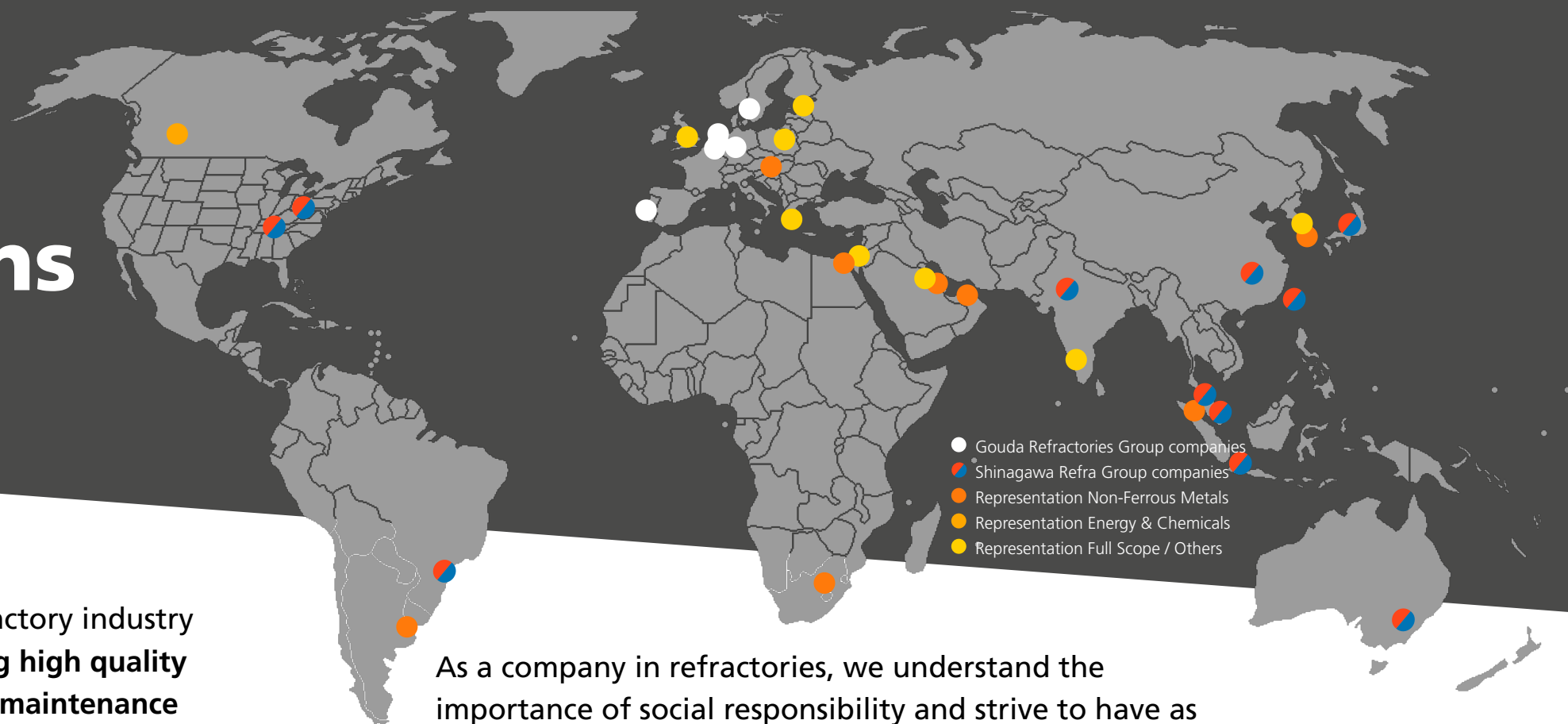




Green Manufacturing
for Primary Aluminium

**Refractories
Shaping a Green
& Smart Future**

125 Years of Excellence in Refractory Solutions



GOUDA Refractories is committed to a green and smart refractory industry and presents its vision and strategy for the future: **supplying high quality refractory materials that ensure an increased life time, less maintenance cost and a reduction in fuel costs, hence CO-emissions.**

As a company in refractories, we understand the importance of social responsibility and strive to have as little impact on our environment in a variety of ways.

GROUP EMPLOYEES

275+

BRICKS (Tonnes p/yr)

60,000+

GROUP TURNOVER (mln)

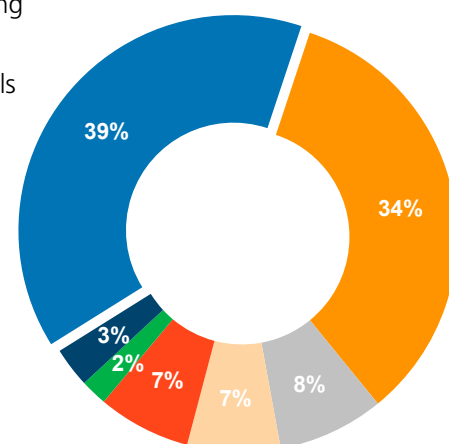
100+

GOUDA Refractories BV is a leading manufacturer of refractory products, operating from two production facilities in The Netherlands. Our operations include a castable plant in Geldermalsen and a brick plant in Gouda, where we are capable of firing dense refractory bricks at temperatures of up to 1,700°C.

With nearly 125 years of history, GOUDA Refractories has built a strong social infrastructure. Combined with its Dutch headquarters and heritage as a family-owned business, this provides a solid foundation for long-term stability and growth.

Our activities in industries

- Aluminium
- Energy & Chemicals
- Waste Processing
- Iron & Steel
- Mining & Metals
- Paper & Pulp
- Others



We believe that businesses play a crucial role in promoting sustainability and creating a positive impact on society. That's why we take our responsibility seriously and strive to make a meaningful contribution to our community. We take pride in being a company dedicated to **sustainability, community development, and safety.**

GOUDA Refractories maintains an active works council and a detailed employee manual. Furthermore, the company ensures that all employees across the GOUDA Refractories Group meet minimum standards for safety, health, and well-being.

GOUDA Refractories also participates in the group's onboarding program. A straightforward and transparent training program supports the continuous development of its employees.

Beyond social infrastructure, GOUDA Refractories also invests in tools and workplace conditions to enhance overall workability within the organization.

Recent investments

(Related to employee well-being)

- Reduce lifting load by installing a new high-end product mixing line;
- Robotization of presses;
- Unloading aid / lifting aid including hydraulic lifting aids;
- Automation of tracks;
- State of the art canteen, sanitary facilities and locker rooms including showers;
- Extra canteen in factory with facilities for outside office hours;
- Silence and prayer room;
- Various training courses in the field of safety and illness procedures;
- An online tool for onboarding and training purposes.

Committed to the future

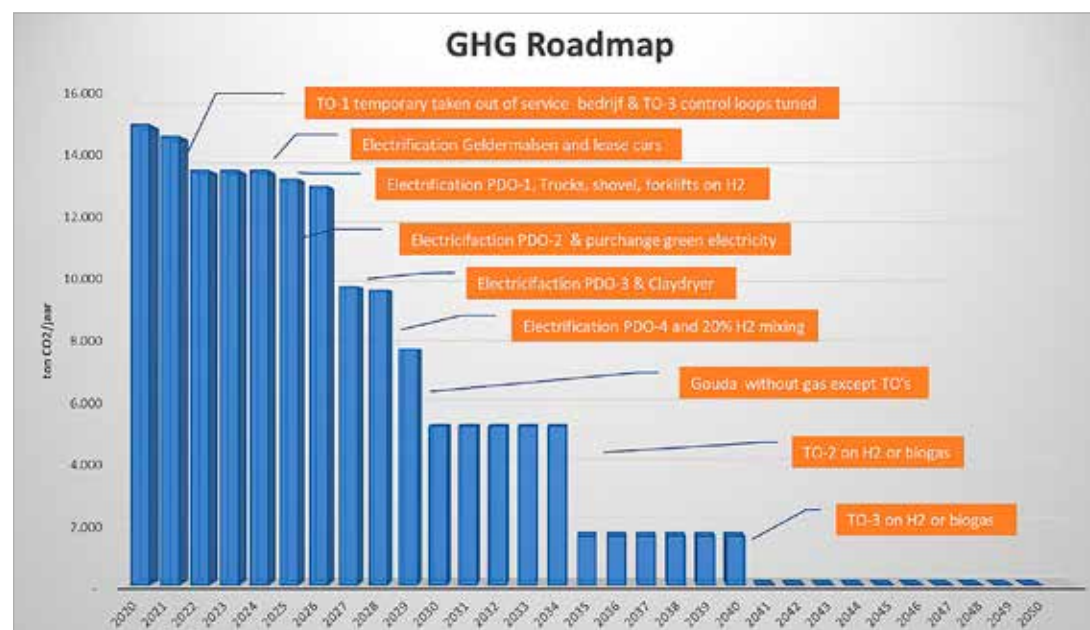
GOUDA Refractories has been participating in Dutch long-term energy efficiency agreements (MJA/MEE) for many years.

Environmental Awareness

One of our most important pillars of social responsibility is environmental awareness. We are committed to **implementing sustainable business practices to minimize our ecological footprint**. This includes reducing our energy and water consumption, limiting waste production and promoting recycling. Through continuous investment in research and development, we aim to find innovative solutions that benefit both our customers and the environment.

Every year, GOUDA Refractories draws up a complete report on its CO₂ emissions and reductions. A report that is audited and approved by SGS Belgium.

For the future steps in our transition, GOUDA Refractories has defined a GHG roadmap. This roadmap is designed to meet the **targeted reduction of ~50% by 2030 and 100% by 2050**. This is in line with the general objectives set for the industry in the European Union. Our goal is to be a frontrunner in our industry and – as a trustworthy partner – to assist our customers to achieve their ESG-targets.



The following projects are examples of initiatives that have been fully implemented in recent years, without claiming to be exhaustive.

Integrated heat exchange system and solar panels

to provide heating and cooling as well as basic energy supply in the newly built office and laboratory in GOUDA. (Implementation 2018-2020)

Lighting

GOUDA Refractories has replaced all lighting in the factory with LED solutions. (In the period 2020-2021)

From diesel to electric

GOUDA Refractories completely switched almost all its forklift trucks from diesel to electric. (In the period of 2013-2020)

Air compressors

All air compressors replaced by newer ones with more efficient air drying and lower energy consumption. (Implementation 2020)

Energy-efficient motors

All electrical motors (e.g. pumps) are being replaced by energy-efficient motors (IE4) during maintenance work since 2019 and is still ongoing.

Cradle to cradle

Reduction of the consumption of virgin raw material with 20-25% by the recycling of old refractory materials has enabled the cradle to cradle principal.

Recycling processes

Less than <5% of spilled or rejected raw materials and/or end products need to be disposed of. The remaining >95% is internally recycled.

Fume gas cleaning

All three tunnel kilns have modern fume gas cleaning devices since 2013.

Environmental permit - journal

GOUDA Refractories has an extensive environmental journal in place to manage our up to date environmental permit which is periodically checked by the local environmental authorities.

Packaging improvements

Reduction of plastic consumption by reducing thickness shrink film from 135 to 125 um. All wooden pallets are recycled and used to make new pallets.

Waste management

Together with Renewi, we are separating 90% of our waste in order to recycle.

Innovative Emission Reducing Materials

In response to the increasing focus on energy efficiency, sustainability, and rising energy costs, GOUDA Refractories has developed a range of refractory materials designed to reduce energy consumption without compromising key properties such as chemical resistance and mechanical strength. These innovations are essential in today's industrial landscape, where energy efficiency and sustainability are of paramount importance.

For the **Primary Aluminium industry**, GOUDA Refractories provides solutions that **extend refractory lifetimes** while reducing energy usage.

GOUDA Refractories is recognized worldwide as the leading reference in refractory materials for **Anode Baking Furnaces**, both open and closed types.

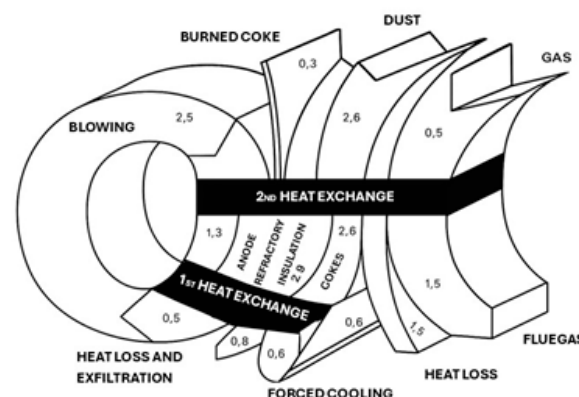
Our strength lies in the **dimensional stability** of our bricks, their **process-related protective mechanisms**, and the **structural stability** of the furnace walls. These qualities are the result of decades of development, built upon deep expertise in design, installation, operation, and maintenance of refractory systems.

To help our customers achieve their sustainability goals, GOUDA Refractories has set a new benchmark with the **LP 50 S brick**, which delivers a longer

service life, improved anode quality, and reduced energy consumption compared to conventional bricks used in anode baking furnaces.

Energy Saving

By producing a stronger brick with a higher **Hot Modulus of Rupture (HMOR)** and lower **creep**, the flue walls can be designed thinner — for example, **90 mm instead of 110 mm**. Thinner flue walls reduce the total refractory mass, which in turn lowers the energy required to heat the refractory materials (typically accounting for **20–30% of the total energy consumption** in an anode baking furnace). This advantage is particularly significant in cyclic operations ranging from **20°C to 1,300°C**, resulting in reduced fuel consumption.



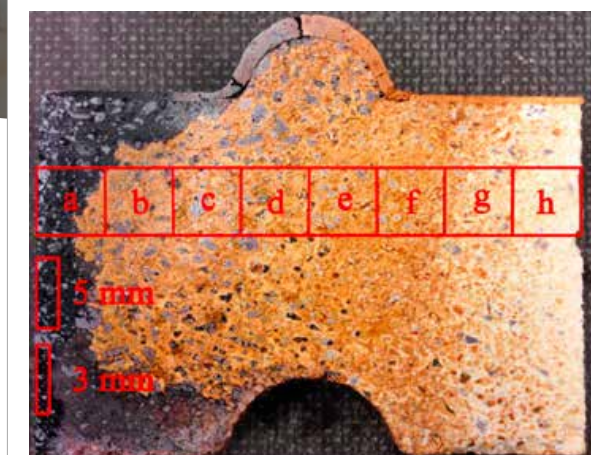
Additionally, the **LP 50 S** brick has a higher **heat transfer coefficient** compared to similar materials, allowing heat to travel more efficiently through the brick to the anodes.

Increased Lifetime

To produce **1,000 kg of aluminium**, approximately **10 kg of refractory material** is required. By extending refractory lifetime, the refractory consumption per ton of aluminium produced can be significantly reduced.

Poor refractory quality can lead to **flue wall deformation, delayed fire changes**, and difficulties in unpacking baked anodes. Furthermore, excessive **false air infiltration** may occur. In most, if not all, cases of poor refractory performance, a higher rate of **anode rejects** results. Since specific energy consumption is directly linked to the production of good anodes, a higher reject rate also increases total energy consumption. In such situations, **energy consumption levels of 3–4 GJ/t of anodes** have been reported. In extreme cases, poor refractory quality may even lead to **explosion risks**.

A longer refractory lifetime also decreases the quantity of **spent material** after demolition. Disposal of used refractories has become increasingly difficult due to landfill restrictions, while the material itself gains **economic value through recycling**. Thanks to the **low porosity** and **low sodium content** of our bricks, **chemical penetration of petroleum coke** is minimized. This ensures that a larger portion of the brick remains suitable for recycling into other refractory products, such as **castables for top blocks**.



Cross-section of a typical sample of exposed refractory lining. The anode pit side is on the left, and the flue side is on the right of the brick. (Source: SINTEF)

Conclusion

GOUDA Refractories continues to lead the industry through its innovative approach to refractory materials. By prioritizing **energy efficiency** and **sustainability**, the company not only meets today's market demands but also contributes to building a more sustainable future.

Our commitment to developing **high-performance, energy-saving solutions** ensures that we remain a **trusted partner** in a wide range of high-temperature industrial applications.



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GOUDA *feuerfest services*

GOUDA *refractories nordic*



**REVESTIMENTOS
REFRACTARIOS**
SOCIEDAD ANÓNIMA
Fundada en 1979

