

# FOCUS ON FOOTPRINTS

**The Siam Refractory Industry., Ltd. explains why cement producers should be more aware of the carbon footprint of refractory products in order to work towards emissions reduction targets.**

**G**reenhouse Gases (GHGs) such as carbon dioxide (CO<sub>2</sub>) and methane (CH<sub>4</sub>) occur naturally and exist in the atmosphere for a long time. These gases are essential for life on earth by trapping heat and maintaining a low range of temperature fluctuation. However, since the industry revolution has transformed agricultural economies into large scale industrial economies, burning fossil fuels has accelerated the volume of GHGs emissions into the atmosphere. As a result, the global temperature has gradually risen from pre-industrial levels.

At the 26<sup>th</sup> UN Climate Change Conference (COP26) in Glasgow on 31 October – 13 November 2021, many nations declared their intent to accelerate action towards the goals of the Paris Agreement (COP21) and the UN Framework Convention on Climate Change. To tackle climate change and prevent climate catastrophe, the goal is to limit global warming to well below 2°C, and preferably to below 1.5°C, compared to pre-industrial levels. More than 200 countries were requested to reduce emissions by 2030. A clear plan was made to phase-down the use of coal, which is responsible for 40% of annual CO<sub>2</sub> emissions.

According to the World Cement Association, approximately 7% of global GHG emissions come from the cement industry. Carbon dioxide emissions from cement plants are categorised into two sources:

- ▶ 60% of emissions originate from the calcination of raw materials such as limestone.
- ▶ Another 40% of emissions come from the burning process.

Surprisingly, concrete when exposed to air can slowly reabsorb nearly 60% of the carbon dioxide produced by the calcination process. Accordingly, most cement producers focus on the reduction of CO<sub>2</sub> emissions from the burning process.

After COP26, most cement producers committed to accelerating CO<sub>2</sub> emissions reduction towards net zero by the middle of the century (2050).

Cement producers can reduce GHG emissions by a number of means such as:

- ▶ Enhancing the combustion processes in the cement rotary kiln.
- ▶ Reducing fossil fuel consumption by using alternative fuels such as RDF or industrial waste.
- ▶ Using waste heat from cement production processes for electrical power generation.
- ▶ Launching new products with lower carbon cement and lower carbon concrete, for example, SCG Hybrid Cement, which has a lower clinker content.
- ▶ Introducing renewable and carbon capture technologies.



**SRIC is the first refractory manufacturer to achieve a certified Carbon Footprint product.**



**2.3 MWp solar roof installed at SRIC plant.**

- ▶ Selecting and using lower carbon or longer service life supply materials, including refractory and consumable materials.

However, the one big barrier preventing cement producers from working on CO<sub>2</sub> emission reducing activities is the difficulty in evaluating their own carbon footprint level, as many companies lack the carbon emissions information of their supply materials, especially refractory materials.

The Siam Refractory Industry., Ltd (or SRIC) is a refractory manufacturer, providing information about the carbon footprint of refractory products for the cement industry.

The company's intention to provide customers with the carbon footprint information of its products is a step towards accelerating emissions reduction in the cement industry.

### **GHGs and carbon footprints**

GHGs are compound gases that can retain heat in the atmosphere and make the earth warmer. The main GHGs are methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), hydrofluorocarbon (HFCs), perfluorocarbons (PFCs), sulfur hexafluoride (SF<sub>6</sub>), and nitrogen trifluoride (NF<sub>3</sub>). Various GHGs have different impacts on global warming. All GHGs are always calculated in terms of CO<sub>2</sub> equivalents.

A carbon footprint is the total volume of greenhouse gases that are generated by human activity. This offers a method to measure, collect, manage, and communicate GHG emissions related to organisations, products, and services. A carbon footprint is comprised of direct and indirect emissions (Scope 1 to Scope 3).

- ▶ **Scope 1 – Direct emissions:** All emissions directly emitted from the company's production process (chemical and physical process or combustion of fossil fuels).
- ▶ **Scope 2 – Indirect emissions:** These are emissions generated by external parties of electric power, steam, or heat.
- ▶ **Scope 3 – Other emissions:** All other indirect emissions from both upstream and downstream the supply chain, such as purchase of raw materials.

A carbon footprint standard can apply to organisations, products, services, and events. Normally, there are three levels of the standard – CO<sub>2</sub> emission assessment, CO<sub>2</sub> reduction and carbon neutralisation.

### **Lower carbon means lower cost**

Reducing CO<sub>2</sub> emissions not only helps to prevent global warming, but can also help to give companies a competitive advantage by reducing inefficiencies within organisations, such as

excessive energy usage and extra raw material consumption.

In addition to cost reduction, some companies must pay for every ton of CO<sub>2</sub> they release.

In the future, a carbon tax system that is typically based on the carbon footprint of the products will be implemented. Products with a higher carbon footprint are taxed more; those with a lower footprint are taxed less.

To create transparency for customers, SRIC calculate associated GHG emissions in order for cement producers to make environmentally informed purchasing decisions, by cooperating with the National Metal and Materials Technology Centre (MTEC) in Thailand. Also, SRIC's product carbon footprint received certification from the Thailand Greenhouse Gas Organisation (TGO).

### Carbon emissions in Thailand

In 2017, the Thailand Greenhouse Gas Management Organisation (Public Organisation) or TGO was established as an autonomous public organisation in accordance with Thai law to manage and expedite development and implementation of greenhouse gas reduction projects and support public, private and international organisation partnerships to promote implementation of climate action. TGO responds to the intensified and widespread impacts of climate change on the economy and society. In recognition of the need to manage and reduce greenhouse gas emissions in Thailand, The Royal Decree on the Establishment of TGO B.E. 2550 was amended in 2019 to strengthen the efficiency and effectiveness of TGO in its missions and mandate to support greenhouse gas management in Thailand, in line with an evolving international climate change regime, as well as accommodating the amended Public Organisation Act B.E. 2542 (amended B.E.2550).

### The role of refractory manufacturers in CO<sub>2</sub> emissions reduction

As an industrial product manufacturer, SRIC has worked on carbon footprint management to reduce GHG emissions, for example:

- ▶ SRIC installed a 2.3 MWP solar cell system to decrease power consumption, thus improving production efficiency to decrease GHG emissions from electrical power.
- ▶ The company replaced fluorescent lighting with higher efficiency LED lighting.
- ▶ SRIC has reduced energy consumption by focusing on the burning system in tunnel kilns.
- ▶ SRIC is also developing lower burning temperatures for new products with lower GHG emissions.

- ▶ The company has installed an automation system and digital information system to raise production efficiency.

SRIC is improving the process of sourcing raw materials by using recycled refractory material to decrease industrial waste and deliver lower carbon products to customers.

0.5 kg of refractory is used per one ton of clinker. This figure does not seem significant in comparison to fuel and other material supplies. But refractory plays another important role in reducing the CO<sub>2</sub> emissions from cement production.

Most cement producers plan to reduce CO<sub>2</sub> emissions by using alternative fuels such as industrial waste or refuse derived fuel (RDF) instead of fossil fuels. However, RDF use increases the sulfur, sodium, and potassium content involved in the process. These substances can cause material to stick to the wall of the riser pipe/inlet chamber and blocking can occur. This blocking problem not only impacts cement operations, but also puts plant personnel at more risk during the manual clearing process.

Not only this, but the refractory service life in the rotary kiln is also shorter with a high chemical load.

To cope with this problem, SRIC has introduced an advanced refractory solution for alternative fuels which has succeeded in the cement kilns of SCG Group. SRIC intends to launch this innovative solution to other cement producers in the near future to help them decrease their CO<sub>2</sub> emissions.

### Product carbon footprint certificates

SRIC cooperates with the National Metal and Materials Technology Centre (MTEC) to calculate product carbon footprints of the company's selected product ranges, especially in the cement industry.

Seeing as the main industrial sector of Thailand is agriculture, carbon footprint information is mostly available for supply material, rather than for refractory materials. At an international level, there was also no publication of registered carbon emissions figures of refractory materials. SRIC and MTEC then had to raise the information regarding the carbon emissions of certain materials. Various sources had quite different values and many refractory materials manufacturers were not interested in studying and publishing their information. Then SRIC and MTEC composed a literature review to compare and select suitable carbon emissions figures for each material, so that reliable and comparable figures were available in future.

On 26 January 2018, SRIC received the first Carbon Footprint Label Scheme for the company's popular Magnesia Spinel Brick TUFMAG AF as certified by TGO, and on 12 October 2019, SRIC stepped forward and received a Carbon Footprint Certification Award for the company's premium Magnesia Spinel Refractory Brick, MSN80, and its low cement refractory castable, C60A, from the Minister of Natural Resources and Environment.

At present, SRIC continues to study, cooperate and follow up on the carbon emissions of major refractory raw material manufacturers and suppliers in order to seek out updated carbon footprint emissions information.

SRIC also studies and registers the carbon footprint emissions of its own products, especially for the cement industry.

The company is committed to protecting the environment and working towards climate change mitigation, targeting net zero CO<sub>2</sub> emissions by 2050. ■

## Sources

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