"We ensure sustainability throughout our operations."

Ganesh W Jirkuntwar, Senior Executive Director and National Manufacturing Head, Dalmia Cement (Bharat), discusses the transformative shift of the cement industry towards greener practices. Going green aligns with global climate goals and presents opportunities for enhanced competitiveness and environmental stewardship.

What is the current sentiment in the cement industry about going green?

Cement, a key component of concrete, is a major contributor to CO2 emissions. Studies show that the cement industry's worldwide yearly production of 4.2 billion tonnes contributes about 7 per cent of worldwide carbon dioxide yearly emissions. Since the pandemic, India and the world are now pushing harder than ever to meet climate goals. Moreover, for India, the need and importance to cut down on emissions is double; to target climate change and to reduce the current dangerous levels of air pollution.

The usage and demand for cement are only going to increase due to the burgeoning population and the need for housing and infrastructure. India, along with the world, needs to fast-track the journey to zero-carbon. Consumers are also becoming increasingly aware of the environmental impact of the products they use and are seeking more sustainable and eco-friendly options. By going green, cement companies can meet this demand, gaining a competitive edge in the market and establishing themselves as environmentally conscious businesses.

In the cement industry, the problems of emissions lies in the manufacturing of cement. The energy used to heat the kilns that produce the clinker and the chemical processes that convert limestone into calcium oxide are the major causes of these emissions. However, the Indian cement sector has been at the forefront in responding to climate change. Many large cement companies have done huge emission reductions by using supplementary cementitious materials, improving energy efficiency, substituting fossil fuels with alternative fuels, using waste heat to generate electricity, and scientifically trying new production techniques and process improvements.

Ganesh W Jirkuntwar, Senior Executive Director and National Manufacturing Head, Dalmia Cement (Bharat)

Technologies like Waste Heat Recovery (WHR) power generation systems, reducing or ceasing the use of fossil fuels, using solar energy, as well as converting current fossil-fuel-based facilities into renewable biomass fuel-based units, are being used by various companies to reduce the emissions during cement production. As the need for energy is paramount in the cement industry, the solution to its emission issues lies in finding renewable electricity that can produce clean, safe, affordable, and infinite energy. Across the globe and in India, companies are in the process of changing their manufacturing

techniques to transition to clean energy and reduce their carbon footprint.

Tell us about the key alternative raw materials used for the manufacturing of green cement?

Green cement, which boasts a lower carbon footprint compared to traditional cement, is made using supplementary cementitious materials (SCMs). Below are some of SCMs, which are typically used in green cement production.

- **Fly ash:** It is a byproduct of coal-fired power plants and contains silica and alumina, which are great for making green cement.
- **Ground granulated blast furnace slag (GGBS):** This is a byproduct of the steel industry. When ground into a fine powder, it can replace traditional materials in cement production and significantly reduce carbon emissions.
- **Calcined clay:** This clay type is heated to high temperatures to enhance its reactivity. It can replace traditional raw materials in green cement production.

These materials help in reduction of clinker, with a very high carbon footprint in cement production and hence reduce the carbon footprint of cement.

How does the use of alternative fuels impact the productivity and efficiency of the manufacturing process?

The use of alternative fuels in cement manufacturing processes has several benefits. It significantly reduces dependency on fossil fuel, which is highly polluting and reduces greenhouse gas emissions, hence a great lever for lowering carbon footprint. Alternative fuels like biomass, municipal wastes and industrial byproducts are being used as a substitute to fossil fuels such as coal, petroleum coke etc. Uses of alternative fuel helps in lowering cost of production as well as help maintain cleanliness of the environment.

However, usage of alternative fuels comes with its set of challenges impacting productivity and efficiency in the manufacturing process. The lower calorific values of alternative fuels compared to fossil fuels impacts the heat balance of the cement kiln. Hence to ensure the correct temperature profile is maintained during the entire process, cement plants need to optimise fuel mix and make operational adjustments of the kiln. Also, careful considerations need to be taken during selection of alternative fuels, ensuring compatibility with the manufacturing process, else it can impact the quality of the clinker and the final product.

Quality and availability of alternative fuels are also vital. As waste and by-products are sourced from other industries, reliable supply chains and strict quality control measures are required to ensure standard quality and availability. There are also additional challenges like health and safety risks to workers handling storage of the alternative fuels and meeting regulatory compliances and standards in terms of use of alternative fuels.

To mitigate these challenges, the cement industry will need to adopt diverse strategies like research and investments in advanced technologies for optimal use of alternate fuels, partnership with other industries for reliable availability and collaboration with regulatory bodies for monitoring compliances.

Tell us about the cement blends or products from your organisation that are lower in their carbon content.

We offer cement blends that are designed to have lower carbon content. Blended cements are made by mixing two or more materials, with at least one being a cementitious material like Portland cement, fly ash, ground granulated blast furnace slag (GGBS), silica fume or limestone. In India, we manufacture several types of blended cements, including:

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- **Portland Pozzolana Cement (PPC):** This blend includes Clinker and pozzolanic materials such as fly ash. Known for its strength and durability, PPC is commonly used in construction projects like dams, bridges, and high-rise buildings.
- **Portland Slag Cement (PSC):** PSC combines Clinker with GGBS, a by-product of the iron and steel industry. PSC offers high strength, low heat of hydration, and resistance to sulfate and chloride attacks, making it ideal for marine and coastal structures. Dalmia Bharat is the largest manufacturer of PSC in India, known for its lowest carbon footprint.
- **Composite Cement:** This blend includes OPC/ Clinker along with other cementitious materials like fly ash or GGBS, as well as additives such as limestone or silica fume. It's commonly used when high durability and strength are needed in

India boasts the manufacture of numerous varieties of blended cements through a process that includes combining various materials with cementitious components.

construction projects.

Our blended cement is available under the brand names Dalmia INFRAPRO and Dalmia INFRAGREEN, among others, covering various categories mentioned above. We also offer other brands such as Dalmia DSP and Konark Cement.

Tell us about your Net Zero Goals. How much have you achieved so far?

We were the first cement company in the world to commit to a net zero and carbon-negative roadmap in 2018 setting an ambitious precedent. By embracing a circular economy model, we focused on recycling materials, reusing resources, and adopting alternative raw materials and fuels in our production cycle. This strategy has allowed the company to avoid a substantial 8.6 million tonnes of CO2 emissions annually, with a targeted reduction to 15 million tones per year by 2027. We have established around 72 MW of waste heat-based power generation capacity, contributing 20 per cent of our total power needs. This shift to waste-fueled power not only enhances overall efficiency but also facilitates a clean energy transition away from fossil fuels. We are 14 times water-positive and were among the first to pioneer alternative fuels in cement kilns. We also commenced our transition to electrical vehicles by joining the EV100 initiative, becoming the first to join the triplet of RE100, EP100 and EV100 globally. We have also been integrating circularity into our products and processes and have become a plastic waste recycling positive company.

Currently, the company boasts one of the lowest net carbon footprints in the global cement industry at 456 CO2 emission-Kg/tonne.

How do you incorporate sustainability in your cement manufacturing process?

As a company we strongly believe in the business philosophy 'Clean and Green is Profitable and Sustainable'. We ensure sustainability throughout our operations through several key approaches.

1. Use of alternative raw materials like fly ash and slag in the manufacturing process which helps to reduce emissions and lowers carbon footprint. This has enabled us to reduce the use of natural resources.
2. Implementation of sustainable mining practices to minimise environmental impact like minimising water usage, use of eco-friendly mining techniques, restoring mined lands and protection of biodiversity in that region.
3. Use of water conservation techniques like recycling and reusing water to reduce water usage through optimal processes. Eg. Using rainwater harvesting to reduce dependency on freshwater resources.
4. Controlling air emissions through upgraded technology, alternative fuels, and systematic monitoring of emissions with our plants and surrounding areas. To manage 'fugitive' emissions, we have also implemented measures like enclosed conveyors, installation of dust collection systems and regular equipment maintenance to prevent leaks. We also train our employees to identify and report any air quality issues.
5. Beyond environmental concerns, we also deeply focus on health and safety, people management and community engagement, promoting sustainable measures across our operations.

Can incorporation of automation and technology further the green initiative of the cement industry?

Use of advanced technologies and automation systems can help cement manufacturers become more sustainable by reducing energy consumption, increasing efficiency and minimising waste generation.

One of the key benefits is optimisation of cement manufacturing process is decrease in energy consumption and limited greenhouse gas emissions. For example, automated kiln control systems can help maintain precise temperature and pressure conditions, allowing for efficient fuel burning and reduced emissions.

Advanced technologies like artificial intelligence and machine learning, can assist in real-time monitoring and identifying any inadequacies or areas of improvement, helping manufacturers to optimise their operations and reduce waste and emissions.

Using sensors and data analytics for predictive maintenance of equipment allows for timely repairs and replacements. This approach can help minimise unexpected breakdowns and reduce related maintenance costs.

Additionally, digital solutions can track and report sustainability metrics, allowing cement manufacturers to monitor their environmental performance.

Overall, use of automation and technology can increase efficiency, reduce downtime and boost productivity whilst minimising environmental impact.

What are the major challenges in reducing the carbon content of cement manufacturing?

There are several key challenges:

- **Emissions from raw material:** One of the key challenges is the emissions associated with calcination of raw materials - limestone. It accounts for almost 60 per cent of the CO2 emissions in the cement sector. Unlike other industries where emissions mainly come from burning fossil fuels, this is a challenging issue for cement production, as there are no simple alternatives available yet.
- **High energy requirement:** Cement production requires very high temperatures, typically achieved through the combustion of fossil fuels such as coal, oil, and natural gas. This reliance on fossil fuels makes it hard to switch to cleaner energy sources, complicating efforts to reduce emissions.
- **High technology costs:** Many decarbonisation technologies, such as carbon capture and storage (CCS), are capital-intensive and require large investments. This high cost can be a significant barrier, especially for smaller cement manufacturers.
- **Regulatory and policy support:** The cement industry needs government driven regulatory frameworks and policies that support the adoption of low-carbon technologies. However, establishing effective policies and regulations that encourage decarbonisation while ensuring competitiveness and addressing potential trade-offs is a challenge for policymakers.
- **Lack of financial incentives:** Decarbonising cement production requires substantial investments in new technologies, equipment, and infrastructure. But limited financial incentives and regulatory frameworks for promoting low-carbon cement can inhibit the adoption of sustainable practices.

Addressing these challenges requires a multi-pronged approach, including technological innovation, supportive policies, financial incentives and collaboration among governments, industry stakeholders and research institutions. Continuous research and development are also crucial to find and scale up effective decarbonisation technologies for the cement sector.

How do you measure the impact of your green cement on the environment?

Measuring the impact of green cement on the environment and society involves a comprehensive approach considering its entire life cycle. Several steps are taken to gauge this impact:

- **Environmental Impact Assessment (EIA):** An EIA is conducted to evaluate how Cement production affects the environment. This includes assessing material extraction, manufacturing processes, energy and water usage, and the product's carbon footprint.
- **Social Impact Assessment (SIA):** SIA evaluates how Cement production influences local communities, such as job opportunities and community development. Stakeholder engagement and local knowledge play a crucial role in this assessment.
- **Life Cycle Assessment (LCA):** LCA measures the overall environmental impact of Cement, from extraction to disposal. Identifying areas for improvement helps minimise environmental harm.
- **Environmental reporting:** Regular reporting on environmental performance and progress toward sustainability goals ensures transparency. This includes data on carbon emissions, water usage, and waste generation, aiding stakeholders in staying informed.
- **Stakeholder engagement:** Engaging with stakeholders helps understand their concerns and perspectives. This collaboration identifies opportunities for improvement and ensures sustainability strategies align with stakeholder expectations.

- Kanika Mathur