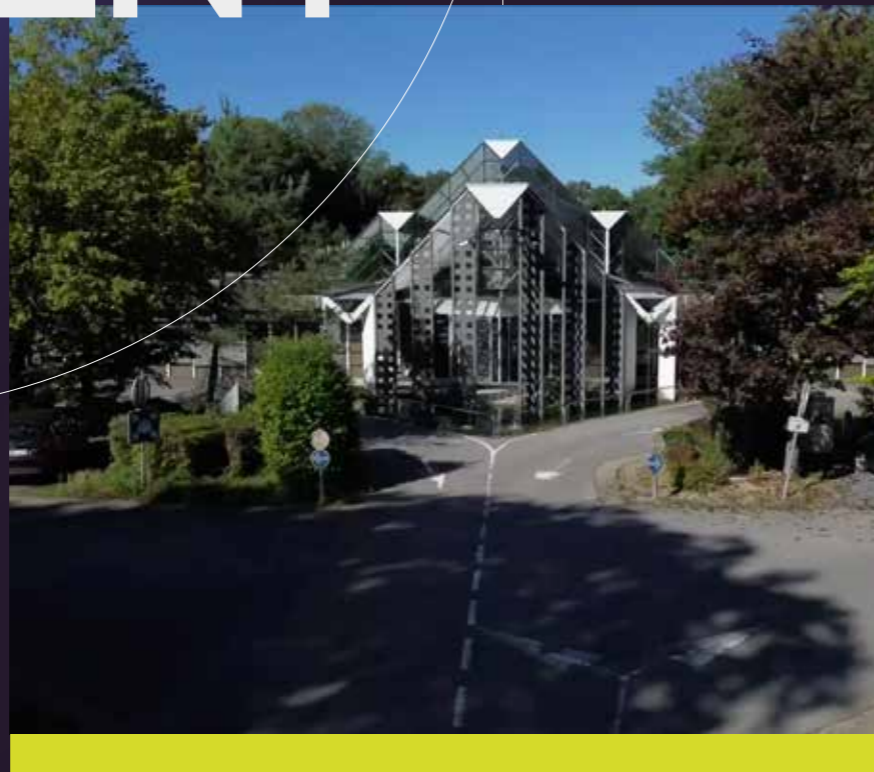


2011

ANNUAL  
REPORT

[www.crmgroup.be](http://www.crmgroup.be)

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# Foreword from the ✦ CEO & President



CRM Group is an independent, not-for-profit applied research center **delivering cutting-edge R&D in metal and steel production**, product development and a broad range of industrial applications. Our holistic product-process-application approach places strong emphasis on the industrial deployment of innovation, in direct alignment with major societal priorities: **circular economy, energy transition and digital transformation**.

Our work is supported by a robust network of over **45 industrial members**, including global leaders such as **ArcelorMittal and Tata Steel**, alongside raw material suppliers, OEMs and companies from sectors as diverse as **aeronautics, space, defense, energy and recycling**. In 2025, we also provided specialized services **to more than 300 external clients**.

**Health and safety remain our foremost priority. 2025 marked an important milestone: more than two years without a lost-time injury.**

This result reflects the sustained implementation of our safety action plan, including extensive shop floor audits, more than 100 preventive safety visits, and monthly Toolbox Meetings to share best practices across the organization.

CRM Group remains fully committed to the **United Nations Sustainable Development Goals**. In 2025, **we received the “Sustainable Development Company” award** from the Local Chamber of Commerce for the second consecutive year. Through improved energy monitoring, targeted investments and systematic SDG impact assessment across our R&D portfolio, we continued to reduce both our energy costs and our carbon footprint.

In terms of program renewal, the key priority was to anticipate the end of the National and Regional Relaunch and Resilience plan at mid-2026. More than **30 new project proposals were submitted across European, Belgian and regional frameworks**, covering energy transition, critical raw material recycling, supply chain sovereignty, digital transformation, CO<sub>2</sub> and hydrogen. Target industries include steel, non-ferrous metals, energy, recycling, aeronautics, space and defense.

Financially, 2025 delivered healthy results. Despite ongoing geopolitical tensions, inflation returned under control in Belgium and energy prices stabilized, allowing us to master costs **and close the year in a solid position**.

2025 was also a year of recognition and connection. CRM Group achieved numerous significant milestones, received prestigious awards, and welcomed ministerial visits and major industry events at our sites, further reinforcing our role as a central hub for innovation and collaboration in the metallurgy ecosystem.

**This annual report  
presents the key highlights  
and achievements  
of the year.**

**Joeri NEUTJENS**  
General manager @CRM GROUP

**Thinus VAN DEN BERG**  
President @CRM GROUP



# CRM Group at a glance

CRM Group is an independent **applied research** centre bridging the gap between scientific knowledge and **industrial reality**. Our mission is to support companies in tackling their most complex technological challenges, from material development and process innovation to digitalisation and sustainability.

Our strategic vision is built around a simple conviction: that research only creates value when it translates into concrete **industrial impact**. By combining pilot-scale facilities, deep sectoral expertise and long-term partnerships, CRM Group acts as a trusted innovation partner for industries navigating major transitions, whether towards **decarbonisation, circularity, advanced manufacturing or digital transformation**.

# Key Figures

## Income by financing

TOTAL INCOME  
**47,8M€**

European Grants  
**6%**

National & Regional Grants  
**15%**

Industrial Collaboration  
**79%**

## Income by program

Steel Effective Collaboration > **23,3 M €**

Steel Collective > **5,7 M €**

Other > **18,8 M €**

## Gender balance:

♂ **79,4%**  
♀ **20,6%**

More than  
**280 employees**

**78,6%** From Belgium

**21,4%** From the world



Discover more about our team, our vision, and our solutions by scanning this QR code.

# Average customer satisfaction of

With more than 200 customers in 2025

92,5%

19 new projects granted for funding

More than 20 000 m<sup>2</sup> lab & pilot facilities

More than 300 applied research projects in effective collaboration with industrial partners

25 European funded projects

10 European projects coordinated by CRM Group

# key highlights



## Belgian Economic Mission to India and the United States:



CRM Group's CEO and CTO represented CRM Group during the **Belgian Economic Mission to India**, led by Her Royal Highness Princess Astrid of Belgium, signing a contract for the expansion of the **Tempcore® technology**.

A second Belgian Economic Mission to the **United States** focused on the **aerospace, defense and clean energy innovation**.

## Members Day:

CRM Group welcomed representatives from its member companies for a day of **facility tours, project presentations, networking** and the Annual General Meeting.



## Launch of 3 new defense projects:

CRM Group launched two projects under the Belgian **NGCAT** thematic call, engaging its expertise in thermal signature, PCM and coating technologies. A third project, **CHIPART**, selected under the **European Defence Agency's IF CEED** program, focuses on transforming titanium machining scrap into high-value parts through additive manufacturing.

## Framework agreement with Safran Aero Boosters Paris Air Show:

At **Le Bourget**, CRM Group and **Safran Aero Boosters** signed a collaboration agreement in the presence of Walloon Minister Pierre-Yves Jeholet, formalizing a long-term research partnership in materials and manufacturing processes for aeronautics.



## Visit of Minister of Energy Mathieu Bihet:



Minister of Energy Mathieu Bihet visited CRM Group's facilities, with presentations on the Energy Shift platform, CO<sub>2</sub> capture, SMRs and Waste2Energy, followed by site visits of the **electrolyzer demonstrator**, the **HelioRoof** installation and the **SMELD** nuclear recycling line.

## CRM Group recognized as SDG Pioneer 2025:



At the **AKT - CCI Liège-Verviers-Namur Gala**, CRM Group was recognized as an SDG Pioneer 2025, highlighting its commitment to embedding sustainability at the heart of its R&D activities.

## 30 years of CRM Ghent:



CRM Group celebrated the **30th anniversary** of its Ghent office, honoring three decades of research excellence, industrial collaboration and team commitment in Flanders.

## New pilot facilities:

CRM Group commissioned **RACHEL**, a new in-house designed reactor for **Direct Reduced Iron** production, enabling larger and more homogeneous batches to support in-depth studies on **hydrogen-based ironmaking** routes.

A new **mobile pilot plant for CO<sub>2</sub>-capture** using the anti-sublimation cryogenic process has been acquired and operated at industrial sites.



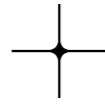
# From research to industrial solutions

At CRM Group, **industrial impact is built through partnership.** Across a wide range of sectors, from **energy transition and circular economy to aerospace, defence, hydrogen and nuclear applications,** our collaborative model brings together research **expertise, pilot-scale facilities and the industrial know-how** of our partners to turn technological challenges into concrete solutions.

The testimonials below reflect the diversity of these collaborations and the tangible outcomes they generate, from validated processes and new industrial pilots to long-term relationships built on shared ambition and complementary expertise.



**Nenad MILENKOVIC**  
Project Leader @SMELD PROJECT & SCK CEN



SCK CEN, the Belgian nuclear research center, conducts advanced research for peaceful nuclear applications. One emerging challenge in the sector is the growing volume of metallic materials generated during the dismantling of nuclear facilities. Rather than classifying these materials as waste, the objective is to recycle them safely.

CRM Group plays a key role in the project by contributing its expertise in **metallurgical research, induction melting technologies and pilot-scale processing**. By combining nuclear science with metallurgical know-how, the collaboration helps to develop innovative recycling approaches that can significantly reduce waste volumes in nuclear decommissioning.

The **SMELD project** focuses on improving the understanding of isotope behavior during metal melting in order to expand the range of radioactive metallic waste that can be recycled.

**sck cen**

# SMELD SCK CEN



Our collaboration with CRM Group has delivered valuable R&D insights and created a strong foundation for future cooperation around sustainability and circular economy.



These four years of collaboration with CRM Group were essential to understand the process and prepare its industrial development.



**François POCHET**  
CEO @PEPS ENGINEERING

**PEPS Engineering designs and develops tailor-made industrial equipment for industry, including advanced technologies for metal recycling.**

Within the **PURE ZINC project**, PEPS Engineering was responsible for designing the first industrial version of the equipment required to implement the zinc purification process at large scale. CRM Group had already developed the technology and operated a prototype within its facilities.

Building on this existing prototype and CRM's expertise in **vacuum pyrometallurgy and metal recycling**, the project made it possible to validate key technological principles and prepare the next stage of development.

**The collaboration** has been decisive in moving the technology closer to industrial deployment, with discussions now underway with investors to finance the first industrial pilot.

**Charles ROBIN**  
Director Decarbonization Solutions  
@CARMEUSE



This project shows how collaboration between partners with complementary expertise can accelerate the development of sustainable industrial solutions.



Lime production is a "hard-to-abate" industrial process, making the development of CO<sub>2</sub> capture solutions a key priority for Carmeuse.

To address this challenge, Carmeuse launched a project to build a pilot facility capable of testing new operating conditions for PFR (Parallel Flow Regenerative) lime kilns, with the objective of **increasing CO<sub>2</sub> concentration in flue gases and facilitating carbon capture.**

CRM Group joined the consortium thanks to its strong expertise in **designing and operating industrial pilot installations.** In less than three years, the pilot was built and operated through several campaigns with the support of CRM Group's operational teams.

**Results** already demonstrate strong potential for improving carbon capture in the lime industry and highlight the value of combining complementary industrial expertise.

**Frederik VAN DE VELDE**  
CEO  
@ARCELORMITTAL BELGIUM

In hot rolling, precise temperature control is essential to ensure stable operations and consistent product quality. While temperature control along the strip length is well mastered, managing variations across the strip width remained a key challenge.

ArcelorMittal Belgium partnered with CRM Group to develop advanced solutions combining **thermal modelling, selective cooling technologies and new measurement systems.**

CRM Group's expertise helped translate theoretical modelling into **practical solutions adapted to the demanding conditions of a hot strip mill.** The project introduced improved temperature monitoring and control strategies for the transfer-bar cooling system.

**The results** show clear benefits for process stability, strip quality and operational reliability, while reducing the risk of rolling incidents and associated production losses.



Cooperating with **CRM Group** is inspiring because of their exceptional skills to translate qualitative theoretical research into practical and direct applicable solutions. They understand our problems and always think along to find a way out.



ArcelorMittal



**Olivier DE VRIENDT & Nicolas REIMARCKERS**

Direction of Innovation

@ SAFRAN AERO BOOSTERS

Safran Aero Boosters is a technology **leader in low-pressure compressors** and a key partner to the world's major **aero-engine manufacturers**. As the aerospace sector commits to decarbonization, disruptive architectures such as the Open Fan concept at the heart of the RISE program are driving major design changes: **more complex aerodynamics, doubled rotation speeds, increased mechanical stress and new functional requirements for engine components**.

Addressing these challenges requires deep expertise in materials and manufacturing processes. Through its broad capabilities in metallic materials, its ability to mobilize knowledge and translate it into tangible results, and its creative approach to problem-solving, CRM Group has become a natural partner for Safran Aero Boosters across multiple **collaborative research programs, including Cristal, WINGS and Preforwal**. This partnership was formalized with the signing of a collaboration agreement at the Paris Air Show in 2025.



**Results across these programs have been substantial.** Within WINGS, process modeling contributed directly to the forging sequences now used by Safran Blades, alongside advances in the understanding of chemical attack on components. The Preforwal program focused on the implementation and quality control of blade manufacturing processes, while Cristal is exploring new materials and processes to enable the first-stage stator vane to fulfill new functional requirements.



Thanks to our experience in WINGS, where forging modeling was co-developed, CRM Group has become a natural partner for Safran Aero Boosters. The partnership signed at Le Bourget in 2025 has further strengthened our excellent collaboration, and I commend CRM Group's dynamism both in building collaborative research projects and in delivering on them.

# Our strategic platforms



# Circular Economy & industrial symbiosis



At CRM Group, circular economy goes beyond recycling.

Our work focuses on industrial symbiosis, process optimization and advanced valorization routes that enable industry to reduce waste, lower emissions and secure strategic raw materials.



BERNARD  
VANDERHEYDEN

#### Turning industrial challenges into circular value.

By combining pilot-scale facilities, digital tools and close collaboration with industrial partners, we support the transition toward more resilient and low-impact production systems.

# Pilot facilities

A dedicated recycling platform is available at CRM Group enabling testing, scaling and demonstration of environmentally sound recycling processes.

It consists of:

- > Unique facilities for **safe handling & pre-processing of toxic materials** such as black mass: granulation, pelletizing, ...
- > A dedicated furnace for **pyrometallurgical treatment of toxic materials** (black-mass), hosted in a container
- > **The cutting-edge plasma furnace** designed for recovery of critical raw materials, new green steel making technologies (scrap or H<sub>2</sub> reduced DRI melting, or smelter) and the valorization of slag through slag remelting & slag valorisation

# Circular steelmaking

## Digital twin for enhanced EAF operations

Electric Arc Furnaces once mainly used for long products, now play a key role in low-carbon flat steel production replacing the blast furnace and in primary steelmaking through the use of Direct Reduced Iron (DRI).

To support this shift, CRM Group developed in collaboration with ArcelorMittal and Tata Steel an online **EAF process model**, acting as a **digital twin** integrated directly into industrial control rooms.

It provides real-time support to operators, improving process stability and control for high-value products.



### Key developments

- ✓ Online soft sensor deployed in multiple plants worldwide
- ✓ Accurate prediction of melt temperature and composition
- ✓ Automatic calibration tool drastically reducing setup time
- ✓ Off-line simulation tools for process optimization
- ✓ Extension to stainless and high-alloy steelmaking

# Scrap upgrading, sorting & characterization

Scrap is central to sustainable steelmaking, but its quality is increasingly challenging. As post-consumer scrap volumes rise, advanced solutions are required to maintain product performance while increasing recycling rates.

Within the **CAESAR project**, CRM Group is validating **integrated technologies at full industrial scale** to clean, upgrade and characterize low-quality scrap streams.

## Objectives

- ✓ Enable local use of low-quality scrap in Europe
- ✓ Maintain high steel quality for demanding applications
- ✓ Valorize all recovered fractions (non-ferrous metals, carbon-rich and inert materials)
- ✓ Move toward a **zero-waste steel industry**

CAESAR



# Managing residuals in high-scrap steelmaking

Higher scrap rates introduce residual elements that are difficult to remove once in the melt. Elements such as **Cu, Sn, Cr and Mo** can affect both processing and final steel properties.

CRM Group develops **grade-specific guidance** based on realistic scrap scenarios and multiple steel families, helping producers to anticipate and manage these effects.

## Impacts

- ✓ Stable processes under high scrap conditions
- ✓ Preserved product quality
- ✓ Meaningful CO<sub>2</sub> reduction pathways

# Valorization of residues

## Slag valorization

Metal production is changing to meet environmental rules and CO<sub>2</sub> reduction targets, and therefore slags must also be better managed and reused.

CRM Group supports this transition with lab-scale and pilot-scale facilities and strong technical expertise, including slag characterization.



### At pilot scale:

- ✓ Plasma furnace that can melt 100 to 300 kg of slag
- ✓ Dry granulator to process the molten slag

### At laboratory level:

- ✓ Modeling tools such as the EAF model, FactSage (thermodynamic software), and CFD simulations to predict slag properties and behavior
- ✓ A high-temperature rheometer measures slag viscosity
- ✓ A new heat-resistant furnace for slag remelting and cooling under controlled conditions, including water granulation

### Impact:

- ✓ Engineering of next-generation slags
- ✓ Recovery of metal alloys
- ✓ Production of valuable slag products

# Smart briquetting & online quality certification



Industrial residues rich in alloying elements, such as battery recycling streams, shot blasting residues or machining waste, can replace conventional ferro-alloys through briquetting.

To ensure consistent quality despite variable inputs, CRM Group developed a **Smart Briquetting pilot** with advanced online quality control.

## Integrated technologies

- ✓ Line-laser profilometry for morphology analysis
- ✓ Hyperspectral imaging for homogeneity assessment
- ✓ In-house LIBS system for elemental composition control

The demonstrator phase will be carried out at **Revatech**.



## Pre-processing of byproducts

For the valorization of Fe-rich and Zn-containing byproducts CRM Group is working on two different solutions: cold agglomeration and pyrometallurgical processing.

Discover more on [www.zhyron.eu](http://www.zhyron.eu) & [www.swerim.se](http://www.swerim.se)

**Cold agglomeration** of the Fe-rich and Zn-containing is used to make them compatible with the hydrogen-based valorization routes, CRM Group investigated **cold agglomeration** via roll press compaction and extrusion, in collaboration with **ArcelorMittal**, including both cold and high-temperature characterization.

A two-stage process designed **to remove lead and cadmium** before treating the zinc- and iron-bearing residue by selective volatilization (called fuming) is under analysis on mixtures of dust & sludges from blast furnace, BOF and EAF.

The agglomerates will be converted into:

- > **Direct Reduced Iron**
- > **High-purity zinc oxide**

Using green hydrogen and electricity at **GreenIron** facilities. A **pyrometallurgical** process is designed to selectively recover zinc and iron while protecting them from the toxic lead contamination.

A two-stage process designed **to remove lead and cadmium** before treating the zinc- and iron-bearing residue by selective volatilization (called fuming) is under analysis on mixtures of dust & sludges from blast furnace, BOF and EAF.

## Upscaling phases

- ✓ Tests on limited quantities
- ✓ Intermediate production runs (few kilograms of zinc) in our layer furnace, reproducing Rotary Hearth Furnace (RHF) conditions
- ✓ Upscaling of the optimized process at pilot scale using **a few tons of material** in our rotary kiln.

# Recycling of processing streams

## Upscaling pickling liquor regeneration for aeronautics

Within the **WINGS project**, CRM Group supports the ecological transition of the aeronautics sector by recycling acidic and alkaline pickling baths for Sonaca.

**Diffusion dialysis** was selected for its simplicity, robustness and low maintenance needs.

## Results

- ✓ Upscaling from laboratory scale to **100 L/day** processing
- ✓ 80 % acid recovery
- ✓ Very low metal leakage
- ✓ Performance validated at near-industrial scale





# Digitalization

Digital technologies are **key accelerators of competitiveness and business growth**

To deliver even more relevant and high-value support to our customers, CRM Group is **developing and testing digital solutions, such as AI, within our own operations**. These include products traceability and safety, advanced exploitation of technical data from our pilot facilities, and the use of GenAI to enhance knowledge management and utilization.



CATHERINE  
ARCHAMBEAU



# Digitalization for efficient production

## Digital twin for metal additive manufacturing

CRM Group is developing a digital twin for metal additive manufacturing to enable **in-situ monitoring and certification of part quality**.

To support this, multiple sensors were integrated into the **HYMAX Direct Energy Deposition (DED) pilot line**, enabling real-time data acquisition during printing.



## Integrated monitoring technologies

- ✓ Coaxial infrared cameras for melt pool temperature profiling
- ✓ Profilometer for dimensional control
- ✓ Ambient environment sensors for process stability

In collaboration with **Pepite**, CRM Group is automating data post-processing and developing a user interface for live sensor visualization.

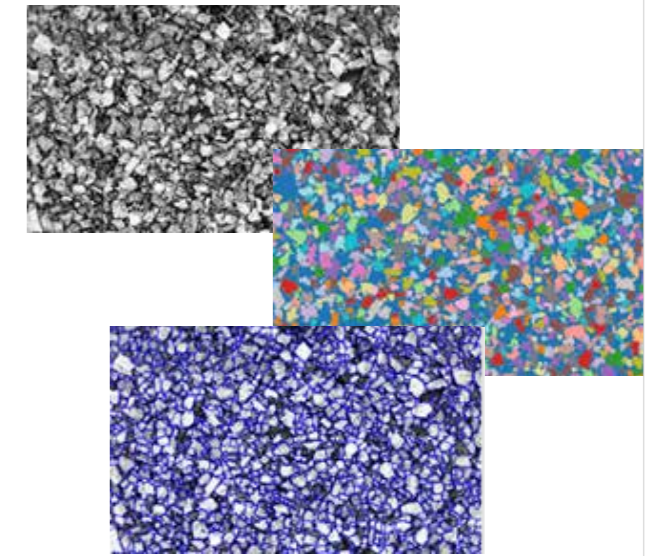


A nickel superalloy was printed under varying process conditions to train a **machine-learning model**, which will enable **point-by-point parameter adjustment** through in-situ feedback control, targeting optimal density and part integrity.

## Vision systems & AI for supervision and predictive maintenance

At the furnace inlet, materials are inspected and characterized in real time, including particle size distribution and particle counting.

In parallel, an in-depth analysis of three years of historic process data was conducted to support data-driven control and predictive maintenance.



### Identified use cases

- ✓ Furnace pressure control
- ✓ Early detection of filter clogging
- ✓ Prediction of process deviations

**Initial results confirm the strong potential of historic data to anticipate process behavior and maintenance needs.**

Multi Hearth Furnaces operate under extreme conditions and treat a wide range of materials. To improve control and maintenance, CRM Group developed in collaboration with JohnCockerill vision-based inspection systems combined with advanced image processing and AI.

## Integrated inspection & data platforms for work roll performance

Edger roll wear in roughing mills can lead to surface defects, shortened campaigns and unplanned shutdowns.

CRM Group developed a comprehensive strategy addressing cooling, lubrication, inspection and roll manufacturing.

At the core of this approach is **Isy-Edger**, a digital inspection and data platform designed to monitor edger roll wear and support data-driven decisions and currently under demonstration at ArcelorMittal Belgium and Tata Steel Netherlands.



Together, these tools help extend roll lifetime, reduce defects and lower lifecycle costs.



### Key functionalities

- ✓ AI-based analysis of Safety Data Sheets (SDS)
- ✓ Automatic generation of simplified safety instruction cards
- ✓ QR-code identification for each product, lot and container
- ✓ Real-time updates of stock, status and location via QR scanning

The system also manages mixtures, whether purchased or produced internally, ensuring consistent safety documentation and traceability.

Following its successful deployment, the platform is now being extended to **paints and metallic powders**, demonstrating how digitalization delivers tangible benefits in safety, efficiency and data quality.

### Key components

- ✓ Smartphone application for inspection data collection
- ✓ Cloud platform for analysis and benchmarking
- ✓ In-stand laser-based profile measurement system to track roll degradation during campaigns

## In-house digital chemical product management system

To manage the growing complexity of chemical products across multiple laboratories and storage locations, CRM Group developed a **fully centralized digital chemical management system**. All chemical products are now registered in a central database, ensuring full traceability, stock control and regulatory compliance.

## Printed electronics & smart surface functionalities

### From simulation to full-scale 3D printed electronics

Functionalizing complex 3D surfaces is increasingly critical for advanced applications in **defense, aerospace and energy**. CRM Group investigates the integration of **printed electronics directly onto 3D geometries**, enabling conformal heating elements with enhanced control and functionality. These developments

open the door to **smart, additively manufactured surface functionalities**, with applications ranging from energy-efficient de-icing to advanced thermal management in demanding environments.

Using thermal spray technologies, 3D heaters were deposited on curved substrates and benchmarked against conventional 2D heaters produced by screen printing.



# energy shift



The energy transition is reshaping industrial processes.

At CRM Group, we support this shift by developing and validating technologies that reduce industrial CO<sub>2</sub> emissions.

JEAN BORLÉE

Ways and means include enabling hydrogen-based processes, developing non-fossil alternative fuels, electrifying high-temperature operations, strengthening energy storage solutions and capturing unavoidable CO<sub>2</sub> emission.

From laboratory scale to pilot and pre-industrial deployment, our approach combines experimental validation, process modelling and industrial realism to accelerate the transition toward low-carbon production routes.



# Decarbonization of steelmaking

## Direct Reduced Iron: from laboratory scale to pilot facilities

Direct Reduced Iron (DRI) is a cornerstone of green steel production. CRM Group operates a comprehensive suite of experimental reactors covering the full development pathway, from laboratory screening to pilot-scale production under industrially relevant conditions.

Our facilities allow testing from a few hundred grams up to **55 kg of DRI**, under conditions representative of **Midrex, Energiron and pure hydrogen-based processes**, including controlled gas composition, temperature and pressure.



The latest reactor, **RACHEL**, was designed to produce larger and more homogeneous DRI batches, enabling in-depth studies on:

- ✓ Reoxidation behavior
- ✓ DRI stability during handling and transport
- ✓ Influence of iron and carbon content
- ✓ Impact of iron ore quality

These capabilities support safe scale-up and industrial deployment of hydrogen-based ironmaking routes.



# Green blast furnace: hydrogen-assisted operation

While new routes are emerging, the blast furnace will remain a key ironmaking process during the transition to low-carbon steelmaking. Short-term decarbonization levers include hydrogen-rich injectants and reduced coke rates.

Hydrogen significantly affects:

- ✓ Reduction kinetics
- ✓ Softening behavior
- ✓ Gas permeability
- ✓ Cohesive zone stability

To address these challenges, CRM Group developed a **combined experimental and numerical approach** to support safe hydrogen-enriched blast furnace operation.



Laboratory campaigns quantify hydrogen effects on burden behavior, while the **MOGADOR blast furnace model** has been upgraded to simulate high-hydrogen conditions.

Results show that hydrogen-rich atmospheres modify reduction and degradation mechanisms, shift the cohesive zone upward and reduce overall pressure drop, providing essential insight for industrial implementation.



## Alternative reductants

**Alternative reductants** produced from biomass and waste materials are used to replace fossil coal in conventional BF-based ironmaking.

**CRM Group** is supporting ArcelorMittal Belgium in the progressive ramp-up of the Torero plant in Ghent. CRM Group has recently carried out solid and gas sampling campaigns on the industrial site, based on a **gas analysis expertise** which has significantly been extended towards hot dirty **industrial gases**, containing high loads of tars, dust and moisture.

The **SMART Life project** explores the use of:

- ✓ Recycled plastics,
- ✓ Waste fractions, and
- ✓ Bio-based materials

To be blended with biomass to produce more alternative reductants and replace more coal. As part of this work, CRM Group has built extensive expertise in **thermal processing of waste-derived reductants** and is supporting ArcelorMittal Belgium in preparing the next phase of the **Torero plant**.





# Electrification of thermal processes

In collaboration with **John Cockerill**, CRM Group has designed, built and commissioned the **world's first fully electrified Multiple Hearth Furnace (MHF)**.

Following validation at small scale, the project progressed through detailed engineering, integration of electrical heating elements and installation of a dedicated power-transmission and process-control system.

Additional instrumentation was installed to enable advanced data acquisition and future AI-based optimization. The furnace was commissioned in **2025**.

Operating with **continuous feeding** at temperatures up to **1,000 °C**, the electrified MHF matches the performance of conventional furnaces, while eliminating fossil fuels, flue-gas emissions and CO<sub>2</sub> generation.

The world's  
first fully electrified  
Multiple Hearth Furnace

## Hybrid slab reheating: simulation of low-carbon heating concepts

Hybrid slab reheating, combining induction preheating, hydrogen-fired heating and electrically heated soaking, offers a promising route to significantly **reduce CO<sub>2</sub> emissions from reheating furnaces**.

CRM Group acquired dedicated experimental equipment to simulate these hybrid reheating cycles at laboratory scale, while reproducing industrial surface heating conditions.

By combining induction preheating with controlled-atmosphere furnaces, CRM Group can evaluate:

- ✓ Oxide growth and adherence
- ✓ Surface quality
- ✓ Descaling behavior

These capabilities support the development and validation of next-generation reheating strategies for ArcelorMittal and Tata Steel.



# CO<sub>2</sub> capture

## Process conversion cost-effective CO<sub>2</sub> capture compatibility

With industrial partners (Aperam, Carmeuse, AGC Glass and Prayon), CRM Group assesses the options to **convert industrial processes** to render them compatible with CCUS techniques and to limit the final costs of CO<sub>2</sub> capture.

CRM Group and Carmeuse are notably joining forces for the groundbreaking “Butterfly” project, a futuristic **CO<sub>2</sub> concentration system** in lime production. In 2025, the first-of-a-kind industrial demonstrator kiln was operated 24/7 by CRM Group personnel for an additional two-month test campaign.

## CO<sub>2</sub> capture pilot facilities

1

“PiCaSSo” dedicated to testing **solvent absorption processes**. It was operated in 2025 to **test amine-based industrial CO<sub>2</sub> solvents** under conditions replicating those found in the facilities of the project industrial partners.

2

A large pilot plant for CO<sub>2</sub>-capture using a promising anti-sublimation cryogenic process developed by Chart-SES in the USA, housed in a marine container for testing on-site.

3

“HUGE” pilot plant tailored to the testing of **CO<sub>2</sub> adsorption processes** on a scale which is sufficient to simulate **real industrial conditions** in terms of bed heterogeneity. Processes such as **PSA** (Pressure Swing Adsorption), **TSA** (Temperature Swing Adsorption) and **combined PTSA cycles** have been successfully reproduced.



This **mobile pilot plant using anti-sublimation** cryogenic process, was operated by CRM Group during several months in 2025 in two partner plants (Carmeuse-Seilles and AGC-Moustier), connected to the selected fume ducts at each site to ensure full representativity of operating conditions. High capture rate and high output CO<sub>2</sub> concentration were demonstrated.

The mobile pilot plant has since then been moved to Aperam-Châtelet for running a new testing campaign in 2026 on the fumes from an operating slab reheating furnace.

# Hydrogen as an enabler of the clean energy transition

## MaterHYum: a unique hydrogen testing platform

To support hydrogen technologies, CRM Group, in partnership with BEBLUE, is developing MaterHYum, a dedicated service platform for testing materials and components in gaseous and cryogenic hydrogen environments.

By reproducing representative operating conditions, MaterHYum provides deep insight into material behavior under hydrogen exposure, supporting validation, certification and safe deployment.

### Testing capabilities include



- ✓ Liquid and gaseous hydrogen
- ✓ Temperatures from **-273 °C to +420 °C**
- ✓ Pressures up to **700 bar** (autoclaves) and **1,000 bar** (permeation)
- ✓ Tensile, fatigue and permeability testing
- ✓ Coupled thermo-mechanical testing
- ✓ Controlled impurities and gas mixtures

MaterHYum is a key enabler for the hydrogen value chain, from materials development to component qualification.

## Ensuring safe hydrogen transport through advanced testing methods

As demand for hydrogen grows, the **safe transport of pressurized hydrogen** becomes a major concern for grid operators. **Hydrogen-metal interactions can degrade mechanical properties** and accelerate fatigue crack growth in pipeline steels. These effects increase risks for potential pipeline failure while existing standardized tests do not fully reflect real operating conditions.

CRM Group addresses this need through the development of the Dynamic Tube Rupture Test (DTRT), an **innovative method designed to evaluate hydrogen-material compatibility under realistic service conditions** by combining fatigue loading, internal hydrogen pressure, and representative defects.



Several DTRT prototypes are under development simulating:

- ✓ Fatigue loading under constant hydrogen pressure
- ✓ Fatigue testing under cyclic hydrogen pressure using gas cylinders
- ✓ A closed-loop hydrogen recycling system

In parallel, promising **crack monitoring techniques** are being advanced.

### Impact:

Several DTRT prototypes are under development simulating:

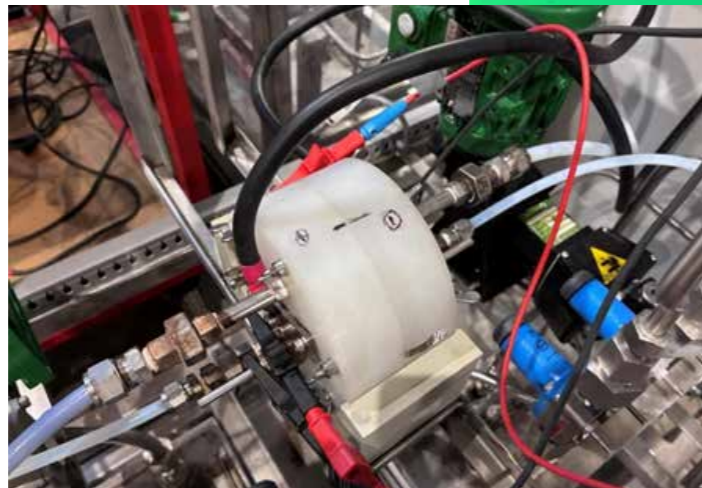
- ✓ Assessing pipeline materials under realistic hydrogen conditions
- ✓ Supporting material selection,
- ✓ Managing pipeline integrity
- ✓ Belgium's positioning as a key hydrogen transport hub,
- ✓ Contributing to EU carbon neutrality objectives for 2050.



# Upscaling hydrogen production

In the development of **alkaline water electrolysis technology** in collaboration with John Cockerill Hydrogen, CRM Group's activities in the project are focused on the elaboration and testing of stack components.

**The upscaling of the manufacturing process of innovative electrodes developed by CRM Group** allowed pilot-scale testing. Predicting the aging behavior of electrolyzer components, under constant or intermittent polarization, is another critical topic addressed by CRM Group.



# Energy storage

## Roll-to-roll pilot line for battery materials

CRM Group supports the development of batteries and components for stationary energy storage and collective applications through its advanced pilot-line infrastructure.

Our **roll-to-roll pilot line** has been upgraded to process very thin substrates used in battery manufacturing, including:

- ✓ 6  $\mu\text{m}$  copper foil
- ✓ 15  $\mu\text{m}$  aluminum foil

Upgrades focused on the winding system, enabling stable handling of ultra-thin coils. Validation trials confirmed the line's capability to produce battery materials at pilot scale, supporting innovation in energy storage technologies.



# Advanced Manufacturing



CÉDRIC GEORGES



Designing robust and innovative manufacturing routes.

Advanced manufacturing stands at the intersection of materials science, process innovation and digital technologies.

At CRM Group, we design, develop and validate manufacturing routes that enhance performance, extend component lifetime and reduce material waste — with a strong focus on aeronautics, space, defense, nuclear and high-value industrial applications.

Our approach seamlessly connects lab development, pilot-scale validation and support through to industrial deployment. This continuity enables us to transform advanced concepts into robust solutions, ready for the most demanding production environments.

# High performance forging

Combined with chemical and microscopic analyses performed on industrial dies, this approach allows:

- ✓ Mapping degradation mechanisms over time
- ✓ Identifying critical zones most prone to failure
- ✓ Establishing a predictive degradation timeline

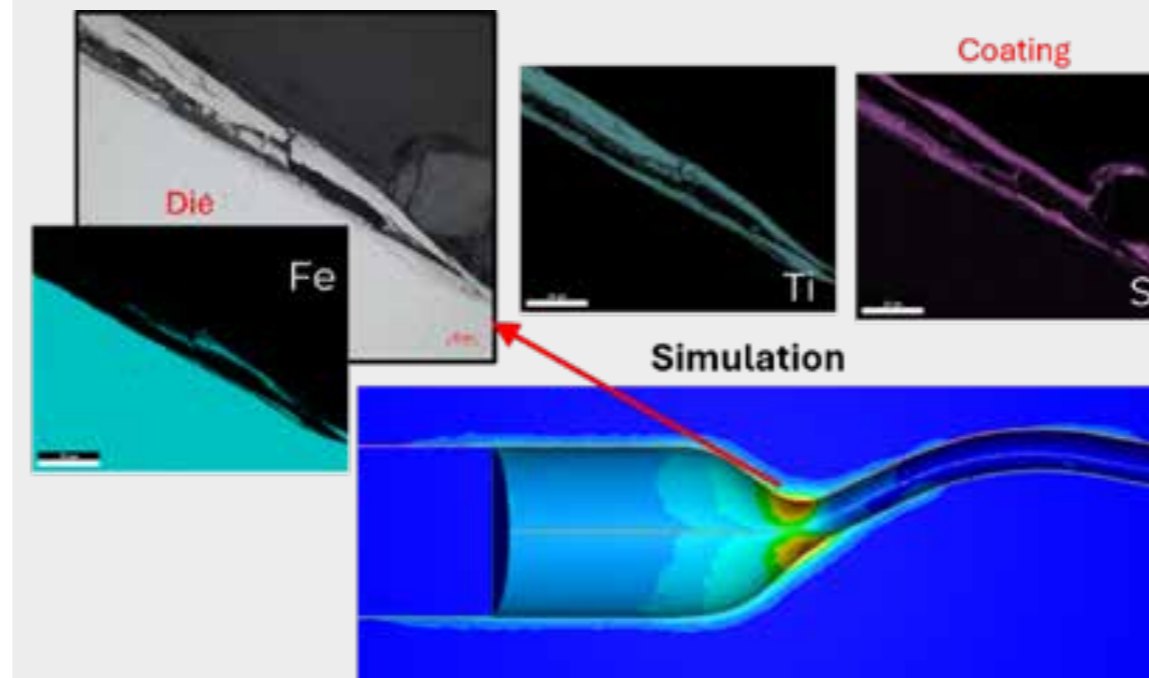


## Extending die lifetime through simulation, analysis and real-time monitoring

The progressive wear of **forging dies** remains a major challenge in high-precision forging, leading to reduced **service life, production delays**, costly maintenance and material waste.

CRM Group collaborates with **Safran Blades** and its new factory in Marchin to understand and predict the degradation mechanisms of forging dies used for hot forging of titanium components.

High-fidelity **finite element simulations** reproduce the thermal and mechanical evolution of the dies over multiple forging cycles.

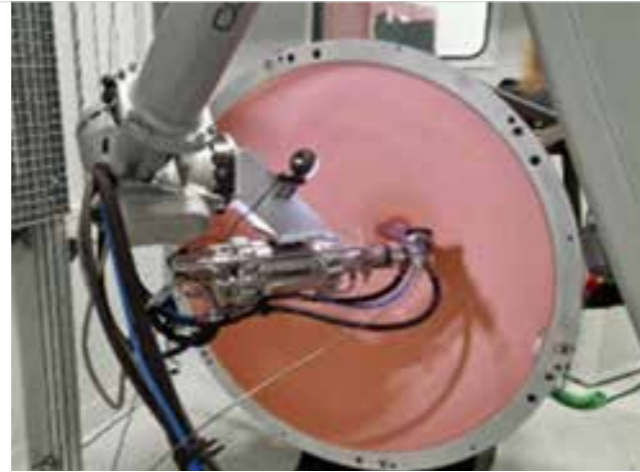


In parallel, CRM Group is developing an **optical monitoring** tool capable of detecting early signs of damage during operation.

By coupling live measurements with machine-learning algorithms, the system aims to **predict the severity** of die **degradation in real time**.

First on-line trials are scheduled for early 2026.

# Innovative manufacturing routes for lightweight metal matrix composites



Building on its long-standing involvement in the **WINGS program**, CRM Group supports **Safran Aero Boosters** in the industrialization of advanced titanium blade forging and the development of next-generation manufacturing routes for Metal Matrix Composite (MMC) materials.

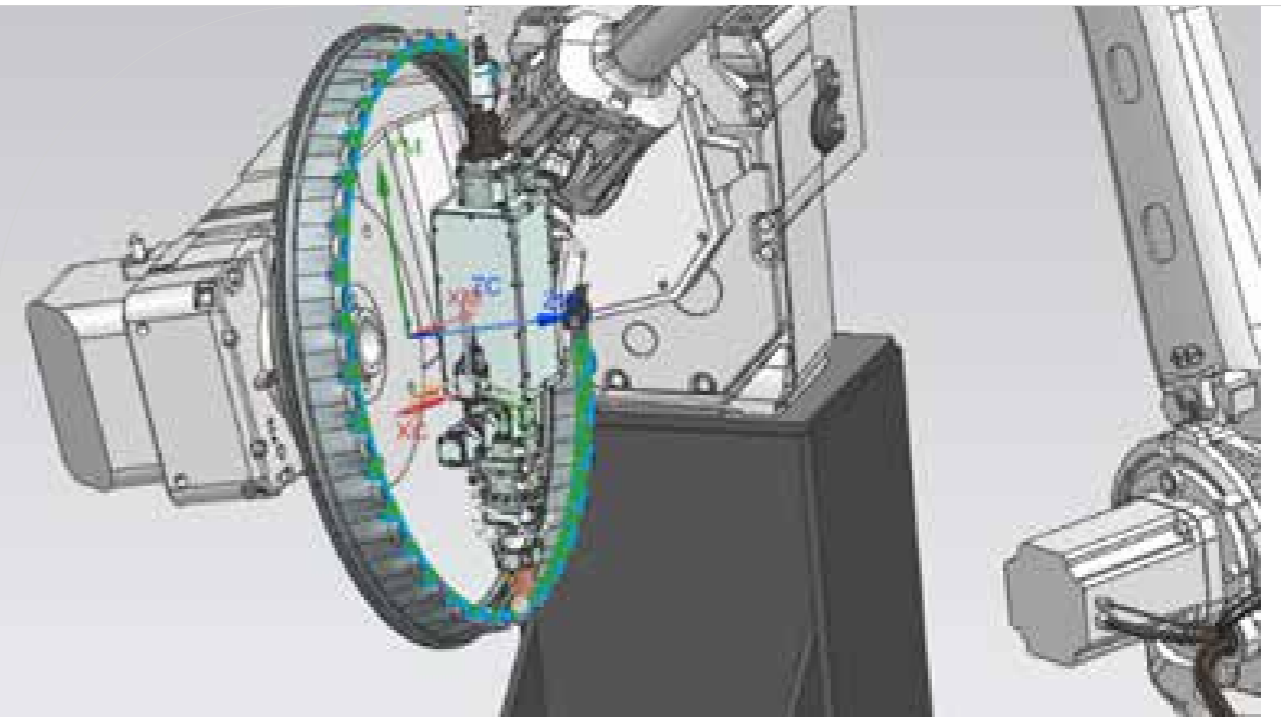
One key innovation under investigation is **high-pressure cold spray** deposition for the direct build-up of Aluminum Matrix Composite (AMC) coatings or structural elements.

This process enables the simultaneous deposition of:

- ✓ An aluminum matrix
- ✓ Reinforcement phases such as silicon carbide, tungsten carbide or other ceramic particles

The relative proportion of each constituent can be precisely adjusted, enabling tailored material properties.

This approach opens new perspectives for **lightweight structures** combining reduced mass with high mechanical robustness, adapted to severe operating conditions involving **wear, erosion and corrosion**, key requirements for aeronautics and defense components.



# Large-scale aluminum direct energy deposition



## Manufacturing a 360° launch interface ring

In collaboration with **SONACA** CRM Group aims to manufacture **for the European Space Agency (ESA) a full-scale, 1-m-diameter Launch Interface Ring in aluminum** using powder-laser Direct Energy Deposition on its HYMAX robotic equipment.

To achieve this challenging task, CRM Group has developed powder treatment methods and adapted the processing tools to obtain highly dense builds.

CRM Group has also developed **an innovative strategy based on 3D profilometry to ensure geometrical accuracy and stability** during long printing operations.

Following the successful production of two 30-degree segments of the ring, **ESA has approved the manufacturing of the full 360-degree ring in 2026.**

# Sustainable refurbishment of copper parts with cold spray technology



Cold spray technology is an efficient, low-temperature method for **restoring or enhancing metallic 3D components** without altering their underlying microstructure.

This approach is particularly **advantageous for additively manufactured copper parts**, which are often sensitive to heat and prone to oxidation under conventional thermal repair methods. By avoiding melting, cold spray preserves the integrity of the substrate while enabling localized buildup, dimensional restoration, and functional surface enhancement.

- ✓ Rapid repair cycles
- ✓ Compatibility with complex geometries,
- ✓ Improved electrical and thermal performance,
- ✓ Sustainable refurbishment of copper 3D printed components



# Sustainable & competitive steel industry

Green & digital  
solutions



Today, our work supports the steel industry's transformation toward **higher efficiency, lower environmental impact and increased operational reliability**, by combining process innovation, advanced modelling, digital tools and industrial validation.

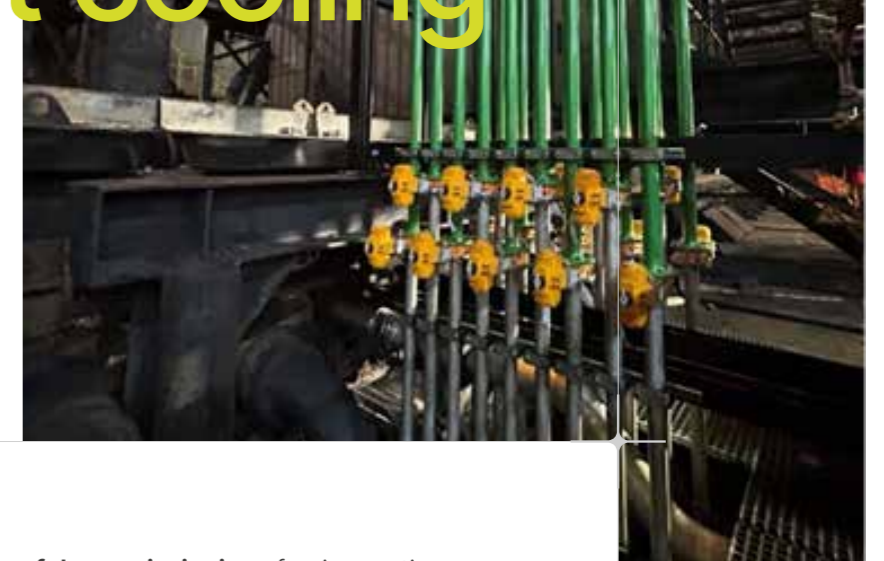


**Steel remains at the core of CRM Group's historical expertise.** Innovation only matters when it scales.

By **upscaling and industrializing solutions**, through close partnerships with industrial partners and a clear understanding of real industrial needs and constraints, we contribute to a competitive and sustainable steel industry.

# Efficient cooling

**SmartCool – a smart cooling actuator in industrial operation**



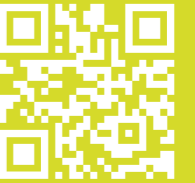
CRM Group contributed to **the successful commissioning** of an innovative selective cooling actuator at **ArcelorMittal Ghent's hot strip mill**.

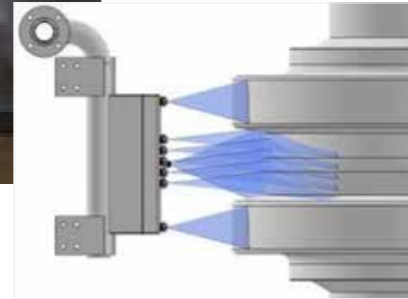
This actuator enables **real-time correction of transfer bar temperature distortions**, using upstream temperature measurements before the cooling section to intelligently adjust cooling. By improving temperature control accuracy, the system enhances the uniformity of the transfer bar's thermal profile.

These improvements directly reduce:

- ✓ Inhomogeneous strip deformation
- ✓ Threading refusals and cobbles
- ✓ Strip steering issues

The SmartCool installation marks a significant step forward in process stability, product quality and operational reliability in industrial hot rolling.





## New roll cooling strategies for improved roll performance

Edger roll degradation in roughing mills leads to surface edge defects, particularly edge slivers, shortened campaigns and unplanned mill stoppages.

Advanced thermal modelling was used to design optimized edger roll cooling strategies that reduce heat-induced wear while avoiding excessive slab edge cooling.

These solutions have been applied through roll cooling revamping projects at **ArcelorMittal Belgium and Tata Steel IJmuiden**.

CRM Group designed **new cooling headers**, which were **constructed and tested at full scale** in the laboratory. Industrial implementation is planned for 2026, combined with targeted lubrication strategies to further extend roll lifetime and reduce wear.

To address this, CRM Group applies a **comprehensive approach** built around four complementary pillars:

**cooling, lubrication, inspection and roll manufacturing.**



**The system was successfully tested under industrial conditions at Tata Steel IJmuiden's hot strip mill.**

- ✓ Improved inspection quality
- ✓ Enhanced ergonomics and
- ✓ Increased operator safety

# Smart solutions supporting maintenance

Rolling stand inspections are essential for safe and reliable hot strip mill operation. Traditionally, visual inspections are performed from outside the stand using flashlights, limiting visibility. Entering the stand improves inspection quality but exposes operators to significant safety risks.

To overcome these limitations, CRM Group developed a **mobile inspection cart equipped** with advanced optical components, including cameras, lenses and integrated lighting. This solution enables detailed visual inspections without requiring operators to enter hazardous areas.



## Efficient monitoring of sinter strands to support maintenance and reduce energy consumption

As the steel industry transitions toward direct reduction routes, existing assets such as **sinter strands** must remain reliable and energy-efficient throughout their remaining lifetime.



Once implemented online, this solution will enable continuous monitoring of air leaks, facilitating targeted maintenance actions, improving energy efficiency and extending equipment lifetime.

Building on its well-established sintering models and industrial measurement capabilities, CRM Group is developing a new digital tool to support sinter strand maintenance. The system uses existing continuous measurements to identify piping segments with the highest air-in leakage, a major driver of increased power consumption.

# Sustainable pickling

The development of new steel grades for the automotive industry, along with the decarbonisation of steel production, introduces process challenges, including difficulties during pickling.

**The Picklean pilot line** is a unique tool designed to support our industrial customers in determining optimal processing parameters and evaluating the influence of alloying and residual elements on the pickling process.



The modular and versatile pilot enables pickling of representative steel panels of 200×300mm<sup>2</sup> through immersion, spray or high turbulent conditions.

Among others, the line is perfectly dedicated for evaluating:

- ✓ **New process actuators** and compare the benefits to the current standard process
- ✓ The **influence of tramp or alloying elements** on the pickling process and kinetics

# CONSTRUCTION

The construction industry plays vital role in society, both in terms of economical backbone and societal solutions.

Although part of this sector is globalized at the international level, it contributes significantly to the local activity of regions and communities.



MICHAEL GREMLING

# Structural optimization & advanced forming

## Cold roll forming expertise

Cold roll forming plays a central role in the production of steel profiles for construction applications.

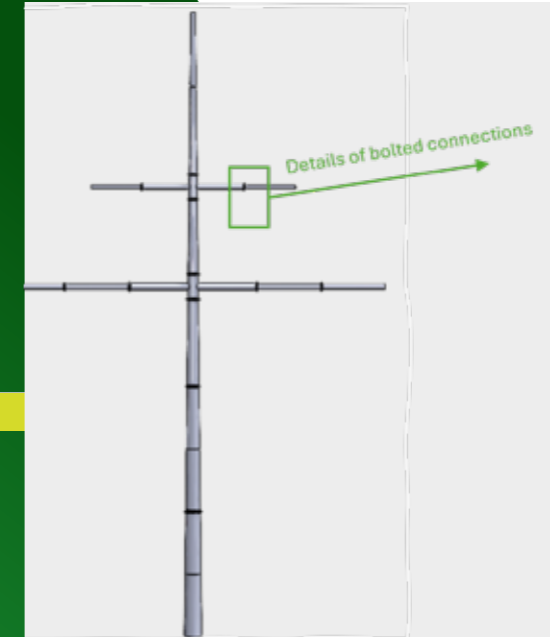
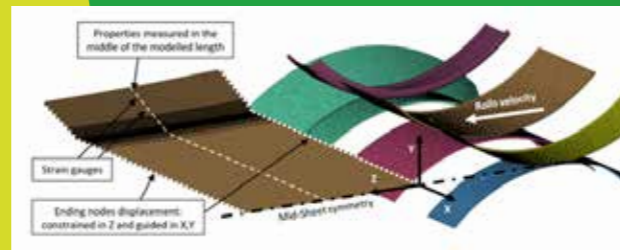
CRM Group provides advanced modelling and experimental expertise to support manufacturers in optimizing forming processes and final product performance.

A cost-effective Finite Element (FE) model dedicated to cold roll-forming processes in industrial settings - thoroughly correlated with the results of two full-scale experimental test campaigns - delivers precise predictions of key parameters such as:

- ✓ Material strain
- ✓ Spring-back behavior
- ✓ Profile shape defects
- ✓ Load distribution on the forming equipment

Our service includes also the possibility to assess the steel grade influence on the cold roll-forming lines in terms of loads on the machine and spring-back of the metal sheet.

This expertise ensures reliable production, improved dimensional accuracy and enhanced structural efficiency.



## Structural optimization for safer and more efficient designs

CRM Group supports structural optimization projects aimed at reducing weight while maintaining safety margins and compliance with Eurocodes by using High Strength Steels (HSS).

By combining numerical simulations and experimental testing, we help clients:

- ✓ Improve load-bearing capacity
- ✓ Optimize material distribution
- ✓ Validate innovative design concepts

These activities directly contribute to cost-efficient and sustainable construction solutions and have been applied amongst others on **solar structures, carports, pylons, wind towers, silos, racking systems.**

# Fire safety engineering & testing

**Fire hazards** are a major concern for the construction industry, but also for many other sectors, not least because of the material, environmental and economic damage they can cause, but above all because of the danger they represent for human lives.



With many years' experience in the field of fire protection in buildings, CRM Group offers expertise in:

- ✓ **Reaction to fire and fire resistance** of construction products and building elements
- ✓ **External fire exposure to roofs tests**
- ✓ The study of the **collapse of structures** subjected to fire.
- ✓ Supporting **customers in carrying out large-scale** certification tests in external laboratories in Belgium and abroad.

In addition to these construction-related topics, CRM Group is also active in a number of other areas, such as **fire testing of valves**, and analysis of **high-temperature behavior** of materials. CRM Group can also study the **development of specific test benches on request**.

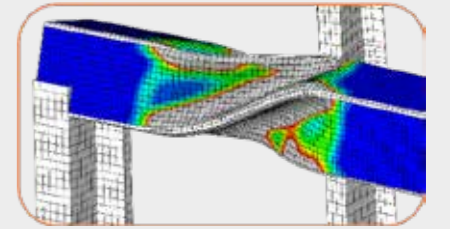
## Lightweight & high-performance steel solutions

### Enabling long-span steel decks with high-strength steels

The construction sector is increasingly seeking lighter, more efficient structural systems capable of spanning longer distances while maintaining performance and safety.

CRM Group contributes to the development of **lightweight long-span steel decks using high-strength steels**, enabling optimized structural designs with reduced material consumption.

Through structural modelling, laboratory testing and validation, our teams assess mechanical performance, serviceability and stability supporting manufacturers in developing next-generation steel deck systems.



These solutions contribute to:

- ✓ Material efficiency
- ✓ Reduced structural weight (up to 18%)
- ✓ Improved sustainability of building systems
- ✓ Lightweight yet robust solutions
- ✓ Easier handling and assembly
- ✓ Lower global carbon footprint
- ✓ Overall cost optimization

## Building physics & performance assessment

Energy efficiency, water protection and indoor comfort are central to modern building performance. CRM Group provides building physics expertise to **evaluate thermal, acoustic and hygrothermal behavior of construction systems**.

By combining **modelling and experimental validation**, we help ensure long-term reliability and compliance with performance expectations.



# Certification & regulatory compliance

Supporting  
compliance  
with EN 1090

The EN 1090 standard guarantees the **safety, stability and quality** of metal structures incorporated into constructions, by limiting the risks of failure, collapse or accident.

**CRM group** has a wide range of skills within its teams to help companies meet these requirements.

**Our welding engineers** and welding coordinators can help companies to :

- ✓ Determine the Welding Procedures Qualification Records (WPQR) required on the basis of drawings
- ✓ Find the optimum welding parameters
- ✓ Write the Welding Procedures Specifications (WPS)
- ✓ Qualify welding procedures and welders

**Our Non-Destructive testing (NDT) team** has Level II operator certification for various techniques and is available to :

- ✓ Define the tests to be carried out (techniques to be used, percentage of welds to be tested, etc.)
- ✓ Carry out the tests in our laboratories or on site





**KEY  
PROJECTS**

# Phase Change Materials (PCM) for thermal management.

Phase Change Materials (PCM) represents a key technological **solution for passive thermal management in constrained environments**. Their ability to absorb, store, and subsequently release large amounts of thermal energy at an almost constant temperature makes them particularly well suited for the thermal stabilization of sensitive systems.

For several years, the CRM Group has developed recognized expertise in the field of PCM systems, covering **the entire value chain, from design through to functional integration** into application-oriented systems.

Developments are systematically **supported by comprehensive test campaigns** to validate performance under conditions representative of the intended applications.

Applications are primarily focused on the space and defense sectors. The participation onboard the inaugural flight of Ariane 6 represents a **validation under real operating conditions** within one of the most demanding environments.

Building on this success, CRM Group has recorded its first private collaborations in the field of PCM.

Building on these advances, CRM Group is actively pursuing the expansion of application fields for its PCM technologies. The **space and defense sectors** are currently receiving particular attention.

## HURRICANE

### Unlocking industrial waste heat for a more efficient and sustainable energy system

Steelmaking is energy-intensive and with it a huge amount of heat is released; heat that is until recently often lost.

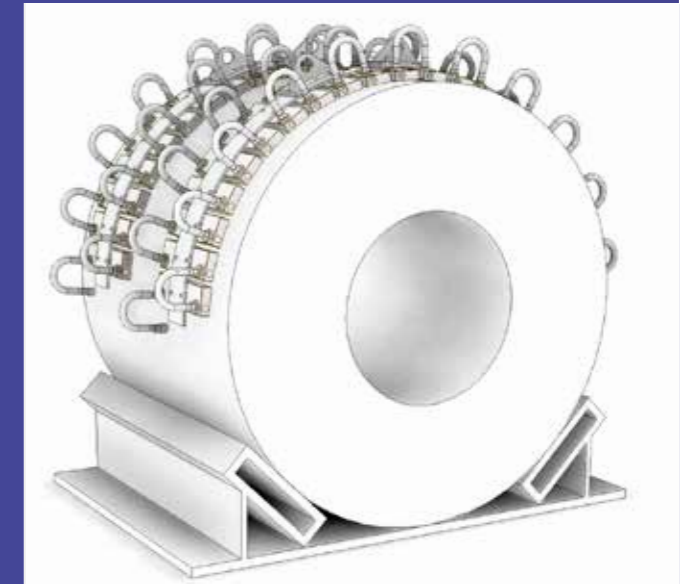
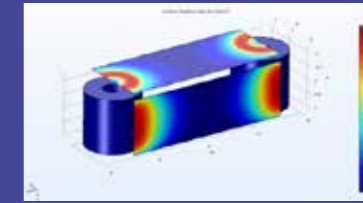
With cutting-edge technologies HURRICANE is **recovering and reusing residual heat** at ArcelorMittal Belgium's Ghent site helping reduce energy, water, and material consumption.

CRM Group's ambition in the project is **to recover the heat from hot rolled coils** at the exit of the hot strip mill. **Two new heat exchanger concepts** were developed.

The first concept is a radiative heat exchanger using **innovative heat-collecting panels** installed along the coil transport tunnel. These panels capture the radiative heat and transfer it to a fluid through internal piping. High-emissivity coatings were tested to improve heat absorption.

The second concept is a **conductive heat exchanger** based on direct contact with the coil surface to further recover the heat during cooling.

During the past year, **the heat exchangers were designed, built, and tested at laboratory scale**. The laboratory results showed good potential for high temperature heat recovery and the scale-up to industrial conditions for pilot testing at ArcelorMittal Ghent is underway.



## SEATBELT

### Disruptive research for next-generation batteries

The SEATBELT project aims to develop **solid-state lithium battery** modules for both mobility (electrical vehicles) and stationary (e-bus) applications.

The all-solid-state lithium battery produced through solvent-free extrusion and lamination combines several **innovative materials**: a thin lithium metal anode, a hybrid electrolyte formed in-situ, a safe cathode material free of critical elements (LiFexMn1-xPO4, or LFMP), and an ultra-thin aluminum cathode current collector.



This **new, sustainable concept** focuses on reducing the use of critical raw materials, improving electrochemical stability, and increasing durability. For example, using a thin lithium film instead of laminated extruded sheets lowers material use in the anode. An anolyte layer and specially designed current collector coatings help maintain performance even at high voltages.

CRM Group develops the **lithium film by vacuum evaporation and deposition** onto copper substrates or directly onto the hybrid electrolyte. Direct deposition improves the interface between materials and reduces the overall battery weight.

To make lithium compatible with the solid electrolyte, an interlayer is applied to the hybrid. Optimizing deposition parameter - such as thickness, density, surface roughness, and morphology - has **improved the battery's electrochemical performance.**



## DILAPRO

### Digital twin technologies for advanced additive manufacturing



Additive manufacturing is increasingly used to produce high-value metallic components with complex geometries.

However, ensuring consistent quality during the printing process remains a major challenge, particularly for critical industrial applications.

The **DILAPRO project** aims to develop a digital twin of the metal additive manufacturing process, enabling real-time monitoring and quality control during production. By combining advanced sensing technologies, data analytics and machine learning, the project seeks to better understand the complex interactions occurring during the printing process.

At CRM Group, the research focuses on integrating advanced sensors into the **HYMAX Direct Energy Deposition (DED) pilot line**. The system includes coaxial infrared cameras to monitor melt pool temperature, a profilometer for dimensional measurements and environmental sensors to ensure stable printing conditions.



## PUREZINC : Recovering valuable metals through innovative recycling technologies.

The increasing demand for critical metals and the growing volume of industrial residues are driving the development of new recycling technologies capable of recovering valuable materials from complex waste streams.

The **PUREZINC project** focuses on the recovery of zinc and other valuable metals from industrial residues using an innovative vacuum-based metallurgical process. This technology makes it possible to selectively extract metals from residues that are traditionally difficult to recycle, thereby contributing to a more circular and resource-efficient industry.

The results obtained during the experimental campaigns significantly improved the understanding of the process and confirmed its potential for industrial application. Discussions are currently ongoing with industrial partners to support the next phase of development and the construction of a first industrial pilot unit.

By enabling the recovery of valuable metals from industrial residues, PUREZINC contributes to **reducing waste, securing raw material supply and strengthening the circular economy within the metallurgical industry.**

Within the project, CRM Group developed and operated a pilot installation designed to validate the process under representative operating conditions. Building on previous research, the pilot equipment was adapted to test key technological principles and confirm the feasibility of scaling the process toward industrial deployment.



# Application of Life Cycle Assessment (LCA)

Environmental impact evaluation is taken into consideration as a transversal activity at CRM Group and therefore life cycle analyses have been conducted for different projects :

## A quantitative LCA to evaluate the environmental impacts of repairing a Reactor Coolant Pump diffuser by Laser Cladding

The LCA aimed to compare the environmental impacts of this repair method with those associated with complete part replacement.

The results showed that transportation had the highest CO<sub>2</sub> impact followed by preparation and finishing machining steps.

It was also the main contributor to fossil resource use and acidification. Replacing the diffuser was expected to have much higher impacts due to the long 5-year production time and multiple international transports.

## In-depth analysis of energy consumption and carbon footprint in ferroalloy production

The study aims at highlighting the key parameters for assessing the carbon footprint of major ferroalloys (FeCr, FeNi, FeMn and FeSi) for steel makers.

The results showed that a set of parameters influences the carbon footprint of ferroalloys and these parameters vary depending on the type of ferroalloy.

Therefore, for a steelmaker, it is difficult to directly assess the carbon footprint based only on the quantity of elements in the alloy, especially when the alloy comes from different suppliers located in various countries.



Other studies are ongoing related to the assessment of the environmental impact of the processing or rare earth cobalt and vacuum airlock systems aiming at assessing the impact of a reduced number of pumps.

# Aeronautics, space & defense: where our technologies meet new frontiers



CRM Group's expertise in advanced materials, surface engineering, thermal management and manufacturing technologies extends well beyond its traditional industrial base.

The capabilities developed to address the demanding requirements of the steel, energy and circular economy sectors have proven highly relevant to the **aerospace, space and defense industries**, where performance, reliability and precision are non-negotiable.

From **Phase Change Material (PCM) systems** validated on board the inaugural flight of **Ariane 6**, to large-scale additive manufacturing, laser cladding, cold spray repair technologies, **functional coatings for infrared signature control**, and **printed electronics for embedded sensing**, CRM Group brings a comprehensive and field-tested portfolio to mission-critical applications.

Through close collaboration with partners such as **Safran, Sonaca, ESA, John Cockerill, FN Browning** and the **Royal Military Academy**, CRM Group is establishing itself as a trusted research partner for industries where technological excellence and operational reliability are essential.

# Services

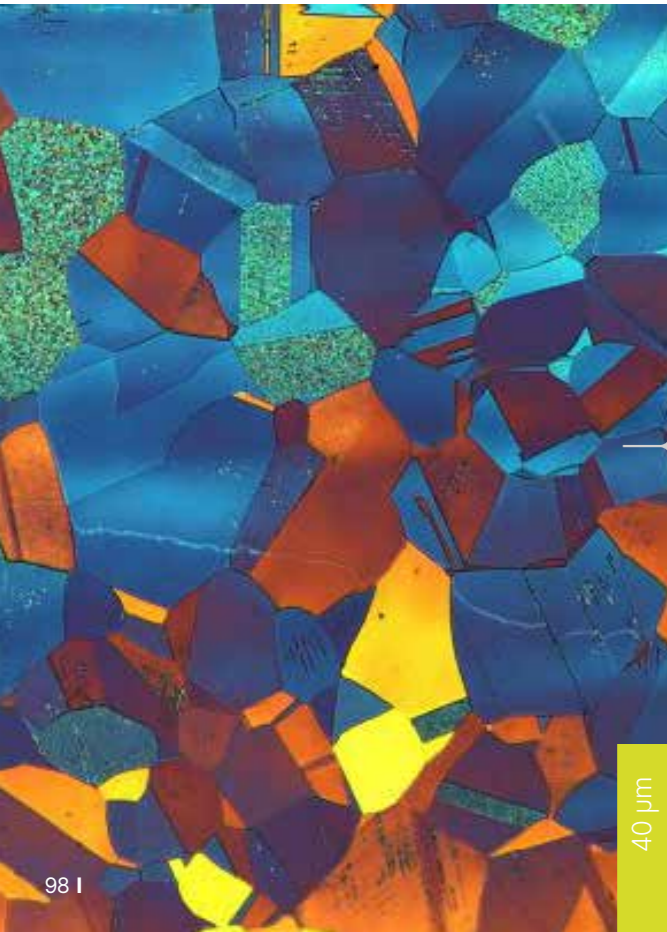
# &

# expertise

Whether you want **to optimize** an existing **product or process** or have **an innovative idea**, at CRM Group we are capable of **supporting you** at different stages of your project. We help you navigate from a blank page or a complex challenge to an economically viable solution through a wide range of characterization, testing and simulation tools.

**Our extensive experience in funding mechanisms** opens opportunities for additional financial leverage to realize your project.

# Materials characterization: from macro to nano scale



40 μm

CRM Group provides advanced material analysis services through **three specialized laboratories: chemical characterization, optical analysis, and mechanical testing.** This comprehensive setup allows us to assess raw materials, by-products, and various metallic samples, whether coated, uncoated, and in different physical forms at every stage of development or production.

Our services contribute to selecting the most appropriate materials for a given application, improving performance, reducing costs, ensuring easier processing and installation, and minimizing potential risks. For several of these materials' characterization techniques, **CRM Group is ISO 17025 accredited.**

## Complex material properties expertise



Beyond standard mechanical or surface characteristics, **CRM Group offers advanced expertise in assessing complex in-use properties** such as weldability, corrosion resistance, formability, and resistance to external influences like UV radiation, extreme temperatures, pressure, and fire.

We regularly conduct mechanical tests and in-service performance evaluations that fall outside conventional frameworks. For example, **we perform fatigue testing with variable amplitude or creep and crack propagation behavior in complex environments (molten salt, hydrogen, ...).**

These properties are evaluated through dedicated testing combined with additional techniques in electrochemistry, surface analysis, real-environment exposure, and physical metallurgy. The closer the test conditions are to actual service environments, the more accurate and relevant the outcomes are for practical applications.

## Salt spray and UV exposure laboratory



Specifically for in-use evaluation of surface-related properties, such as corrosion resistance or behavior under specific weathering conditions, CRM Group provides a complete set of capabilities. **These include advanced electrochemical testing**, as well as access to **one of the largest salt spray and UV exposure laboratories in Europe**.

In addition, we operate several test locations for **outdoor exposure under natural conditions**. When a part is damaged through corrosion or a combination of environmental and mechanical stress, **our material experts can reconstruct the contributing factors through post-mortem analysis** and provide recommendations for improvement.

Specific expertise in **stress corrosion cracking has been developed, especially for aerospace applications**.

## Force cell calibration and infrared pyrometer laboratory

At CRM Group, we offer both on-site and off-site calibration services for tensile and compression testing machines, as well as their load cells. Additionally, we operate a state-of-the-art infrared pyrometer calibration laboratory.

In our pyrometer calibration laboratory, we utilize **three highly stable black body furnaces** (with emissivity better than 0.998), **two standard pyrometers**, and **one standard platinum resistance thermometer**.

Ensuring the accuracy of measurement tools used in production and **quality control is essential for delivering high-quality products to your customers**.



This setup allows us to cover a unique temperature range from 50°C to 1600°C. We calibrate all brands and models of infrared pyrometers, including short and broad wavelength pyrometers, two-color and multi-wavelength pyrometers, as well as line scanners and thermographic cameras.

Our current accredited range covers temperatures **from 300°C to 1600°C, in accordance with ISO/IEC 17025**.

# Knowledge sharing

&

# Visibility



## 2025 Rolls Technology Committee's Best Paper Award



This recognition honors this paper "A Team Effort to Solve Strip Surface Quality Issues from Hot Rolling Critical Applications", presented at **AISTech 2024** in Columbus, Ohio.

The paper, developed in collaboration with **ESW** and **Tata Steel IJmuiden**, addresses the formation of orange peel on rolled strip surfaces and presents the development of a new roll shell material combining laboratory testing, on-site validation and collaborative research.

This award reflects both the quality of the work carried out at CRM Group and the value of cross-industry partnerships in advancing steel technology.



The moments of exchange went beyond simple knowledge dissemination, creating spaces where ideas, technologies and partnerships could take shape.

Several workshops focused on **high-value technological themes**. Events such as the SmartCool Workshop brought together experts and industrial partners around advanced cooling solutions, enabling discussions on performance, energy efficiency and future applications.

At the same time, we are proud to see our colleague **Mohamed Krid** selected among the finalists of the **Rising Star Award 2025**, announced during the YOUNG VOM event.

His project on the **regeneration of aerospace pickling baths**, aimed at extending bath lifetime while reducing chemical waste and operational costs, perfectly illustrates CRM Group's ambition to combine **technological excellence with sustainability in industrial processes**.

Similarly, participation in an **ESA workshop**, in connection with **European Space Agency**, highlighted CRM Group's involvement in cutting-edge technological ecosystems linked to space and advanced materials.

In 2025, CRM Group actively contributed to numerous workshops and conferences, reinforcing its role as a **platform for dialogue between research, industry and institutions**.



Collaboration and networking were also at the heart of initiatives such as the **Nordic-Walloon Research & Innovation mission**, hosted at CRM Group. This mission provided a framework for exchanges between Nordic and Walloon actors, combining visits, presentations and discussions aimed at identifying new opportunities for cooperation in applied research and industrial innovation.

CRM Group also hosted and co-organized thematic events such as the **GRD Workshop 2025**, bringing together industrial partners, technology providers and researchers.

This workshop illustrated how applied research can support concrete industrial challenges, notably in advanced manufacturing and circular economy, while fostering long-term collaboration within industrial ecosystems.

**Beyond technical and industrial topics, CRM Group paid particular attention to transversal & strategic dimensions.**



Through these workshops and conferences, CRM Group reaffirmed its commitment to **knowledge sharing, collaboration and impact**, ensuring that innovation remains closely connected to industrial reality.

CRM Group also strengthened its presence in the **aerospace, space and defense** ecosystem through participation in major international events.

At the **Paris Air Show (Le Bourget)**, CRM Group showcased its capabilities in advanced manufacturing and surface engineering to a global audience of aerospace and defense stakeholders.

At **Formnext**, the leading international forum for additive manufacturing, CRM Group highlighted its metal printing technologies and their relevance for high-value industrial and defense applications.

CRM Group also took part in **AM Village**, the European Defence Agency's dedicated workshop bringing together armed forces, industry and academia around additive manufacturing for military logistics and operational support.

## Industrial Use of hydrogen - Decarbonation of steel production

**X. Vanden Eynde**

Winter School 2025: H2 Production and Use, 27 - 31 January 2025, LaboThAp Liège, Belgium

## Evaluation of the carbon footprint of ferroalloys used in stainless steel manufacturing

**N. Hashemi, G. Lannoo, B. Vanderheyden, L. Fourdrinier, S. Belboom**

8th meeting of the FNRS LCA Contact group, 28 January 2025, University of Liège, Belgium

## Direct Energy Deposition (DED) of a new high strength aluminium alloy

**N. Jimenez**

4th ESA workshop on Advanced Manufacturing, ESA-ESTEC, 4-6 March 2025, Noordwijk, Nederland

## Development of new titanium alloys for additive manufacturing

**S. Nardone, N. Jimenez**

4th ESA workshop on Advanced Manufacturing, ESA-ESTEC, 4-6 March 2025, Noordwijk, Nederland

## ZHyRON project: Valorization of iron-rich & Zinc-containing steelmaking by-products via Hydrogen-based Reduction

**T. Marcon, B. Mignon**

ESTEP & FEhS: Slag Workshop, 5-6 March 2025, Duisburg, Germany

## Jet Vapor Deposition: The Choice for Zn Coatings of Future Steels for Automotive

**M. Boyer, L. Goiset, A. Csay, N. Amimi, S. Pace, E. Silberberg**

3rd Automotive Steel International Conference, 9-12 March 2025, Orlando, Fla., USA, 10.33313/200/018

## Printed and 3D electronic under severe environments

**P. Guaino**

ESA workshop on advanced manufacturing of electronics, 10-11 March 2025, UK

## SMART SURFACES - Workshop Ideation - Skywin & LiEU

**J-F Vanhumbbeeck**

ECOLYS, 18 March 2025, Namur, Belgium

## Les verrous qui bloquent l'innovation et comment les lever

**J-F Delaigle, J-C Peterkenne, J. Neutjens, L. Bonjean, A. Vereecke**

Innovating together: from research to industry, 27 March 2025, Liège, Belgium

## Technologie-infrastructure : caractérisation des matériaux destinés au secteur de l'hydrogène

**M. Larnicol, C. Archambeau**

Innovating together: from research to industry, 27 March 2025, Liège, Belgium

## Compétence & expertise : Dépôt de revêtements métalliques à haute performance par laser cladding

**G. Walmag**

Innovating together: from research to industry, 27 March 2025, Liège, Belgium

## Derisking - test before invest expertise : Infrastructures à disposition des PME actives dans l'aéronautique

**N. Nutal**

Innovating together: from research to industry, 27 March 2025, Liège, Belgium

## Derisking - test before invest: Expertise au service de la valorisation des déchets métalliques

**A. Rassili**

Innovating together: from research to industry, 27 March 2025, Liège, Belgium

## Technologie-infrastructure: Infrastructures de pointe pour le développement et l'optimisation des technologies énergétiques

**D. Garot**

Innovating together: from research to industry, 27 March 2025, Liège, Belgium

## Compétences et expertises: La réparation de pièces mécaniques de haute valeur

**C. Georges, N. Jimenez**

Innovating together: from research to industry, 27 March 2025, Liège, Belgium

## Hurricane: 'Harnessing Industrial Waste Heat for Resource Efficiency and Circular Economy'

**B. Vervaeet**

Hubs4Circularity: 3rd H4C Community of Practice Webinar, 2 April 2025, Belgium

## Use of model and pilot scale plasma furnace to assess the next-gen DRI-EAF slags

**T. Marcon, A. Hosseini, J-C Pierret**

Slag Valorisation Symposium, 8-11 April 2025, Leuven, Belgium

## FULLRECO4US COST action

**A. Rassili**

Final meeting and conference of COST Action 20133 FULLRECO4US, 5-7 May 2025, Basel - Switzerland

## Environmental impacts using life cycle assesment (LCA) of repairing a reactor coolant pump (RCP) diffuser by laser cladding vs. replacing the part (Poster)

**N. Hashemi, C. Georges, N. Jimenez, Y. Derrienic, S. Belboom**

Society and Materials International Conference, 6-7 May 2025, Madrid, Spain

## Jet Vapor Deposition (JVD): The Obvious Future Choice for Zinc Coating of Steel

**M. Boyer, L. Goiset, A. Csay, N. Amimi, S. Pace, E. Silberberg**

AISTech 2025 — Proceedings of the Iron & Steel Technology Conference, 5-8 May 2025, Nashville, Tenn., USA, DOI: 10.33313/389/173

## A cost-effective cold roll-forming FE model for industrial applications

**T. Senart, M. Gauchey, E. Dupont, C. Cofano**

The 28th International ESAFORM Conference on Material Forming – ESAFORM 2025, Materials Research Proceedings 54 (2025) 989-994, 7-9 May 2025, Paestum, Italy

## Oxy-combustion of coke breeze for integrated dry reforming for steelmaking decarbonization

**I. Luzzo, E. Faraci, M. Gili, D. Ressegotti, C. Morelli, L. Micheletti, D. Garot**

47th Meeting of the Italian section of the combustion institute, Advancing Combustion for a Sustainable and Low-Carbon Future, 12-15 May 2025, Pisa, Italy

## Circularity Enhancement by Low Quality Scrap Analysis and Refinement (CAESAR)

**J-C Pierret**

JRC1st INCITE sectoral workshop on Innovative Techniques - INCITE hybrid workshop for iron and steel, 13-15 May 2025, Sevilla, Spain

## Projects and pilot equipment at CRM group for full assessment of CCUS options in complex industrial plants

**J. Borlée, R. Close, L. Lopez, V. Deveen, D. Garot**

Flanders Metals Valley Seminar: 'Seminar on Carbon Capture', 14 May 2025, PWC Belgium, Diegem, Belgium

## Green Hydrogen R&D ecosystems: opportunities and targets

**C. Archambeau**

S3 DIS4 - Energy Innovator Event, 15 May 2025, Thor Park Energyville Genk, Belgium

## A cost-effective cold roll forming FE model for industrial application

**T. Senart, M. Gauchey**

NAFEMS World Congress 2025, 19-22 May 2025, Salzburg, Austria

## 50 Shades of Minerals: Extending & Improving Mineral Resource Lifespans: Opportunities, Challenges, and Future Perspectives - GreenWin Event

**L. Fourdrinier, A. Rassili, B. Vanderheyden**

WIN4C – Walloon initiative for Circular Materials, 21-22 May 2025, Mons, Belgium

## On the repair of industrial steel parts with a robotized Directed Energy Deposition system

**N. Jimenez, C. Georges, Y. Derrienic, X. Pitoiset**

Additive Manufacturing Conference 2025, 27-28 May 2025, Leuven, Belgium

## Manufacturing of a large Launch Interface Ring via Laser Metal Deposition

**N. Jimenez, P. Dufour, H. Hernandez**

Additive Manufacturing Conference 2025, 27-28 May 2025, Leuven, Belgium

## The Steel Industry's pathway to decarbonisation

**G. Lannoo**

EUIndTech2025 Conference, 2-4 June 2025, Krakow, Poland

## Laser beam welding of additive manufactured (L-PBF) aluminium AISi7Mg0.6 and AlZn5.5MgCu: Welding process development and weld seam properties

**B. Keßler, T. Kairet, O. Rigo, P. Billy, P. Svarova, D. Dittrich**

LiM Conference 2025 Lasers in Manufacturing, 23 - 26 June 2025, Munich, Germany

## Réparation de composants métalliques au moyen de technologies de dépôt direct robotisées

**C. Georges, N. Jimenez, N. Hashemi, X. Pitoiset, Y. Derrienic**

Forum France Additive – La FA pour une industrie profitable et durable, 1-3 July 2025, Strasbourg, France

## Direct Energy Deposition of Aluminum: From alloy development to component printing and repair applications

**N. Jimenez**

Mena Forum France Additive – La FA pour une industrie profitable et durable, 1-3 July 2025, Strasbourg, France

**Revamping and operation of a CO2 capture pilot by amine absorption in simulated industrial conditions at CRM Group**

**R. Close, J. Borlée, L. Lopez de Leon**  
IEAGHG 8th Post Combustion Capture , 16 - 18 September 2025, Marseille, France

**BURWEAR – Modelling and reduction of back-up roll degradation in cold and temper mills**

**H. Bolt, S. Flament, Prof. M. de Rooij, P. Heisterkamp**  
Hot & Cold Rolling Day Düsseldorf 2025, 1-2 October 2025, Düsseldorf, Germany,

**CirculArity Enhancements by Low Quality Scrap Analysis and Refinement (CAESAR HEUproject)**

**J-C Pierret, J. Reyes Rodriguez, B. De La Pena, H. Priyadarshi, Ph. Russo, F. Guerin, I. Marquez, G. Minelgaite, D. Verbeken, C. Delgado, L. Unamunzaga, D. Garcia, W. Melis, I. Basterretxea, A. Llau, S. Sanchez, F. van de Winkel**

7th European Steel Technology and Application Days 2025 ESTAD, 6-9 October 2025, Verona, Italy

**MetConZero: addressing the metallurgical consequences of residual elements in scrap-based zero-carbon steelmaking**

**C. Georges, R. Jennen, S. Van Bohemen, N. Charbonnier, A. Pachon, K. Zhu, R. Villegas, P. Jacques**  
7th European Steel Technology and Application Days 2025 ESTAD, 6-9 October 2025, Verona, Italy

**EdgerRolls - Advanced manufacturing and improved performances of hot rolling mill edger rolls**

**J. Malbrancke, S. Flament, H. Bolt, D. Beentjes, S. Grosjean, J. Verbrugge, X. Fernandez, J. Antonissen**  
7th European Steel Technology and Application Days 2025 ESTAD, 6-9 October 2025, Verona, Italy

**Investigation on the use of organic acids to pickle the oxide scale of carbon steel hot rolled strips**

**W. Melfo, S. Flament, P. Beentjes, B. van Rookhuizen**  
7th European Steel Technology and Application Days 2025 ESTAD, 6-9 October 2025, Verona, Italy

**High Turbulence Pickling**

**J. Smal, S. Flament**  
7th European Steel Technology and Application Days 2025 ESTAD, 6-9 October 2025, Verona, Italy

**SmartCool - Smart controlled actuator to homogenize the temperature of the transfer bar**

**P. Adriaen, H. Uijtdebroeks, T. De Vriendt, J. Kominek, P. Kotrbacek**  
7th European Steel Technology and Application Days 2025 ESTAD, 6-9 October 2025, Verona, Italy

**On-line steel surface contamination monitoring with LIBS-based sensor**

**D. Egner, T. Gossuin, W. Smailes**  
7th European Steel Technology and Application Days 2025 ESTAD, 6-9 October 2025, Verona, Italy

**The SMART project: recycling of plastics and waste materials in TORERO to substitute more coal injection in the blast furnace**

**D. Garot, B. Cabeza, G. Rivière, J. Borlée, B. Riems, W. Van der Stricht**  
7th European Steel Technology and Application Days 2025 ESTAD, 6-9 October 2025, Verona, Italy

**Sector-coupling hub for circular use of thermal and industrial waste (HURRICANE)**

**P. Alboort, J. Bauwens, H. Uijtdebroeks, B. Vervaeet, J. Van Bael**  
7th European Steel Technology and Application Days 2025 ESTAD, 6-9 October 2025, Verona, Italy

**Investigation of the reoxidation behaviour of Hot Briquetted Iron (HBI) samples produced on a laboratory scale**

**F. Van Loo, F. Fehse, V. Herdegen, J. Eisbacher-Lubensky, L. Schmidt**  
7th European Steel Technology and Application Days 2025 ESTAD, 6-9 October 2025, Verona, Italy

**Corrosion protection in the steel industry: pre-phosphating and phosphating**

**P. Harlet**  
A3TS Conference: Wet surface treatments: properties and applications, 16 October 2025, Mons, Belgium

**Electronics printed on 3D Surfaces for Large-Area and Harsh-Environment Applications**

**M. Arseenko**  
The Future of Electronics RESHAPED The Flagship Event, 22-23 October 2025, Berlin, Germany

**Operation of a 1 TPD Mobile CO2 Capture Unit Based on Cryogenic Desublimation in Heavy Industry Plants in Belgium**

**L. Lopez de Leon, J. Borlée, R. Close, C. Robin, A. Aubert, E. Bever**  
ESTEP annual event 2025, How decarbonisation, digitisation and circular solutions forge the sustainable European steel future, 28 - 30 October 2025, Udine, Italy

**Upscaling at CRM to support EU iron- & steelmaking de-carbonization and circular economy roadmaps**

**F. Van Loo, J. Borlée**  
ESTEP annual event 2025, How decarbonisation, digitisation and circular solutions forge the sustainable European steel future, 28 - 30 October 2025, Udine, Italy

**CirculArity Enhancements by Low Quality Scrap Analysis and Refinement (CAESAR HEUproject)**

**J-C Pierret, J. Reyes Rodriguez, B. De La Pena, H. Priyadarshi, Ph. Russo, F. Guerin, I. Marquez, G. Minelgaite, D. Verbeken, C. Delgado, L. Unamunzaga, D. Garcia, W. Melis, I. Basterretxea, A. Llau, S. Sanchez, F. van de Winkel**  
European Steel Scrap and Circular Economy Forum 2025, 13-14 November 2025, Düsseldorf, Germany

**Launch Interface Ring via Laser Metal Deposition**

**N. Jimenez**  
Workshop Laser et applications en sciences des matériaux, en métrologie, dans la recherche spatiale et dans l'industrie, 13-14 November 2025, Mons, Belgium

**New CRM Group's upscaling capabilities at the service of industrial symbiosis – applications in steel and zinc sectors**

**L. Fraikin**  
Prometia Scientific Seminar 2025, 24-28 November 2025, Naples, Italy

**Energy efficiency and energy recovery technologies**

**B. Vanderheyden**  
The Future of EU Steel Research - How to foster EU steel leadership, 26 November 2025, Mönchengladbach, Germany

**Boosting competitiveness**

**G. Lannoo**  
The Future of EU Steel Research - How to foster EU steel leadership, 26 November 2025, Mönchengladbach, Germany

**AM Village 2026**

**A. Rassili**  
AM Village 2026 1st Preparation Meeting , 21-23 October 2025, Albacete, Spain

**Four à plasma - Un nouvel outil unique en Wallonie au service de l'économie circulaire des métaux**

**L. Fraikin**  
CESE Wallonie, Rapport d'évaluation de la politique scientifique 2024, 30 January 2025, pp. 41-42

**Lightweight long span decks by HSS grades Based on the use of cold-formed steel trapezoidal profiles**

**E. Dupont, M. D'Antimo, C. Cofano**  
Leichte Decken mit großer Spannweite mit HSS-Sorten. Stahlbau 94, H. 12, S. 765-770 (2025)

**Towards High Speed Galvanizing – Mastering Wiping Conditions Using Hydrodynamic Pads Strip Stabilization**

**O. Brégand, Y. Hardy, P. Gerkens, J-C Golinval, S. Hoffait, M. Bertha, D. Simon, P. Briault and J. Van Eenennaam**  
CORROSION SCIENCE AND TECHNOLOGY, Vol.24, No.2(2025), pp.76~85

**A Team Effort to Solve Strip Surface Quality Issues from Hot Rolling Critical Applications**

**S. Flament, M. Aigner, D. Beentjes, H. Bolt, A. Paar, L. Elizondo**  
Association for Iron and Steel Technology (AIST), February 2025, pp. 76-85

**Development of a New Online Sensor for Steel Surface Contamination**

**D. Egner, T. Gossuin, W. Smailes**  
Association for Iron and Steel Technology (AIST), 2025, pp 1989-1996

**Comprehensive assessment of time of wetness on coil-coated steel sheets**

**M. Hoseinpoor, T. Prošek, J. Mallégo**  
Corrosion Science, Volume 244, March 2025, 112641

**Coke breeze combustion and cog dry reforming pilot plant development for the production of hot hydrogenrich syngas in integrated plants for injection in the blast furnace and CO2 mitigation (ProSynteg)**

**E. Faraci, M. Gili, D. Ressegotti, D. Garot, A. Gutierrez, C. Morelli, L. Micheletti**  
La Metallurgia Italiana, AIM, 5 May 2025, p.30-37

**Décontamination & décarbonation au cœur de l'innovation métallurgie**

**J. Neutjens, X. Vanden Eynde**  
Planet Business, Mediaplanet Belgique, Trends Tendances, Transition énergétique 2025

Sustainability &

people

# Our commitment to sustainability

The board of Directors ensures the integration of sustainability into CRM Group's strategy, risk management and daily operations.

Day-to-day governance of ESG matters is entrusted to a dedicated management team, applying a governance framework inspired by the Swarmwise methodology and validated by AKT-CCI institution (the Chamber of Commerce & Industry).

**A CRM Academy ensures that staff are trained in sustainability & a group of 12 Ambassadors**, belonging to most of the sites, carry out activities every month to bring sustainability to life.

Through a systematic sustainability governance and reporting process, including a Double Materiality Matrix, a Carbon Footprint, an Ethical Charter, an ESG smart KPIs in an annual operating plan (CRM GP 2030) and a VSME-aligned sustainability report, CRM Group ensures that **environmental, social and ethical responsibilities** are transparently, compliantly, and accountably managed.



Sustainability is at the heart of the company's values. Thanks to the skills acquired in the Steel Industry for more than 75 years, the CRM Group can offer its partners innovations in societal challenges for a better future such as CO<sub>2</sub> reduction, recycling & nuclear waste recycling, renewable energies, hydrogen, aerospace, aeronautic, industrial water, smart coating, responsible digitalisation, security, ...

## The 2030 Master plan CRM GP with smart KPI's:

**Cyber:** NIS2, cyber awareness & training, responsible digitalization, GDPR

**Resources:** energy-consumption, CO<sub>2</sub>-emission, CO<sub>2</sub>-footprint, water, waste and continue to invest in renewables and resources consumption reduction

**Wo+Men:** employee well-being, talent retention, gender pay gap, training, ...

**"Green" within R&D-Projects:** Expand use of LCA & eco design, increase publications with strong link to SDG's

**UNITAR:** recognised sustainable entrepreneurship certification. CRM Group has achieved certification, following a 3-year programme (2023-2025) and implementing 30 ESG actions across all pillars.

## The 8 most important points identified in the double materiality matrix:



- / Health, safety, well-being
- / Data protection and privacy
- / Human capital development
- / Anticipation and risk management
- / Employee retention
- / Integration of Life Cycle Analysis
- / Agile organization and response to change
- / Company reputation

## Carbon footprint management



PEOPLE,  
& SHARED MOMENTS.

ENGAGEMENT

# Life at CRM Group

Building  
connections  
beyond work



At CRM Group, innovation is driven by people. Beyond research projects and industrial platforms, we cultivate a working environment where well-being, team spirit and shared experiences play a central role in daily life.

Throughout the year, numerous internal initiatives and moments of connection bring colleagues together across sites, roles and disciplines, strengthening a sense of belonging and collective identity.



From informal moments to large-scale gatherings, internal events are key opportunities to reconnect, celebrate achievements and simply enjoy time together.

The Happy Blue Monday has become a recurring highlight, transforming a traditionally gloomy day into a positive and energizing moment through small attentions, shared activities and a collective well-being challenge.

Team spirit also extends beyond the workplace, whether during a friendly **outing to support Standard de Liège**, or through sports initiatives such as the **ELA Jogging**, where colleagues combine physical activity with solidarity and engagement.

## Celebrating milestones together

In 2025, the celebration of the **30th anniversary of CRM Group's Ghent office** held a special place.

Beyond the technological achievements, this milestone was an opportunity to highlight the people behind three decades of commitment, through celebrations, shared stories and moments of recognition that honored both current and former colleagues.



## Commitment to well-being and sustainable mobility

CRM Group actively promotes healthier and more sustainable habits through initiatives such as the Mobility Week, encouraging alternative commuting modes and raising awareness around environmental impact.

In parallel, the implementation of our **Gender Equality Plan (GEP)** reinforces our commitment to fostering an inclusive and respectful workplace.

Through this initiative, CRM Group promotes equal opportunities, diversity and balanced representation within its teams.

These actions reflect a broader commitment to creating a workplace where well-being, responsibility and engagement are embedded in everyday practices.

## A shared culture, a collective strength

Whether through sports, celebrations, cultural outings or simple everyday interactions, life at **CRM Group is shaped by human connections.**

These moments contribute to a positive working environment, foster collaboration across teams and reinforce the collective energy that drives our organization forward.

# CRM Group

&

# ecosystem reach



## Building innovation through strong ecosystems

CRM Group operates within a broad innovation ecosystem that **connects research, industry, public authorities and international partners**.

By working across regional, national and European networks, CRM Group helps **accelerate the development and industrial deployment** of new technologies addressing major industrial and societal challenges.

## Regional & interregional collaboration

In Wallonia, CRM Group actively contributes to several **Strategic Innovation Initiatives (IIS)** launched by the Walloon Region to accelerate industrial transformation. These initiatives foster long-term collaboration between research centers, industry and public authorities around key technological priorities. CRM Group is notably involved in:

**Win4C**, focusing on circular use of materials and resources

**e-WallonHY**, dedicated to hydrogen technologies and the energy transition

**MadeInWal**, supporting advanced manufacturing and industrial digitalization



Beyond these initiatives, CRM Group is closely connected with regional clusters and innovation networks such as Skywin, Mecatech, Greenwin, AKT, and GRE Liège, which foster collaboration between research organizations, companies and public institutions.

In Flanders, CRM Group also contributes to the **Flanders Metal Valley ecosystem**, strengthening cross-regional cooperation and reinforcing Flanders' position in advanced metallurgy and manufacturing.

## A strong European & international presence

Through these initiatives, CRM Group contributes to major European priorities such as industrial decarbonization, advanced manufacturing, sustainable materials and defense technologies.

By combining strong regional anchoring with active European engagement, CRM Group acts as a bridge between **research excellence and industrial application**, helping transform scientific knowledge into industrial impact.

CRM Group also plays an active role in numerous **European research and innovation programs**, including projects funded by the Horizon Europe program, the **Research Fund for Coal and Steel (RFCS)** and collaborations linked to the **European Defence Agency** and other European partnerships.



## AND MOST IMPORTANT A long-term commitment to industry

Beyond individual projects, CRM Group's involvement reflects a broader commitment: **supporting transition toward a more sustainable, resilient and innovative industrial landscape.**

By contributing to these strategic initiatives, CRM Group reinforces its role as a trusted partner for industry and public stakeholders, helping to shape the industrial value chains of tomorrow.

**CRM GROUP**  
takes actively part to  
the following organizations  
and platforms



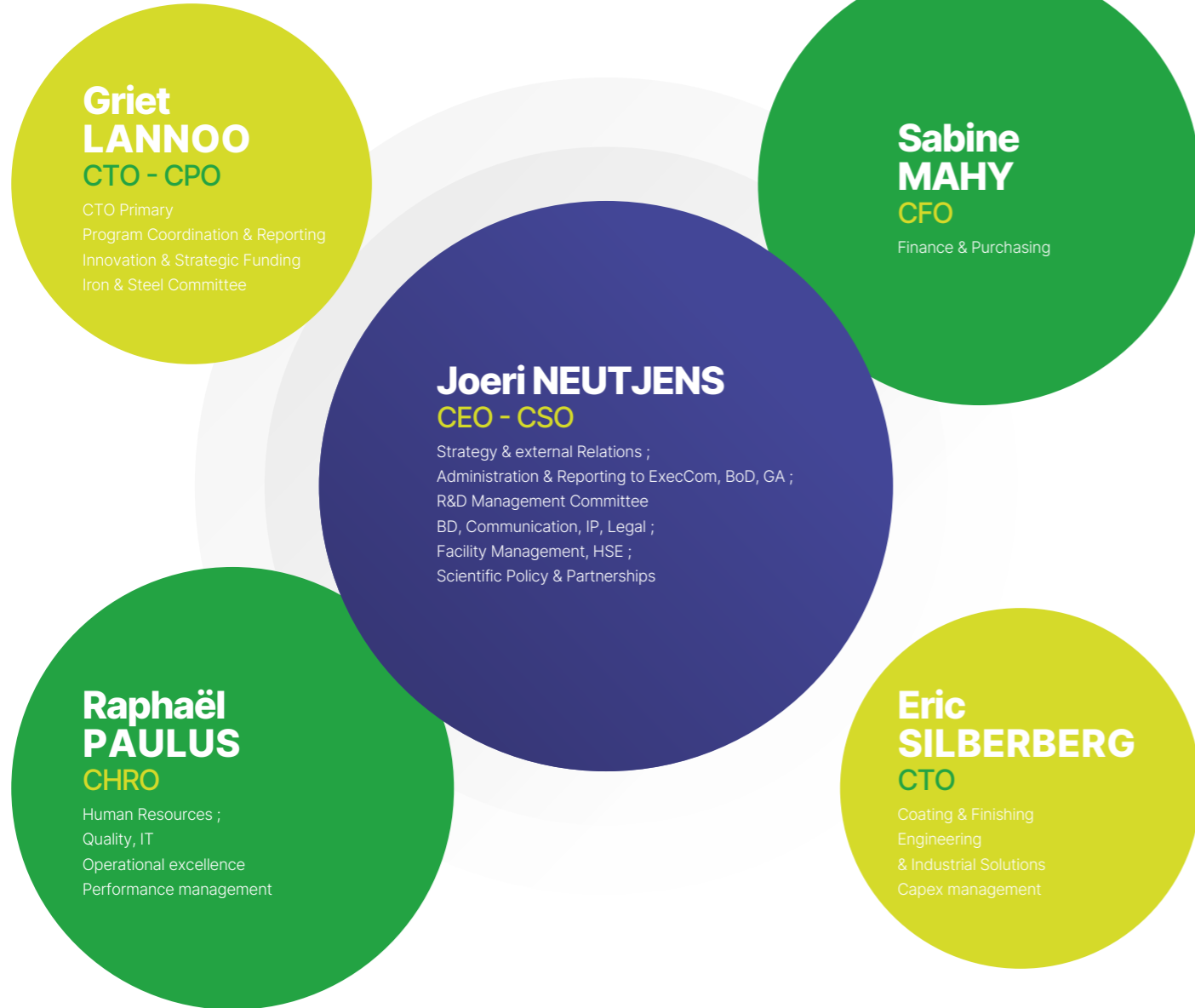
and gratefully thanks  
its industrials members / research  
partners as well as the funding authorities  
for their collaboration & support

# Governance

# organization

&

# LEADERSHIP TEAM



CEO: Chief Executive Officer / CPO: Chief Program Officer / CFO: Chief Financial Officer  
CSO: Chief Scientific Officer / CHRO: Chief Human Resource Officer / CTO: Chief Technical Officer

# Effective members

ARCELORMITTAL .....G.D. Luxembourg  
TATA STEEL Nederland.....The Netherlands

ARCELORMITTAL LUXEMBOURG .....G.D. Luxembourg  
INDUSTEEL BELGIUM.....Belgium

## THE MAIN AFFILIATED COMPANIES ARE:

ARCELORMITTAL :  
ARCELORMITTAL BELGIUM .....Belgium  
ARCELORMITTAL CONSTRUCTION FRANCE.....France  
ARCELORMITTAL FRANCE .....France

## TATA STEEL:

TATA STEEL IJMUIDEN .....The Netherlands  
TATA STEEL NEDERLAND TECHNOLOGY .....The Netherlands

# Associated Members

APRIL 2025

AGC Glass Europe .....Belgium  
AMEPA GmbH .....Germany  
APERAM Stainless France .....France  
AURUBIS OLEN .....Belgium  
BEBLUE CRYOTECH .....Belgium  
BEKAERT .....Belgium  
BIOCARBON INDUSTRIES .....G.D. Luxembourg  
COMET TRAITEMENTS .....Belgium  
DE LEUZE .....Belgium  
DREVER INTERNATIONAL .....Belgium  
DUFERCO .....Switzerland  
EMG Automation .....Germany  
EQUANS .....Belgium  
E.S.W .....Austria  
FN Browning Group .....Belgium  
FONDERIES MARICHAL KETIN & Cie .....Belgium  
HEIDELBERG MATERIALS BENELUX .....Belgium  
HERAEUS ELECTRO-NITE INTERNATIONAL .....Belgium  
HYDROMETAL .....Belgium  
INDUCTOTHERM .....Belgium  
INSTITUT BELGE DE LA SOUDURE .....Belgium  
INTERNATIONAL MANGANESE INSTITUTE .....France

JOHN COCKERILL .....Belgium  
LABORELEC .....Belgium  
LHOIST Recherche & Développement .....Belgium  
MAGOTTEAUX INTERNATIONAL .....Belgium  
NLMK CLABECQ – Plates .....Belgium  
NLMK LA LOUVIÈRE – Strips .....Belgium  
ORBIX SOLUTIONS .....Belgium  
PAUL WURTH .....G.D. Luxembourg  
PHARMA TECHNOLOGY .....Belgium  
PRAYON .....Belgium  
PRIMETALS TECHNOLOGIES AUSTRIA .....Austria  
RECYDEL .....Belgium  
RESA .....Belgium  
SAFRAN AERO BOOSTERS .....Belgium  
SARCLAD .....United Kingdom  
Sonaca .....Belgium  
SUEZ .....France  
TECforLime .....Belgium  
THY-MARCINELLE .....Belgium  
TI GROUP AUTOMOTIVE SYSTEMS .....Belgium  
TMT .....G.D. Luxembourg  
WESTINGHOUSE ELECTRIC BELGIUM .....Belgium

# ORGANIZATION

ON APRIL 15 2025

## Board of Directors

### President

**Thinus VAN DEN BERG, CFO** ..... Global R&D, ARCELORMITTAL

### Vice-Presidents

**Pedro PRENDES** ..... Global R&D Process Portfolio Leader, ARCELORMITTAL

**Hans VAN DER WEIJDE** ..... Director Programmes TATA STEEL

### Directors

**Ivan AERTS** ..... Diensthoofd studiedienst, Centrale der Metaalbewerkers van België

**Christian BOBADILLA** ..... Long Products Research Manager, ARCELORMITTAL Global R&D

**Olivier BRUN** ..... Head of Product Portfolio, ARCELORMITTAL Global R&D

**Rudi CLOOTS** ..... Advisor to the Rector, ULiège

**Nicolas DE ABAJO MARTINEZ** ..... Head of Global R&D Centres and Performance Optimization, ARCELORMITTAL

**Joao FELIX DA SILVA** ..... Advisor to the Chairman, John Cockerill Group

**André FOUARGE** ..... CTO Finishing, ARCELORMITTAL Europe - Flat Products

**GROUPEMENT DE LA SIDÉRURGIE (GSV)** ..... Represented by Philippe COIGNE, Directeur Général

**Leo KESTENS** ..... Professor, Ghent University

**Carel KLEEMANS** ..... Technical Director, TATA STEEL Mainland Europe

**Lahoucine OURHRIBEL** ..... General Secretary, ACV-CSC METEA

**Ilija PORTEGIES ZWART** ..... Head of Technical Packaging & Plating, TATA STEEL

**Mario SINNAEVE** ..... R&D - Quality Control Manager, S.A. des Fonderies Marichal, Ketin & Cie

**Sven VANDEPUTTE** ..... Managing Director FININDUS

**Nitte VAN LANDSCHOOT** ..... R&D Programme Manager for Decarbonization, TATA STEEL

**Manfred VAN VLIERBERGHE** ..... Advisor for strategic & technical projects for Europe Flat Products and Group CTO, ARCELORMITTAL

**Michael VENTURI** ..... Deputy General Secretary, MWB-FGTB

### Observers

**Yvon MASYN** ..... Adviseur, Vlaams Agentschap Innoveren en Ondernemen

**Joeri NEUTJENS** ..... General Manager, CRM Group

### Auditor

**Baker Tilly** ..... Audit, Comptabilité, Conseil SRL

### Iron & Steel Committee

#### ARCELORMITTAL

Marc DI FANT

Laurent FROMM

Eric HESS

Thierry IUNG

Pedro PRENDES

Mayte RODRIGUEZ

Wim VAN DER STRICHT

Tom WATERSCHOOT

#### TATA STEEL

Jochem GROOT

Carel KLEEMANS

Christophe PELLETIER

Hans VAN DER WEIJDE

#### CRM

Joeri NEUTJENS

Griet LANNOO

Eric SILBERBERG

# Quality management

**BELAC** Organisme belge d'Accréditation  
Belgische Accreditatieinstelling  
Belgische Akkreditierungsstelle  
Belgian Accreditation Body  
EA MLA Signatory

**Accreditation Certificate No. 267-TEST**

In compliance with the provisions of the Royal Decree of 31 January 2006 setting up BELAC, the Accreditation Board hereby declares to have granted accreditation conform the requirements of the standard EN ISO/IEC 17025:2017 to:

**CENTRE DE RECHERCHES METALLURGIQUES ASBL -  
CENTRUM VOOR RESEARCH IN DE METALLURGIE vzw  
C.R.M.**

**Rue Ravenstein 4  
1000 Bruxelles**

The body demonstrated the competence to perform the activities in the activity sites, as described in the scope of accreditation 267-TEST which is an integral part of the present certificate.

The current version of the scope of accreditation is available at [www.belac.be](http://www.belac.be).

This certificate remains valid as long as the body continues to meet the accreditation conditions.

The Chair of the Accreditation Board BELAC,



Maureen LOGGHE

Version : 9  
Validity period : 2023-03-16 - 2027-10-27

Original version of this certificate is in French.

BELAC 6.17.00.000

**BELAC** Organisme belge d'Accréditation  
Belgische Accreditatieinstelling  
Belgische Akkreditierungsstelle  
Belgian Accreditation Body  
EA MLA Signatory

**Accreditation Certificate No. 267-CAL**

In compliance with the provisions of the Royal Decree of 31 January 2006 setting up BELAC, the Accreditation Board hereby declares to have granted accreditation conform the requirements of the standard EN ISO/IEC 17025:2017 to:

**CENTRE DE RECHERCHES METALLURGIQUES ASBL -  
CENTRUM VOOR RESEARCH IN DE METALLURGIE vzw  
C.R.M.**

**Rue Ravenstein 4  
1000 Bruxelles**

The body demonstrated the competence to perform the activities in the activity sites, as described in the scope of accreditation 267-CAL which is an integral part of the present certificate.

The current version of the scope of accreditation is available at [www.belac.be](http://www.belac.be).

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The Chair of the Accreditation Board BELAC,



Maureen LOGGHE

Version : 10  
Validity period : 2023-03-16 - 2027-10-27

Original version of this certificate is in French.

BELAC 6.17.00.000

**BQA**  
BELGIAN QUALITY ASSOCIATION

**QUALITY MANAGEMENT SYSTEM CERTIFICATE  
ISO 9001 : 2015**

*BQA nv hereby declares that the management system of the companies Centre de Recherches Métallurgiques ASBL and Advanced Coatings and Construction Solutions SC*



*whose sites are established at, for CRM ASBL, Centre de Recherches Métallurgiques ASBL: Avenue du Bois Saint-Jean 21 - B27 - Quartier Polytech 4 - 4031 Angleur - Belgium, Allée de l'Innovation 1 - B57 - Quartier Polytech 3 - 4000 Liège - Belgium, Rue du Bois Saint-Jean 8 - 4102 Ougrée - Belgium, Rue des Pâles 1 - B56 - Quartier Polytech 2 - 4000 Liège - Belgium, Rue du Chêne 200 - 4000 Liège - Belgium, Technologiepark - Zone A1b - 48 - 9052 Zvijnaarde - Belgium, Rue du Parc Industriel 1 - 4400 Engis - Belgium*

*whose head office is established at, for AC&CS SC - Advanced Coatings and Construction Solutions SC: Allée de l'Innovation 1 - B57 - Quartier Polytech 3 - 4000 Liège - Belgium, with sites: Rue Sompre 1 - 4400 Flémalle - Belgium, Avenue du Pré-Ailly 20 - 4031 Angleur - Belgium*

*has been examined and found in conformity with the ISO 9001, edition 2015, standard for the following application field:*

**Industrial research and associated activities such as testing, calibration and expertise.**

*This certificate has been issued by BQA nv according to its quality manual concerning the certification of systems, and after concluding the contract of certification n° CER ATA\_QMS\_14-03-2024\_336 FR under which the company accepts a regular control of its management system.*

Certificate n° BQA\_QMS\_C\_2006336  
Issue date 2024-04-29  
Valid until 2027-03-27



D. SIMOENS  
Director

**BELAC**  
019-QMS

Any person aware of misuse of this certificate may address himself to BQA nv. This certificate may only be disclosed in its entirety.  
BQA nv - Technologiepark-Zwijnaarde, 79 - 1012 Geel-Zwijnaarde



“ Together,  
we are  
shaping  
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of the future

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