible for the engineering and supply of equipment as well as advisory services for construction work and implementation.*

The existing plant is designed as a 4-stand tandem cold mill. The upgrade will revamp stands 2, 3, and 4 to incorporate the Hyper UCM technology and add an induction heater as well as a No.0 stand at the entry side of the existing mill. Recent similar revamping projects to enhance high grade electrical steel production was a key factor for CSC when choosing Primetals Technologies as its supplier.

Thanks to the upgrade, CSC's production capacity of electrical steel will be increased. Developed by Primetals Technologies, the Hyper UCM technology offers higher reduction rates and greater control options to determine the shape of advanced high strength steels (AHSS).

The technology is based on an optimised combination of roll diameters for work rolls, intermediate rolls, and backup rolls, and makes it possible to use work rolls with smaller diameters while maintaining a high reduction capability. Compared to the standard UC-Mill, it can roll materials of much higher strength into thinner strip while achieving higher levels of quality and productivity.

The largest integrated steel producer in Taiwan, CSC has an annual crude steel output of around ten million tons. The main products are steel plates, bars, wire rods, hot-rolled and cold-rolled coils, electrogalvanised coils, electrical steel coils, and hot-dip galvanised steel coils. About one third of the production is exported, mainly to China, Japan, and Southeast Asia.

# New collaboration to implement grid-friendly power supply system, the next evolution in electric steelmaking

*BGH Edelstahl in Siegen, Germany, has signed an agreement with Primetals Technologies to test the Active Power Feeder solution at its 50-ton electric arc furnace (EAF). Active Power Feeder is projected to be ready for operation under industrial production conditions at EAF plants by 2025.*

Active Power Feeder is a key technology for green electric steelmaking. It utilises a patented and proven medium voltage modular multilevel converter (MMC) technology in a ground-breaking power control system developed by experts at Primetals Technologies.

Thanks to Active Power Feeder, the power supply system will operate maintaining high power quality – at a level that meets the requirements of power utility companies. Additionally, the power supply system ensures low electrical losses and high furnace efficiency.

Another benefit of Active Power Feeder is its highly flexible installation options.

*Primetals Technologies and BGH Edelstahl will implement an Active Power Feeder system at the BGH plant in Siegen, Germany*

Whether a steel producer is looking at modernising an existing EAF or plans to implement a new meltshop, the solution will support the corresponding implementation procedures. Moreover, Active Power Feeder can also compensate for the extra strain put on the power supply system if an additional ladle furnace is introduced. All these features are realised without the need for an extra static VAR compensator (SVC) or a static synchronous compensator (STATCOM).

The collaboration between BGH Edelstahl and Primetals Technologies will demonstrate the environmental, technical, and commercial benefits of the technology under industrial production conditions for scrap melting with EAFs. BGH Edelstahl's furnace will be powered by an Active Power Feeder featuring a 3-phase indirect modular multilevel converter (MMC).

BGH is a specialty steel producer of stainless steels and special alloys of the highest quality. The wide product range also encompasses small batch sizes for special requests and requirements from BGH's end customers, such as precisely timed deliveries and highest quality standards. BGH is committed to reducing their Scope 1 and Scope 2 $CO_2$ emissions by 42 per cent by 2030 compared to the 2021 baseline. Also, the German steel producer aims to reduce Scope 3 emissions by 25 per cent during the same timeframe and compared with the same baseline.

## Clear strategy needed to guide investment

*The peak body representing the heavy construction materials industry in Australia, Cement, Concrete & Aggregates Australia (CCAA), says it welcomes the New South Wales Budget as another step in driving economic development through investment in construction, but reiterated calls for the development of a Heavy Construction Materials Strategy to support effective and affordable supply of these essential materials.*

CCAA advocates that a clear strategy, embracing the end-to-end supply chain (cement, aggregates, sand, and concrete) is needed to guide investment, minimise infrastructure and housing costs, and provide greater certainty for the community around future land use.

*For more detail visit: www.ccaa.com.au*

## The heterogeneity of STEEL DECARBONISATION pathways

*A new report considers the significance of decarbonising the stell sector to achieving climate goals.*

The iron and steel sector accounts for almost eight per cent of global emissions, making it one of the highest emitting industry sectors with around thirty per cent of industrial carbon emissions.

The report by the Organisation for Economic Co-operation and Development (OECD) *'The heterogeneity of steel decarbonisation pathways,'* has been prepared for the 2023 Japanese G7 presidency. It demonstrates that considering the heterogeneity of steel industries is vital for reaching climate goals and for a just and inclusive transition to a low-carbon future. The report maps the heterogeneity of global steel industries, highlighting the differences between them in key areas relevant to decarbonisation. Additionally, it examines how these differences should be considered when developing definitions for near-zero and low-emissions steel production, as well as emissions measurement methodologies and data collection frameworks.

The OECD is an international organisation that works to build better policies for better lives and is involved with establishing evidence-based international standards and finding solutions to a range of social, economic and environmental challenges.

*For more information on accessing the report visit: www.oecd.org*

# Steel and cement industry collaboration scales up ZERO-EMISSIONS TRIALS

*The first trial melt has been completed as part of the innovative Cement 2 Zero project, which aims to develop the world's first zero-emissions cement on an industrial scale.*

The collaborative project is seeking to advance the decarbonisation of the construction, cement and steel sectors by ensuring the process can be scaled up from laboratory to pilot plant.

Partner organisations span the supply chain, with the Materials Processing Institute, University of Cambridge, CELSA Steel UK, Atkins, Balfour Beatty, Day Aggregates and Tarmac each taking on a vital role in research, development, scaling and testing.

The trial melt was carried out using the Materials Processing Institute's seven tonne electric arc furnace (EAF) on its Teesside campus, which allowed team members to observe the process at a large scale.

Three further melts will be carried out using the Institute's EAF and once substantially trialled, developed and de-risked, a series of further industrial-scale trial melts will be held at CELSA's EAF in Cardiff.

*A trial melt underway at the Materials Processing Institute*

## Invention

The process was invented by Dr Cyrille Dunant at the University of Cambridge, who discovered that the chemical composition of used cement is virtually identical to that of the lime-flux used in conventional EAFs.

Cement 2 Zero uses recycled cement as the flux in the electric steel recycling process, the by-product of which when cooled and ground produces Portland cement clinker that can be blended to make 'zero-emissions' cement.

The pilot-scale EAF experiments use the flux material containing end of life recycled cement processed by Day Aggregates and international mining and minerals group LKAB, using a variety of scrap steel inputs provided by CELSA.

The EAF melts are being undertaken by the Materials Processing Institute in its Normanton plant, with the support of Phillip Cartlidge from CELSA. This allows the team to embed large-scale steel recycling expertise into the pilot-scale experiments.

The testing of melt procedures and slag cooling offers a greater understanding of creating an end-product that could be produced on an industrial scale, with Tarmac beginning the process of testing the new clinker to understand the grinding properties and assess key performance criteria of the new material.

Balfour Beatty and Atkins are defining testing protocols and detailing projects which will use the CEC material produced from these pilot-scale EAF trials once completed.

The Cement 2 Zero project secured £6.5m of government funding from UK Research and Innovation (UKRI) as part of the Transforming Foundation Industries challenge.

## Scaling up

Chris McDonald, chief executive officer at the Materials Processing Institute, said: "Until now the research has been at a laboratory scale. The institute having a seven-tonne EAF has enabled this next scale up phase of development and testing to take place.

"The preliminary findings are encouraging in terms of providing the project team with a much greater understanding of the process and how it can be improved and scaled.

"The initial trial melt is a critical part of the project and a huge step towards creating a more efficient, environmentally friendly, and resource conscious manufacturing process contributing to the decarbonisation of the construction, cement and steel sectors."

Carles Rovira, CEO at CELSA UK, added: "CELSA UK is pleased to be working with the Materials Processing Institute and the University of Cambridge on the Cement 2 Zero project.

"This phase of the project, with trials on the seven tonne electric arc furnace at the institute, has started to provide CELSA with relevant insight as to whether the lime replacement material will function for steel making at an industrial scale.

"We are committed to a net zero pathway and embracing the principles of a circular economy through our CELSA circular steel programme. Therefore, investing resources in this ground-breaking collaborative project is a great opportunity for all involved."


Image Source: Messe Dusseldorf/ ctillmann

# Breakthrough technologies by metallurgy plant builders

## Specialist author: Gerd Krause, Mediakonzept, Düsseldorf

### *Green metals – the climate-neutral hope*

*Be it steel, copper or aluminium – the metal industries boast the technologies needed to achieve climate targets. The pathways to the decarbonisation of their respective companies, however, are as manifold as are the challenges faced by steel mills and foundries, aluminium and copper smelters, forging and rolling mills. An overview of the technological spectrum of metal industries with their varying transformation paths to climate neutrality, and the breakthrough technologies by metallurgical plant builders was provided at 'The Bright World of Metals' in Düsseldorf (Germany) from 12-16 June 2023. Every four years, Messe Düsseldorf presents the metal industry champions with their future solutions at the world's biggest metallurgy trade fairs – at the trade fair quartet GIFA, METEC, THERMPROCESS and NEWCAST.*


A total of 63,300 visitors from 114 countries – 58 per cent being decision makers – travelled to the *Bright World of Metals – GIFA, METEC, THERMPROCESS* and *NEWCAST* – in Dusseldorf (Germany) in June 2023. Approximately 2,200 exhibitors from 56 countries presented the power of the metallurgical industry and showcased their equipment and services.

***The next event will be held in 2027. The exact dates will be announced in the coming months.***

***www.gifa.com, www.metec.com, www.thermprocess.com, www.newcast.com***

The metal industries maintain a key aspect of achieving the climate goals. The production of ferrous and non-ferrous metals accounts for some eight per cent of all greenhouse gases emitted globally. If the production of ores and other raw materials required for metal manufacturing are factored in, this figure amounts to around ten per cent.

### *The focal point of decarbonisation: the steel industry*

Special attention is attached to the steel industry here: with seven per cent of global $CO_2$ emissions being caused by iron and steel production alone. By comparison: global road transport accounts for around twelve per cent of all greenhouse gas emissions while approximately eleven per cent of all $CO_2$ emissions are caused by heating residential buildings the world over.

The good news: the technologies for decarbonisation do exist. The major metallurgical plant manufacturers

*Image Source: Messe Dusseldorf/ctillmann*

SMS group, Danieli and Primetals have developed a wide range of solutions ranging from digitalisation and improvement of energy efficiency to technologies for a gradual transition to hydrogen-based, carbon-free production methods. Specialists and suppliers such as Tenova, Küttner, ABP Induction, to name but three, complement the diverse line-up of decarbonisation technologies.

Steel producers pick up the innovations and rebuild their sites for climate-neutral production. Be it ArcelorMittal or Salzgitter, Saarstahl or Tata Steel, Thyssenkrupp or Voestalpine – the progressive enterprises have "switched to green". "Subject to the political framework, around fifty per cent of primary steel production could be changed over to the direct reduction process, and subject to the availability of sufficient quantities of hydrogen, more than twenty million tons of $CO_2$ could be saved every year," says Dr Martin Theuringer, managing director of Wirtschaftsvereinigung Stahl (German Steel Federation). Thanks to scrap-based electric steel production, he says, there is a low-$CO_2$ manufacturing process already available today, which could be "switched" to climate-neutral in downstream processing by using green power and green hydrogen. There is a demand for "green" steel. Steel users ranging from the automotive industry to white-goods manufacturers increasingly demand climate-neutral material.

The future belongs to climate-neutral steel production with green hydrogen and power from renewable energies. Nevertheless, the paths towards reducing $CO_2$-emissions in the global iron and steel industry are anything but uniform.

The individual steel production locations vary widely by production capacity, product portfolio, and plant configuration as well as the availability of renewable energy and hydrogen – and last not least, by the local political guidelines and frameworks.

The decarbonisation pathways can roughly be broken down by the terms $CO_2$-use (SCU, Smart Carbon Usage) and $CO_2$-avoidance (CDA, Carbon Direct Avoidance). SCU processes continue using carbon carriers for iron ore reduction and additionally rely on incremental innovations such as hydrogen injection for $CO_2$-reduction for the conventional blast-furnace basic oxygen converter route. They also include additional environmental protection measures, so-called end-of-pipe technologies such as CCS – Carbon Capture and Storage, and CCU – Carbon Capture and Usage. CDA processes include the scrap-based electric-arc furnace route and iron-ore based steel production using natural gas for direct reduction and in future hydrogen as a reduction agent, i.e. thereby completely avoiding the use of coal or coke used for reducing the iron ores.

In Europe the focus is clearly on replacing pig iron production in $CO_2$-intensive blast furnaces by direct reduction of iron ore in shaft furnaces using hydrogen. Largely, this transition is to be made gradually depending on the availability of (green) hydrogen. Initially, this is still done with natural gas for the most part, to which more hydrogen is added to remove the oxygen from the iron ore (reduction).

The solid iron sponge produced by direct reduction in shaft furnaces (DRI) can subsequently be processed into steel in electric arc furnaces in a hot or cold, lump or briquetted form. Another process route is fluidising DRI in electric smelters while maintaining the downstream process for steel production with the basic oxygen converter.

Decarbonisation technologies revolve around shaft furnaces for direct reduction. DRI is primarily produced from iron ore using the Midrex and Energiron technologies. Midrex has been owned by the Japanese firm KobeSteel since the 1980s; licensees of this technology include metallurgical plan builders SMS group and Primetals. Energiron is a technology developed by plant manufacturers Danieli and Tenova.

The third provider of direct reduction positioning itself in this field is Circored – the hydrogen-based fluid bed technology developed by the former Frankfurt-based Lurgi Metallurgie. Lurgi, which was taken over by the Finnish Outokumpu company in 2001, is called Metso Outotec today. The Circored process is a one hundred per cent hydrogen-based process for direct reduction of iron ore fines. A pilot plant commissioned in Trinidad in 1999 with an annual capacity of 500,000 tons had produced 300,000 tons of high-quality HBI in total. The pilot used hydrogen for process technology reasons, because the decarbonisation of steep production was not a requirement at that time. The decisive factor back then for Lurgi to develop the Circored process was a rising demand for a direct reduction process where iron ore fines could be used direct to cut production costs by eliminating a costly agglomeration step. Today, Metso can promote the Circored process as the first proven direct reduction technology for iron ore with hydrogen on an industrial scale. Primetals operates a pilot plant for hydrogen-based fine ore reduction at the voestalpine site in Linz, Austria. Hyfor direct reduction also does not require


*Image Source: Messe Dusseldorf/ctillmann*

agglomeration steps such as sintering or pelletising. The DRI is melted into liquid pig iron for the converter in the subsequent electric smelter (smelter from Primetals).

## $CO_2$-neutral steel mills

Once renewable energies and green hydrogen are available at competitive prices and in sufficient amounts, the combination of direct reduction and electric steel production is the ideal solution, says the leading metallurgical plant builder SMS group. Then even the construction of a new steel mill is considered, as proven by the greenfield project by H2GreenSteel at the Northern Swedish town of Boden. There the plant manufacturer erected the first $CO_2$-neutral steel mill commissioned by a group of investors. Its Midrex-based direct reduction is to be done exclusively with green hydrogen, steel production with an electric arc furnace powered by green electricity. All other downstream processes are also based on green power. The heat treatment of the steel will no longer be done in gas-fired furnaces as before but inductively with green power. This is a lighthouse project of the European steel industry for climate neutrality.

## METEC highlighted latest decarbonisation solutions

Most steel production sites are far from presenting the ideal conditions found in the far north of Sweden. However, there are also technologies for decarbonisation leading to climate-neutral steel production available for existing mills throughout the world. SMS promises to be the only provider of decarb solutions for all scenarios – a focal theme at *METEC*.

Steel producers are opting for different avenues. The German Salzgitter AG is gradually replacing blast furnaces and basic oxygen steel converters by direct reduction (with Energiron) and electric arc furnaces, including in-house wind power and green hydrogen generation.

Competitor Thyssenkrupp is opting for another avenue. At Europe's biggest steel production site in Duisburg, the goal is also climate-neutral steel production and here too pig iron production in a blast furnace is being replaced by direct reduction; but the processes for steel production via basic oxygen converter and all other downstream processes remain unchanged.

The SMS group is replacing its existing blast furnace infrastructure by a Midrex shaft furnace for direct reduction, combined with an innovative melting technology. While still hot, the direct reduced iron (DRI) is molten down in a so-called open bath furnace (OBF) energy-efficiently. Like the molten pig iron from a blast furnace, the DRI melt is fed into the basic oxygen converter and processed into steel.

With this hydrogen-operated direct reduction Thyssenkrupp wants to save more than 3.5 million tons of $CO_2$ per year – making the combination of hydrogen-based direct-reduction plant, plus smelter and basic oxygen converter in Duisburg the world's biggest decarbonisation project. For the SMS group this order, worth over €1.8 billion, is the biggest single order received in the history of the company. Commissioning is scheduled for 2026.

## For old and new: climate neutral with direct reduction and smelter

Plant manufacturer SMS promotes the configuration of direct reduction plant and smelter (comparable to a conventional submerged arc furnace (SAF)) for both existing plants and new steel mills. In existing steel mills this equipment combination replaces the blast furnaces and associated sintering, blast heater and coking plants.

*Image Source: Messe Dusseldorf/ ctillmann*

### Breakthrough technologies at GIFA, METEC, THERMPROCESS and NEWCAST

- Decarbonisation technologies with green power and hydrogen.
- Digitalisation, Artificial Intelligence, Industry 4.0.
- Heat recovery and energy recovery.
- Renewable energies in industry clusters.
- Circular economy: from classic metal recycling to recycling of lithium-ion batteries to multi-metal recycling of electrical scrap.

Initially, the direct reduction plant can be operated with natural gas as with Thyssenkrupp, and later the natural gas can be gradually replaced by rising percentages of hydrogen. By their accounts, the combination of a natural-gas based direct reduction plant with a smelter already reduces $CO_2$ emissions by approximately fifty per cent compared to the conventional blast-furnace route. This is achieved by the higher hydrogen content in natural gas. In a second step the natural gas can be gradually replaced by hydrogen as a reduction gas, which makes it possible to reduce $CO_2$ further, up to approximately 65 per cent.

SMS promises that the smelter is not sensitive to low-quality ore thanks to the reduction process. In addition to hot sponge iron, the charge material for the smelter can even contain up to ten per cent compressed or loose scrap. The OBF can also produce slag. Like blast-furnace slag, this slag can be granulated and used in the cement industry.

## Many ways – one goal

Due to the long investment cycles for metallurgical plants, a large part of future $CO_2$-savings must be obtained by refitting existing plants and even at locations where neither hydrogen nor natural gas are available in sufficient amounts. "Climate protection and efficiency must go hand in hand to produce real, long-term effects and successes," says Burkhard Dahmen, CEO of the SMS group. On other markets and in other regions such as India and China, he adds, alternatives for direct reduction are needed.

Steel production can be decarbonised by the introduction of innovative, integrated process solutions both in new plants and in existing ones. An important step towards climate neutrality here is the installation of additional infrastructure for using sustainable and renewable energy carriers such as hydrogen, biomass or green power. The 'last mile' towards climate-neutrality can then be covered by technologies for carbon capture and storage.

## Bridge technology 1: Blue Blast Furnace

Plant manufacturer SMS promises to reduce $CO_2$ emissions up to 28 per cent by refitting conventional blast furnaces with the so-called Blue Blast Furnace technology. The special characteristic of a 'blue' blast furnace is the production of syngas from the process gases of blast furnaces and coking plants and its injection into the bottom part of the blast furnace via a novel hot blast ring duct. The syngas is composed mainly of carbon monoxide and replaces coke as a reduction agent to reduce the iron charge in the shaft.

Syngas can be produced with a variety of technologies. A novel reforming process by the SMS subsidiary Paul Wurth is considered especially efficient here. During dry reforming of coke furnace gas, the cupola gas from the blast furnace and the coke furnace gas are reformed at high temperatures. Since this process only uses waste gas from the metallurgical plant and no longer requires any coal, it holds a high potential for reducing $CO_2$. Alongside, there are further technologies to produce syngas, e.g. the reforming of natural gas or coke furnace gas and tar.

## Bridge technology 2: blast furnace upgrade with EasyMelt at METEC

Based on the Blue Blast Furnace principle but going beyond its emission-reduction potential, SMS presented the so-called EasyMelt process (electric assisted syngas smelter) at *METEC*. This technology is an electrified direct reduction and melting process where the hot blast from the conventional blast-furnace process is replaced completely by such gases as coke gas, natural gas, hydrogen and ammonia with the help of a small quantity of coke. By SMS accounts, depending on the energy applied, this technology can save over sixty per cent emissions compared to the conventional route comprising blast furnace and basic oxygen converter. The remaining direct emissions can be further reduced by using CCS technologies or by using biomass or biogas as a base material. For refitting existing plants EasyMelt is less capital-intensive in comparison with all other technologies for low-$CO_2$ iron production. Unlike a direct-reduction only plant, EasyMelt can also process conventional iron ore and not only the scarce and expensive iron ore pellets or lump ore with high iron content, thereby promising economic plant operation. By company accounts, this technology represents an economic alternative to the direct reduction route. Similar to the Blue Blast Furnace technology, EasyMelt can be introduced gradually.

*Image Source: Messe Dusseldorf/ ctillmann*

## Foundries

The many small and medium-sized outfits in the foundry industry are also too heterogeneous for a one-fits-all strategy to produce effects. However, all companies share one concern – energy. "The crucial criterion for transformation is how the high energy needs of foundries can be satisfied in a climate-neutral way," says Prof Dr Ing A Bührig-Polaczek, head of the Foundry Institute at RWTH Aachen University. This, he adds, refers to the energy-intensive melting technology, on the one hand, and to the entire casting process including upstream suppliers and customers, on the other. "The technologies are largely available," says the foundry expert.

"For melting and holding, for example, established electric furnaces are available," says Polaczek. "But hydrogen as a new energy carrier is also technically fit for melting and holding. Although the technology for hydrogen is generally ready, there are still some development and optimisation efforts needed."

## GIFA and THERMPROCESS: fireworks display of technological innovations

New burner technologies for natural gas (for the time being) but hydrogen-ready formed one of the focal themes at the trade fairs *GIFA* and *THERMPROCESS*. What is already feasible here, was demonstrated by, amongst others, Küppers Solutions with its innovative dual-fuel recuperator burner iRecu. This development promises efficient heat recovery, maximum fuel flexibility and a $CO_2$-neutral production. This invention was awarded with the *Innovation Prize for Climate and Environment 2022* and before with the *Efficiency Prize NRW* 2019. It is also an excellent example of the strengths of new manufacturing technologies. The recuperation burner is the world's first burner manufactured by 3D printing in series – and could only be manufactured additively.

Other focal themes at the world-leading trade fairs *GIFA* and *THERMPROCESS* included innovations in induction melting units and thermal process technologies, as showcased by the major industrial furnace manufacturers ABP Induction and Otto Junker. They too focused on energy efficiency and savings. Induction technology is of particular importance in view of zero-carbon emitting induction smelters as a replacement for cupolas and gas-fired furnaces. Technologies and concepts for heat recovery and use of renewable power generated by additional PV systems are also key developments on the pathway to climate neutrality. In addition, induction furnaces are increasing in importance for metal recycling. One goal is the ability to use as much organically contaminated aluminium scrap as possible in foundries.

Foundries do make use of plant manufacturers' innovations. Overall, foundry expert Bühring-Polaczek can give the industry a "good report". He said: "Most companies are already active in the optimisation and transformation of their complete foundry process chain and can already point to first successes." An important way into the future, he adds, is the consistent digitalisation of processes along the lines of Industry 4.0. "It allows companies to gain a new, facts-based transparency for even complex processes, and, hence, considerable efficiency gains," the professor sums up.

This is why foundry expert Bührig-Polaczek appeals to policy makers: "While companies and foundries are advancing speedily, the reliable availability of climate-neutral energy remains an open issue to be solved on a political level. This delays or impedes many necessary innovations and investment."

*TATA Steel and the UK government jointly agree on a proposal for the largest investment in the UK steel industry for decades. The proposal lays the decarbonisation pathway towards globally competitive and sustainable steelmaking in Port Talbot, UK. The proposed investment would reduce the Port Talbot site's carbon emissions by around five million tonnes a year.*

# Largest investment in the UK STEEL INDUSTRY for decades

Commenting on the announcement, TATA Group chairman N Chandrasekaran said: "The agreement with the UK government is a defining moment for the future of the steel industry and indeed the industrial value chain in the UK. It has been an absolute pleasure to work with the His Majesty's Government and the Prime Minister Rt Hon Rishi Sunak in developing the proposed transition pathway for the future of sustainable steelmaking in the UK.

"The proposed investment will preserve significant employment and presents a great opportunity for the development of a green technology-based industrial ecosystem in South Wales. We look forward to working with our stakeholders on these proposals in a responsible manner."

TATA Steel's chief executive officer and managing director, T V Narendran said: "TATA Steel UK has been facing significant challenges due to the heavy-end facilities approaching their end of life. The proposed project, with one of the largest investments in the UK steel industry in recent decades, provides an opportunity for an optimal outcome for all stakeholders.

"We will undertake a meaningful consultation with the unions on the proposed transition pathway in the context of future risk and opportunities for TATA Steel UK. With the support of the UK government and dedicated efforts of the employees of TATA Steel UK along with all stakeholders, we will work to transform TATA Steel UK into a green, modern future ready business."

### *KEY POINTS*

1. TATA Steel and the UK government announce a joint agreement on a proposal to invest in state-of-the-art electric arc furnace steelmaking at the Port Talbot site with a capital cost of £1.25 billion inclusive of a grant from the UK government of up to £500 million, subject to relevant regulatory approvals, information and consultation processes, and the finalisation of detailed terms and conditions.
2. The project would bolster the UK's steel security and would be the first major step towards decarbonisation of the country's steel industry, reducing direct emissions by fifty million tonnes over a decade. With a high degree of circularity, it would leverage strategic, domestically available scrap steel and

*Hot rolled coil production at Port Talbot site*

promote local value addition within the UK.

3. The proposed project would ensure continuity of steelmaking in Port Talbot after the transition, and transform TATA Steel UK into a sustainable, capital-efficient and profitable business. With UK government support, the project has a robust investment case.
4. TATA Steel UK will soon commence consultation on the proposal and the transition period including potential deep restructuring for the carbon-intensive, unsustainable iron and steelmaking facilities at Port Talbot, where many of the existing 'heavy end' assets – such as blast furnaces and coke ovens –are reaching the end of their operational life.
5. The proposed project would also involve TATA Steel's balance sheet being restructured with potential elimination of the current cash losses in the UK operations and non-cash impairment of legacy investments.
6. During the transition period and project phase, TATA Steel UK would work intensively to ensure uninterrupted and reliable supply of products to fulfil customer and market commitments, including through the import of additional steel substrate from stable supply chains to feed its downstream units.
7. Further to the investment proposal, as part of TATA Steel's commitment to advance global research and innovation in materials science for a sustainable future, the company also announced its intention to invest approximately £20 million over four years to set up two additional Centres of Innovation and Technology in the UK at the Henry Royce Institute at Manchester (for advanced materials research) and at Imperial College London (for research in sustainable design and manufacturing).

- ❑ The TATA Steel Group has been named one of the most ethical companies in the world, and is among the top producing global steel companies with an annual crude steel capacity of 34 million tonnes.
- ❑ TATA Steel in the UK has the ambition to produce net-zero steel by 2045 at the latest, and to have reduced 30 per cent of its $CO_2$ emissions by 2030.
- ❑ It is the largest steelmaker in the UK with primary steelmaking at Port Talbot in South Wales supporting manufacturing and distribution operations at sites across Wales, England and Northern Ireland as well as Norway, Sweden, France and Germany. It also benefits from a network of international sales offices around the world.
- ❑ It employs more than 8,000 people and has an annual crude steel capacity of five million tonnes, supplying high-quality steel products to demanding markets, including construction and infrastructure, automotive, packaging and engineering.
- ❑ TATA Steel Group is one of the world's most geographically-diversified steel producers, with operations and a commercial presence across the world.
- ❑ The Group recorded a consolidated turnover of US $32.83bn in the financial year ending 31 March 2022.

*TATA Steel, Port Talbot site*

# Patented NEW RANGE OF REFRACTORY STAINLESS STEELS – more resistant to creep and thermal fatigue

***AZTERLAN, a private technology centre specialising in metallurgical R&D, based in the Basque region in northern Spain, has patented a new range of refractory stainless steels. HTSteels steels are a new family of super refractory steels whose chemical composition includes alloying elements not present in commercial refractory steels and a stabilisation heat treatment, which ensure mechanical properties at high temperatures from the moment the material is used, reducing its deformability and favouring the deceleration of crack growth in high temperature environments.***

Refractory stainless steels are commonly used in the manufacture of industrial equipment components subjected to high temperature stresses (400-1100ºC), in corrosive conditions and withstanding significant loads and wear. For this reason, they are present in applications such as structural components, radiation tubes and parts containers in heat treatment furnaces, used mainly in the sectors of production of rolled products and steel and alumInium castings. Its use also extends to beams, trays and rails in furnaces associated with metal or ceramic sintering in sectors such as powder metallurgy, microfusion and ceramics, structural and transport elements in hot stamping, mining or cement furnaces, etc.

The use of refractory steels is conditioned by two main factors: their useful life in service and the cost of the raw materials used in their manufacture. As explained by Fernando Santos, head of materials and special processes at AZTERLAN: "The useful life of these elements is critical, since their replacement in equipment that works continuously requires the complete stoppage of the manufacturing process, which represents significant losses of energy and productivity. In all cases, the rapid degradation of the components also supposes an important consumption of resources when it comes to the valuable and scarce alloys contained in them".

## FAILURE MODES

In this regard, the main failure modes of these components are linked to prolonged deformation (creep), crack propagation, thermal fatigue, wear and corrosion. For this reason, developing materials with higher creep properties, crack growth rate, thermal fatigue, and wear resistance, while maintaining a good level of corrosion resistance, is essential to avoid rapid degradation of these critical components. "The strategy that we have followed to achieve this objective has been oriented towards understanding the role of each chemical element in the microstructure of the material, as well as the process flow and its variables, as critical aspects to take into account in the final properties. The application of the methodology that we call SUMA (superior materials) has allowed us to interpret the microstructural mechanisms behind the high-temperature properties and select a defined range for each alloy element and its combined proportion. Following this line of work, we have developed a new family of 'super refractory' steels, which incorporates new alloying elements, adjusting others that used to be present in commercial refractory steels and a stabilising heat treatment to guarantee homogeneous and advantageous final properties from the start for use in service."

These new super refractory steels, called HTSteels and protected by patent, include in their chemical composition elements such as Mo, Nb and W, "which promote the precipitation of carbides, in such a way that they make it difficult for cracks to advance through the material/component." They also have tighter amounts of Ni and C "in such a way that we achieve good mechanical properties without affecting the good resistance to corrosion, which refractory steels already offer," says Santos.

## OPTIMAL INDUSTRIAL TRANSFER

To ensure the optimal industrial transfer of this material and its application in the production of parts on an industrial scale, the team has also developed a manufacturing process for these materials. This process, based on a conventional casting process to which some adjustments are incorporated, has as its main objectives: "to ensure sufficient homogenisation of the elements of the charge and to reduce inclusions and oxides in the material." However, the most innovative aspect, Santos confirms: "consists in the design and incorporation of a stabilisation heat treatment aforementioned, which actually comprises a homogeneous and ordered precipitate of secondary carbides throughout the matrix, thereby increasing the mechanical properties at high temperatures."

This new family of super refractory steels has been developed within the HiperMAT European project.

***www.azterlan.es***

# Technical Papers

*The readership of The Refractories Engineer is keen to hear about the latest technological advances and research being undertaken to help drive the industry forward. Therefore, we are happy to receive technical papers from interested parties for publication in The Refractories Engineer.*

All papers submitted must be original, written in English and have the approval of the author(s) prior to submission. They must either report original research work or be a detailed description of the latest technology or knowledge within a specific field related to the refractories industry.

Technical papers are required to be in a Microsoft Word format with any supporting imagery supplied as separate, high resolution jpeg files.

*Submissions should be sent to the editor: editor@ireng.org*

Institute of Refractories Engineers

# Breakthrough NextGen furnace to reduce carbon footprint of glass packaging


Image Source: Ardagh Group ©

*The breakthrough NextGen furnace, currently under construction at the Ardagh Glass Packaging (AGP) facility in Obernkirchen, Germany, is nearing completion. The furnace build, including all refractory brickwork, is complete and the installation of electrical and other ancillary services are now in the final stages.*

The hybrid NextGen furnace technology is designed to use eighty per cent renewable electricity and twenty per cent gas, leading to a significant reduction in $CO_2$ emissions – by as much as sixty per cent in the furnace – dramatically reducing the carbon footprint of glass packaging. It provides an important step in achieving the emissions target of Ardagh's 2030 sustainability strategy and is a key milestone in the company's journey towards decarbonisation.

This pioneering, large-scale hybrid electric furnace will be the first of its kind that can run predominantly on renewable electricity and a small amount of gas. It will use high levels of recycled glass cullet to produce up to 350 tonnes of glass bottles per day, initially in amber glass, with the capability of making other colours.

## Decarbonising the glass production process

Container glass production currently uses a mix of approximately ninety per cent gas and ten per cent electricity. By inverting this energy mix in favour of eighty per cent renewable electricity and twenty per cent gas, the new technology will dramatically reduce the carbon footprint of glass packaging.

Commenting on the furnace, Martin Petersson, CEO of AGP – Europe, said: "Decarbonisation is a key priority for our business and our customers. The NextGen furnace represents a significant investment in creating a sustainable future for glass packaging, and we intend to roll-out this and other low carbon solutions across other AGP facilities in the coming years. We are grateful for the grant support provided by BMWK[1] and KEI which is helping to realise the benefits of this new technology."

## Replacing traditional gas-powered furnaces with low-carbon furnaces

Ardagh is committed to decarbonising the glass production process over the longer term, by replacing traditional gas-powered furnaces with low-carbon furnaces, across all of the group's glass manufacturing operations globally.

Annelene Ikemann, sustainability director at AGP - Europe, explains: "AGP is a leading supplier of sustainable, infinitely recyclable glass packaging. Our NextGen furnace, in combination with our target to supply one hundred per cent renewable electricity to our facilities by 2030, is a positive step forward along our sustainability roadmap. In future phases of this project, AGP aims to replace the remaining gas with green hydrogen, which will further reduce greenhouse gas emissions. In subsequent steps on our sustainability journey, we will look at a wider range of alternative melting technologies as we decarbonise our other facilities."

## Delivering an exciting project

Jens Schaefer, operations director, Ardagh Glass Packaging - Germany, said: "We are delighted to see this ground-breaking furnace nearing completion. We are firmly on track to deliver commercial bottles produced in the NextGen furnace this year; the next step will be the furnace heat-up, followed by full glass production in Q4.

"I would like to thank all the AGP team, our suppliers and sub-contractors who have worked with such dedication and focus to deliver this exciting project."

*www.ardaghgroup.com*

1. *Bundesministerium fur Wirtschaft und Klimaschutz (Federal Ministry for Economic Affairs and Climate Action) and KEI: Kompetenzzentrum Klimaschutz in energieintensiven Industrien (Competence Centre on Climate Change Mitigation in Energy-Intensive Industries) has provided a grant to qualifying energy-intensive industries in Germany.*

*AGC and Saint-Gobain, worldwide flat glass manufacturers leading in sustainability, are collaborating on the design of a pilot breakthrough flat glass line that is expected to significantly reduce direct $CO_2$ emissions.*

# Partnering for the decarbonisation of flat glass manufacturing

*As part of this R&D project, AGC's patterned glass production line in Barevka, Czech Republic, will be entirely refurbished into a high performing and state-of-the-art line that targets to be fifty per cent electrified and fifty per cent fired by a combination of oxygen and gas. This is a technical breakthrough compared to current technology used in flat glass furnaces fired by natural gas. It will be the most sustainable flat glass line design contributing to both companies' paths towards carbon neutrality and to the necessary acceleration of the flat glass industry decarbonisation.*

### *Paving the way*

This development will pave the way to the conversion of industrial flat glass lines in such a way that it can be powered mainly by low carbon electricity, more efficient than any gas solution, with significantly reduced carbon emissions for the customers' benefit, say the companies. The new technology is expected to be implemented on the patterned glass line for operational success by the second half of 2024.

Commenting on the collaboration, Davide Cappellino, president architectural glass Europe & Americas of AGC said: "To contribute to a sustainable world, AGC is committed to developing products that promote sustainable development, and to reducing the environmental impact of its production processes. Following our continued progress in decarbonisation, AGC launched its first low-carbon glass product range at the end of 2022. Now this hybrid design melter is another important milestone in our net zero trajectory to become carbon neutral as a company by 2050. The breakthrough design will be done jointly with Saint-Gobain, combining the best technology knowledge of both companies."

Joana Arreguy, industrial director glass, Saint-Gobain concurred: "We at Saint-Gobain believe strongly in innovation through collaboration. That's why we are delighted to co-develop with AGC a new most advanced technology for flat glass production in the world. This project is in line with Saint-Gobain's commitment to reach carbon neutrality by 2050. This reduction in direct $CO_2$ emissions will benefit our customers who look more and more for low carbon products to be integrated in their solutions. It also comes a few months after Saint-Gobain made two world firsts: a zero carbon production of flat glass last May and the recent launch of ORAÉ®, the world's first low carbon glass."


AGC Glass Europe produces, processes and markets flat glass for the construction industry (external glazing and interior decoration), car manufacture and other industrial sectors (transport, solar power and high-tech). It is the European branch of AGC, a world leader in flat glass. It has over one hundred sites throughout Europe and employs around 15,300 employees. *www.agc-glass.eu*

AGC Inc (headquarters: Tokyo) is the parent company of the AGC Group, a world-leading glass solution provider and supplier of building, automotive and display glass, chemicals, ceramics and other high-tech materials and components, including CDMO services for active pharmaceutical ingredients. Building on more than a century of technical innovation, the AGC Group has developed a wide range of cutting-edge products. The group employs around 56,000 people worldwide and generates annual sales of around 1.7 trillion Japanese yen (approx. US$12.3bn) through its operations in more than thirty countries and regions. *www.agc.com*

A worldwide leader in light and sustainable construction, Saint-Gobain designs, manufactures and distributes materials and services for the construction and industrial markets. Its integrated solutions for the renovation of public and private buildings, light construction and the decarbonisation of construction and industry are developed through a continuous innovation process and provide sustainability and performance. Sales in 2022 amounted to €51.2 billion. The company employs 168,000 people with locations in 75 countries and is committed to achieving carbon neutrality by 2050. *www.saint-gobain.com*

# The first flat glass production using MORE THAN THIRTY PER CENT HYDROGEN

*Saint-Gobain is the first manufacturer in the world to carry out a test production of flat glass using more than thirty per cent hydrogen during research & development (R&D) trials at the Herzogenrath site in Germany.*

With this world first, Saint-Gobain has proven the technical feasibility of manufacturing flat glass with a significant proportion of hydrogen, which will complement other decarbonised energy sources and will reduce the site's direct $CO_2$ emissions (scope 1) by up to seventy per cent.

The company says this strengthens its position as a world leader in sustainable construction and confirms its leading role in helping to build a carbon neutral economy.

### *A European R&D program*

This technical feat was made possible by an R&D program launched in 2022, drawing on the group's extensive expertise in combustion, glass quality, ceramic refractories materials and industrial furnace design. The program in question is carried out in collaboration with the independent German laboratory Gas and Heat Institute Essen eV (GWI), a specialist in industrial gas technologies, and financially supported by the Land of North Rhine-Westphalia to the amount of €3.64 million.

These industrial tests in Herzogenrath have been preceded on a laboratory scale by trials carried out in two research centres in France: Saint-Gobain Research Paris in Aubervilliers and Saint-Gobain Research Provence in Cavaillon.

Analysis of the data from these tests will make it possible to deploy the use of hydrogen in the group's floats in the decades to come, when low-carbon hydrogen is available in sufficient quantities.

This breakthrough innovation marks a new milestone in Saint-Gobain's roadmap towards carbon neutrality in 2050. It complements R&D initiatives on the electrification of glass melting and notable achievements, such as the world's first zero-carbon production of flat glass at Aniche in May 2022, thanks to one hundred per cent cullet and one hundred per cent decarbonised energy (biogas).
*www.saint-gobain.com*

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Email: jill.wales@ancorite.co.uk
Website: www.ancorite.co.uk

## α-ALUMINA

**Elkem Silicon Products**
17 Jessops Riverside, Brightside Lane, Sheffield S9 2RX England
Website: www.elkem.com/contact/
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## ALUMINA FIREBRICKS

**Trent Refractories Ltd**
Menasha Way, Queensway Industrial Estate, Brigg Road, Scunthorpe DN16 3RT
Tel: (01724) 858684 Fax: (01724) 281577
Email: enquiries@trentrefractories.co.uk
Website: www.trentrefractories.co.uk

## BASIC BRICKS

**RHI Magnesita**
Kranichberggasse 6, 1120 Vienna, Austria
Tel: +43 50213 0
Email: office@rhimagnesita.com
Website: www.rhimagnesita.com

**Mayerton Refractories Limited**
Unit 7 Hockley Court,
2401 Stratford Road, Hockley Heath,
Solihull B94 6NW
Tel: 01564 787950
Email: info@mayerton.com
Website: www.mayerton.com

**Trent Refractories Ltd**
Menasha Way,
Queensway Industrial Estate,
Brigg Road, Scunthorpe DN16 3RT
Tel: (01724) 858684 Fax: (01724) 281577
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Menasha Way,
Queensway Industrial Estate,
Brigg Road, Scunthorpe DN16 3RT
Tel: (01724) 858684 Fax: (01724) 281577
Email: enquiries@trentrefractories.co.uk
Website: www.trentrefractories.co.uk

## CALCIUM ALUMINATE CEMENT

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Website: www.imerys.com

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Ollerton Road, Tuxford, Newark,
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Tel: +44 (0) 1777 874500
Email: sales@swpuk.com

## CONSULTANTS/RESEARCH

**David Bell, Consultant (refractories and ceramics)**
Recipes, Heatflow, NDT etc.
Tel: +44 7805 390227
Email: belldaviddr@outlook.com

**Trent Refractories Ltd**
Menasha Way,
Queensway Industrial Estate,
Brigg Road, Scunthorpe DN16 3RT
Tel: (01724) 858684 Fax: (01724) 281577
Email: enquiries@trentrefractories.co.uk
Website: www.trentrefractories.co.uk

## DEMOLITIONS

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Fax: +44 (0) 1246 819573
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5 Jackson Close, Olympic Way,
Gallowfields, Richmond,
North Yorkshire DL10 4FD
Tel: 01748 826046 Fax: 01748 826056
Website: www.gnatuk.com

**Gunform International Ltd**
33 Carsthorne Road, Carr Lane Industrial
Estate, Hoylake, Wirral, Merseyside CH47 4FB
Tel: (0151) 632 6333 Fax: (0151) 632 6444
Email: info@gunform.com
Website: www.gunform.com

**S.H.L. Refractories (U.K.) Ltd**
Celcius House, Lawn Road Industrial Estate,
Carlton in Lindrick, Worksop, Nottinghamshire
S81 9LB
Tel: (01909) 731959 Fax: (01909) 731579
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## FURNACE WRECKING

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5 Jackson Close, Olympic Way,
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Website: www.gnatuk.com

## HIGH ALUMINA BRICKS

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Ollerton Road, Tuxford, Newark,
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Tel: +44 (0) 1777 874500
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**StudWeldPro-UK**
Ollerton Road, Tuxford, Newark,
Nottinghamshire NG22 OPQ
Tel: +44 (0) 1777 874500
Email: sales@swpuk.com

**RHI Magnesita**
Kranichberggasse 6, 1120 Vienna, Austria
Tel: +43 50213 0
Email: office@rhimagnesita.com
Website: www.rhimagnesita.com

**Mayerton Refractories Limited**
Unit 7 Hockley Court, 2401 Stratford Road,
Hockley Heath, Solihull, B94 6NW
Tel: 01564 787950
Email: info@mayerton.com
Website: www.mayerton.com

## HIGH ALUMINA FIBRES

**M&M Energy Systems Ltd**
**StudWeldPro-UK**
Ollerton Road, Tuxford, Newark,
Nottinghamshire NG22 OPQ
Tel: +44 (0) 1777 874500
Email: sales@swpuk.com

## HIGH ALUMINA FIREBRICKS

**Mayerton Refractories Limited**
Unit 7 Hockley Court, 2401 Stratford Road,
Hockley Heath, Solihull, B94 6NW
Tel: 01564 787950
Email: info@mayerton.com
Website: www.mayerton.com

**Trent Refractories Ltd**
Menasha Way,
Queensway Industrial Estate,
Brigg Road, Scunthorpe DN16 3RT
Tel: (01724) 858684 Fax: (01724) 281577
Email: enquiries@trentrefractories.co.uk
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## INCINERATOR REFRACTORY INSTALLATIONS

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Estate, Hoylake, Wirral, Merseyside, CH47
4FB
Tel: (0151) 632 6333 Fax: (0151) 632 6444
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**Trent Refractories Ltd**
Menasha Way, Queensway Industrial Estate,
Brigg Road, Scunthorpe DN16 3RT
Tel: (01724) 858684 Fax: (01724) 281577
Email: enquiries@trentrefractories.co.uk
Website: www.trentrefractories.co.uk

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Sandyford Business Park, Sandyford,
Dublin 18, D18 R9C7
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Tel: +353 1 255 1800 Fax: +353 1 495 9201
Email: sales@siltherm.eu
Website: www.siltherm.eu

**StudWeldPro-UK**
Ollerton Road, Tuxford, Newark,
Nottinghamshire NG22 OPQ
Tel: +44 (0) 1777 874500
Email: sales@swpuk.com

## MICROSILICA

**Elkem Silicon Products**
17 Jessops Riverside, Brightside Lane,
Sheffield S9 2RX England
Website: www.elkem.com/contact/
Tel: +44 7810 428768

## MIXERS

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33 Carsthorne Road, Carr Lane Industrial Estate, Hoylake, Wirral, Merseyside CH47 4FB
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Email: info@gunform.com
Website: www.gunform.com

**Markham (Sheffield) Ltd**
Marspal House, Lawn Road Industrial Estate, Carlton-in-Lindrick, Worksop, Nottinghamshire S81 9LB
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Email: dan.spencer@pemat.uk
Website: www.pemat.uk

## MONOLITHIC REFRACTORIES

**Calderys NGJ Ltd**
Units H3 and H4 Gildersome Spur, Morley, Leeds, LS27 7JZ
Tel: +44 (0) 113 263 6268

**RHI Magnesita**
Kranichberggasse 6, 1120 Vienna, Austria
Tel: +43 50213 0
Email: office@rhimagnesita.com
Website: www.rhimagnesita.com

## MONOLITHIC REFRACTORIES - CASTABLE

**Capital Refractories Ltd**
Station Road, Clowne, Chesterfield S43 4AB, United Kingdom
Tel: +44 (0) 1246 811163
Fax: +44 (0) 1246 819573
Email: info@capital-refractories.com
Website: www.capital-refractories.com

**Robert Lickley Refractories Ltd**
Dormston Trading Estate, Burton Road, Dudley, West Midlands DY1 2UF
Tel: (01902) 880123 Fax: (01902) 880019
Website: www.robertlickley.co.uk

**StudWeldPro-UK**
Ollerton Road, Tuxford, Newark, Nottinghamshire NG22 OPQ
Tel: +44 (0) 1777 874500
Email: sales@swpuk.com

**Trent Refractories Ltd**
Menasha Way, Queensway Industrial Estate, Brigg Road, Scunthorpe DN16 3RT
Tel: (01724) 858684 Fax: (01724) 281577
Email: enquiries@trentrefractories.co.uk
Website: www.trentrefractories.co.uk

## MONOLITHIC REFRACTORIES - GUNNING

**Trent Refractories Ltd**
Menasha Way, Queensway Industrial Estate, Brigg Road, Scunthorpe DN16 3RT
Tel: (01724) 858684 Fax: (01724) 281577
Email: enquiries@trentrefractories.co.uk
Website: www.trentrefractories.co.uk

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Email: sales@swpuk.com

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Menasha Way, Queensway Industrial Estate, Brigg Road, Scunthorpe DN16 3RT
Tel: (01724) 858684 Fax: (01724) 281577
Email: enquiries@trentrefractories.co.uk
Website: www.trentrefractories.co.uk

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Menasha Way,
Queensway Industrial Estate, Brigg Road,
Scunthorpe DN16 3RT
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Email: enquiries@trentrefractories.co.uk
Website: www.trentrefractories.co.uk

## PYROMETER SHEATHS

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Website: www.fccu.com

## REFRACTORIES ENGINEERS

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Ollerton Road, Tuxford, Newark,
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**Quartis Ltd**
PO Box 138, Cranbrook, Kent TN17 9AF
Tel: (01580) 754747 Fax: (01580) 754949
Email: quartis@fccu.com
Website: www.fccu.com

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Mobile: +44 (0) 7377 212544
Email: contact@refractory-anchors.co.uk
Website: www.refractory-anchors.co.uk

**Mach One (International) Ltd**
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Website: www.gunform.com

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Estate, Hoylake, Wirral,
Merseyside CH47 4FB
Tel: (0151) 632 6333 Fax: (0151) 632 6444
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Celcius House, Lawn Road Industrial Estate,
Carlton in Lindrick, Worksop,
Nottinghamshire S81 9LB
Tel: (01909) 731959 Fax: (01909) 731579
Email: sales@shl-refractories.co.uk
Website: www.shl-refractories.co.uk

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Tel. +49 (0) 2051 2087.13
Fax +49 (0) 2051 2087.20
E-mail: cwolf@velco.de
Website: www.velco.de

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Haberstr. 40, 42551 Velbert, Germany
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Email: richmondreclaim@gmail.com

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Tel: +44 7810 428768

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Website: www.sandablackwell.com

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Website: www.elkem.com/contact/
Tel: +44 7810 428768

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Website: www.fiberconfiber.com

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Ollerton Road, Tuxford, Newark,
Nottinghamshire NG22 OPQ
Tel: +44 (0) 1777 874500
Email: sales@swpuk.com

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PO Box 138, Cranbrook, Kent TN17 9AF
Tel: (01580) 754747 Fax: (01580) 754949
Email: quartis@fccu.com
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## TESTING AND ANALYTICAL

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Menasha Way, Queensway Industrial Estate,
Brigg Road, Scunthorpe DN16 3RT
Tel: (01724) 858684 Fax: (01724) 281577
Email: enquiries@trentrefractories.co.uk
Website: www.trentrefractories.co.uk

## THERMAL INSULATION

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Business Park, Sandyford, Dublin 18, D18
R9C7
Republic of Ireland
Tel: +353 1 255 1800 Fax: +353 1 495 9201
Email: sales@siltherm.eu
Website: www.siltherm.eu

**StudWeldPro-UK**
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Nottinghamshire NG22 OPQ
Tel: +44 (0) 1777 874500
Email: sales@swpuk.com

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South Africa 1910
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Mob: +27 83 275 8948
Email: dcbiggs@mweb.co.za
Website: www.chbinspection.com

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## WEAR RESISTANT CASTABLES

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Email: sales@swpuk.com

## WEAR RESISTANT EPOXIES

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Email: sales@swpuk.com

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| 2007/09 | T Staton, CEng , BTech, MIMMM, FIRef Eng |
| 2009/11 | P Rooney, MSc, FIRef Eng |
| 2011/13 | C Windle, BSc Hons, FIRef Eng, MIM3, FSGT |
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Institute of Refractories Engineers

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