Innovating with **expertise and vision**

We have consistently leveraged our deep knowledge, technological expertise and proprietary processes to reinforce RAIN's unique position across its segments. Over the past year, we have actively applied these strengths to drive forward innovative projects focused on creating a cleaner and more sustainable future.

UN SDGs impacted

Focus areas

- Product and process innovation
- Proprietary technologies
- Digital transformation
- Knowledge management and industry expertise

Stakeholders impacted

- Customers
- Employees
- Vendors and suppliers
- Government and regulatory bodies

Material topics associated

- Talent and capability development
- Circularity and innovation
- Cybersecurity and privacy

Product and process innovation

During the year, we achieved key milestones in product development, marking notable progress across our diverse portfolio. Two leading global aluminium groups initiated industrial-scale trials of our proprietary calcined anhydrous carbon pellets (ACP), reflecting the increasing recognition of our innovative solutions.

Carbon segment

We introduced high-density shaft CPC products, which gained widespread market acceptance throughout the year, signalling bright prospects. Additionally, we boosted our operational efficiency by investing in digitalisation and energy-saving initiatives.

Advanced Materials segment

We made considerable strides by launching new products with cleaner, greener attributes. These innovations featured higher purity, reduced carbon footprints and incorporated bio-based and recycled raw materials, reinforcing our commitment to environmentally responsible practices.

Cement segment

We exceeded previous records for clinker production at our cement plants. Furthermore, we generated a record amount of green electricity through our waste-heat and solar power systems, underscoring our commitment to sustainability.

Case study

NOVARES® LCM500: A win-win proposition

Objective

At RAIN, high product performance is essential to our business reputation. As part of our commitment to continuous improvement and innovation, we aim to develop new products, manufacturing processes and technical applications that support long-term sustainability.

Initiatives undertaken

In our Advanced Materials segment, we introduced a new resin —NOVARES® LCM500 — for the coatings and paint industries. Our strategy of using renewable feedstocks drove this innovation. We upcycled industrial byproducts by combining 50% of conventional petroleum-based precursors with 50% Cardanol, a renewable cashew nut shell liquid.

Outcome

Our breakthrough innovation, NOVARES® LCM500, not only enhances circularity and sustainability but also delivers exceptional technical performance and flexibility, showcasing our commitment to upcycling industrial byproducts and sustainable innovation.

Proprietary technologies

RAIN leverages in-house technology to refine products, boost yields and enhance environmental compliance.

We reinforce our competitive edge by strengthening our IP portfolio, including patents on advanced manufacturing techniques.

- In-house development of technologies for refining products, improving yields and enhancing environmental compliance.
- Strengthen intellectual property (IP) portfolio, including patents for advanced manufacturing techniques.
- Apply proprietary processes for energy savings and emissions reduction.

Digital transformation

Our Carbon segment made strides in energy efficiency and operational improvements by successfully installing online energy monitoring systems across four calcination sites. These systems provide real-time insights into energy consumption and breakdowns, to gauge the impact of our energy reduction initiatives effectively. As a result, we aim to significantly reduce energy use by more than 10% over the next three years.

Advancing process digitalisation

We upgraded our Trendminer production data-mining software to enhance usability and improve our iHistorian database. These upgrades enable real-time tracking of key production metrics, including kiln CPC yields, carbon dioxide emissions and flow rates. Additionally, we have embarked on an AI pilot programme at one of our US Carbon plants, where we explore artificial intelligence to refine performance parameters and optimise operations.

Enhancing operational efficiency

Our digital transformation extends into production and maintenance areas, with notable improvements. The Lake Charles plant, for instance, now employs an online continuous monitoring system, replacing manual quarterly inspections of turbine generator units with 24/7 remote monitoring capabilities. Likewise, our Gramercy and Norco plants have upgraded to cloud-based technology, eliminating the need for bi-monthly physical monitoring in favour of online tracking.

Knowledge management and industry expertise

We build expertise in our Carbon and Advanced Materials segments through focused training programmes and knowledge-sharing initiatives. Our Company applies longstanding industry experience to optimise operations and deliver innovative customer solutions.

We underscore our role as a thought leader by engaging in industry publications and sharing insights to advance the field.

- Building expertise in carbon and advanced material sectors through specialised training and knowledge sharing.
- Leveraging in-depth industry know-how to enhance operational performance and offer customer-oriented solutions.

Case study

RAIN wins the Best Paper Award at the ICSOBA 2024 Conference

Objective

At RAIN, our commitment to sustainability and innovation is at the core of our mission. In 2024, we aimed to contribute to the reduction of carbon dioxide emissions in the aluminium industry by presenting a comprehensive analysis of emissions-free CPC production at the ICSOBA 2024 conference.

Initiatives undertaken

Our award-winning paper, titled 'A Case Study for Emissions-Free CPC Production' was the culmination of extensive research on the environmental impact of calciner emissions. Three colleagues from RAIN's Carbon segment developed and presented the paper at the prestigious event. We focused on:

- Analysing the key factors contributing to carbon dioxide emissions during the production of calcined petroleum coke (CPC).
- Presenting a novel method for quantifying kiln yields using an online carbon dioxide analyser and flow meter.
- Outlining the potential feasibility of a carbon dioxide capture system for emissions-free CPC production at our Lake Charles facility.

Outcome

The research highlighted key areas of impact for the aluminium industry, focusing on carbon footprint reduction in electrode production:

Environmental impact

Explored how GPC raw material quality and waste-heat recovery can reduce carbon dioxide emissions in CPC production.

Technological innovation

Presented methods for measuring emissions and the potential for carbon capture in the calciner process.

Industry applicability

While the costs of implementing carbon dioxide capture technologies are currently high, the research suggests that advancements in this field could make it a viable solution over the long-term for reducing carbon footprints in the aluminium industry.

Strategic collaborations for innovation

Collaboration with key partners is a core aspect of our intellectual capital. We have established various strategic partnerships that strengthen our R&D capabilities and help accelerate product development. For example, in 2024, RAIN participated in several publicly funded R&D projects, such as the European Union's 'Sustainable Routes for Synthetic Graphite Production' under the Horizon Europe framework. Our role in this project is to explore alternative sustainable raw carbon materials, such as biogenic materials and byproducts from recycling processes, to reduce carbon dioxide emissions.

Moreover, our partnerships with Green Graphite Technologies (GGT) and Northern Graphite focus on advancing natural graphite purification and coating technologies essential for manufacturing high-performance lithium-ion battery anodes. These collaborations provide valuable feedback on our products and help us identify new business opportunities and refine our offerings to serve customer needs better.

We also emphasise the importance of industry collaborations. We actively participate in conferences like the TMS (The Minerals, Metals and Materials Society) conference, where we present cutting-edge research and innovations. These events allow us to showcase our expertise and help us stay connected to the latest developments in the industries we serve.

Building expertise for innovation excellence

At RAIN, continuous learning is fundamental to maintaining our competitive edge. We invest in systems and practices that foster development across all levels. Our employees engage in e-learning platforms that offer technical and non-technical courses, as well as attend technical seminars and collaborative workshops to stay at the forefront of industry knowledge.

Project-based learning is a core component of our culture, allowing employees to gain hands-on experience while contributing to the organisation's success.

The lessons learned from these projects are captured in a central database, ensuring that valuable insights are shared across teams and applied to future initiatives.

Cultivating a skilled and innovative workforce

The expertise of our workforce is key to driving our innovation efforts. We focus on building critical skills in R&D, process technology and project management. By offering targeted training and on-the-job learning opportunities, we equip our teams with the tools they need to tackle complex technical challenges. Cross-departmental collaboration ensures that knowledge is shared, leading to more innovative solutions.