

Reimagining operations to reduce carbon emissions

VALE IS INTRODUCING GREEN BRIQUETTES TO MAKE THE METALS SECTOR MORE SUSTAINABLE

HEADQUARTERED IN RIO DE JANEIRO, BRAZIL, VALE IS ONE OF THE WORLD'S LARGEST INTEGRATED MINING COMPANIES AND EMPLOYS APPROXIMATELY 125,000 PEOPLE IN MORE THAN 30 COUNTRIES. VALE IS A LEADING GLOBAL PRODUCER OF IRON ORE AND NICKEL, WITH A VISION TO IMPROVE LIVES AND TRANSFORM THE FUTURE.

VALE'S BRAZIL OPERATIONS FEED DIRECTLY INTO THE VERY BEGINNING OF BRAZILIAN AND GLOBAL SUPPLY CHAINS FOR STEEL – SO ANY CHANGE IN THE WAY IT EXTRACTS IRON ORE HAS A LONG TAIL OF CONSEQUENCES. THIS IS TRUE IN TERMS OF HOW ITS PRODUCTS ARE TRANSPORTED ACROSS RAIL AND VIA PORTS, AND FOR UPSTREAM CUSTOMERS WHO NEED IRON ORE TO PRODUCE VEHICLES, RAILWAYS, BRIDGES, PYLONS AND MUCH MORE.

In 2022, Vale announced to its investors and the market that it would become a sustainable mining company, switching its focus from being a 400 metric tons per year (mtpy) standard miner to a 350 mtpy quality and sustainable iron ore solution provider. This commitment was underpinned by its desire to focus on quality, rather than quantity, aiming for a +50 mtpy increase in iron ore agglomerates such as pellet feed, and the newly introduced to the market green briquette. We take a closer look at how this is being achieved.

GREEN BRIQUETTES: A NEW BEGINNING

Marcello Spinelli, Executive Vice-President for Iron Solutions at Vale, says the company has been working towards green briquettes for almost 20 years, knowing these will reduce greenhouse gas emissions by up to 10% for its steelmaking clients. Fast-forward to November 2023, and Vale announced the startup of the first iron ore briquette plant at its Tubarão Unit, in Vitória, Brazil. "We already have an estimated backlog that should take 18 months to fulfill," says Marcello.

Rogério Nogueira, Vale's Director of Product and Business Development, says, "With the development of this new type of briquette, Vale is taking another important step in its contribution to reducing emissions from the steelmaking chain through innovation, always in close collaboration with its clients and development partners."

Fernanda Tauffenbach, partner, Infrastructure & Capital Projects, Deloitte Brazil, is delighted to be working on this leading-edge, exciting program of work.

"This significant investment and new way of working is part of Vale's strategy to reduce Scope 3 emissions by 15% by 2035. We are working closely with the Vale team to turn this innovative idea into a reality on time, on budget, safely and securely," she says.

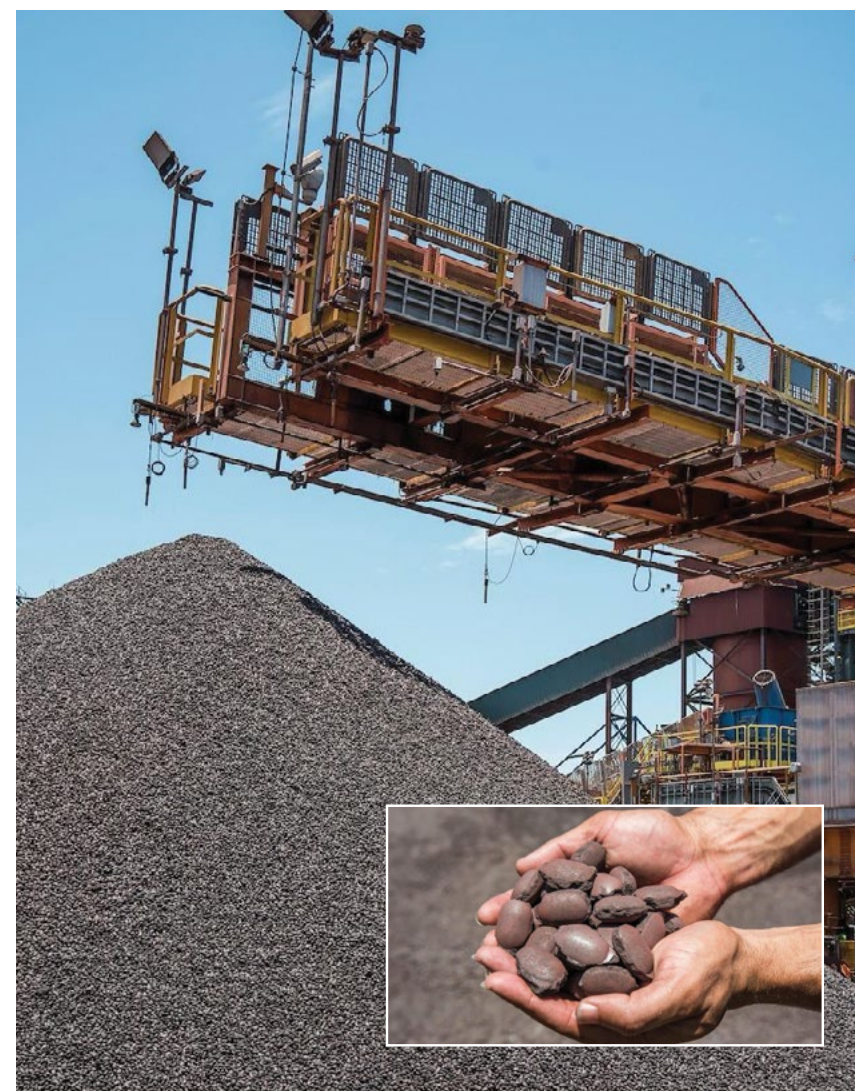
So, what are green briquettes, exactly, and how will they make the steel supply chain more sustainable? The easiest answer is that a 'green briquette' is made of iron ore and an agglomerant technological solution that resists blast furnace temperatures without disintegrating, which reduces steelmakers' dependency on sintering, which requires the use of coal heated to about 2,372° Fahrenheit (1,300° Celsius). The green briquette does not require burning as part of its production: instead, a drying process between 392 and 482° Fahrenheit (200 and 250° Celsius) is used, requiring significantly less energy. All of this helps Vale and its customers contribute towards achieving decarbonization goals by reducing 10% of the carbon dioxide emissions that are emitted during the steel production process.

THE ART OF CONTROLLING CARBON EMISSIONS

Eduardo Raffaini, partner, Infrastructure & Capital Projects, Deloitte Brazil, has been closely involved in this transformation project.

"The focus of the briquette project is delivering a high-value, more sustainable product to Vale's clients across the country or overseas. The idea now isn't to mine the largest amount possible of iron ore, it's to mine and deliver only what's required, and to process those raw materials in accordance with high-quality standards to benefit the environment, as well as the rest of the supply chain," he explains.

Encouragingly, the innovation has sparked more creative thinking to control its carbon exposures, with Vale also carefully researching and testing how it can review the way it uses its furnaces to reduce their heat from 1,112 to 392° Fahrenheit (600 to 200° Celsius). This would mean that the main combustion can use natural gas, which causes less pollution than other energy sources.



Iron ore briquettes stockpile and close up. New product will be produced in plants in Espírito Santo, with a total capacity of 6 million mtpy. (Image: Vale)

REALIZING THE NEW SOLUTION

Vale and Deloitte have been collaborating on strategy development, tactics and operations.

Eduardo Lavocat, senior manager, Infrastructure & Capital Projects, Deloitte Brazil, says "We have been helping Vale since the start of plants #1 and #2, developing and implementing a new integrated solution for project management and planning, through Lean Construction methods, Advanced Work Packaging (AWP), Building Information Modeling (BIM) and project controls. These solutions are helping to overcome the complexity and the usual roadblocks you would expect in the redesign of old plants."



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REPURPOSING A BROWNFIELD SITE FOR THE BETTER

The two new briquette plants will be made possible by a combination of a brownfield site – two pelletizing plants that were going to be decommissioned that now have been converted – and a greenfield site using land that has not been developed on before next to the existing plants, where Vale built part of the new processes required for briquette production. The first one

commenced operations in November 2023 and the second is planned to start operating in mid 2024. Their combined production capacity will be approximately 6 million mtpy. Long-term estimates are that Vale will have the capacity to produce more than 50 million tons of green briquettes per year, resulting in a potential reduction in emissions of 6 million metric tons of carbon dioxide equivalent per year through the use of this technology.



Plants #1 and #2 at Tubarão Unit, in Vitória, Brazil. (Image: Rafael Coelho, Vale)

CRITICAL SUCCESS FACTORS

When reflecting on what it takes to drive this industry-wide transformation, the team agrees it comes down to four main factors:

- **A unifying vision:** This is underpinned by a real purpose and commitment to innovate the mining industry and shift its reputation from one that harms to one that improves the environment.
- **Courageous leadership:** Being open minded, open to innovation, and open to making a difference.

- **Expert team:** Having a strong, robust engineering team that can tackle all the challenges that appear during the project – everything is new, so experienced professionals are needed to deliver in different and faster ways.
- **Partnership:** It takes an ecosystem to enact long-lasting change including designers, consultants, suppliers, construction companies, communities and all other stakeholders who are equally committed to delivering on the vision.

CHANGING THE GLOBAL MINING GAME, ONE STEP AT A TIME

There is no doubt that investment is required to reimagine the metal supply chain. So far Vale has self-funded approximately US\$250 million needed to implement the first green briquette plants and expects to invest billions in the program in the next ten years, but the spending doesn't stop there.

Steel companies, hot-briquetted iron (HBI) producers, and every other participant in the global metal supply chain will need to adjust or invest in new operations to use the green briquette effectively – and judging by existing customer interest levels, this is exactly what is already taking place.