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Hi-Green Carbon Ltd

About Hi-Green Carbon Ltd

Date: 2nd January 2025

Hi-Green Carbon Limited, a prominent part of the Radhe Group Energy, is headquartered in Rajkot, Gujarat. Established in 2011 under the name "Shantol Green Hydrocarbons (India) Private Limited," the company underwent a name change in 2022, adopting its current name to better reflect its business of sustainable solutions and carbon recovery.

The company specializes in the recycling of end-of-life tyres (ELTs) using an advanced continuous pyrolysis process. This innovative technology efficiently transforms ELTs into valuable products, including Recovered Carbon Black (rCB), fuel oil, and synthesis gas. The continuous pyrolysis process is notable for its high efficiency and minimal human intervention, ensuring a streamlined production flow that aligns with Hi-Green Carbon's commitment to sustainability and the reduction of greenhouse gas emissions.

Hi-Green Carbon operates a production facility in Bhilwara, Rajasthan, with the capacity to recycle 100 metric tonnes (MT) of waste tyres per day. In November 2024, the company plans to launch a second unit in the Dhule district of Maharashtra, which will also have a capacity of 100 MT per day. Additionally, a third unit is currently under construction in the Dhar District of Madhya Pradesh, expected to be operational by June 2025. This expansion aims to enhance the company's production capabilities with geographical diversification.

Market cap (INR Cr)	**605**
CMP	242
Promoter Holding %	71.86

Business Overview

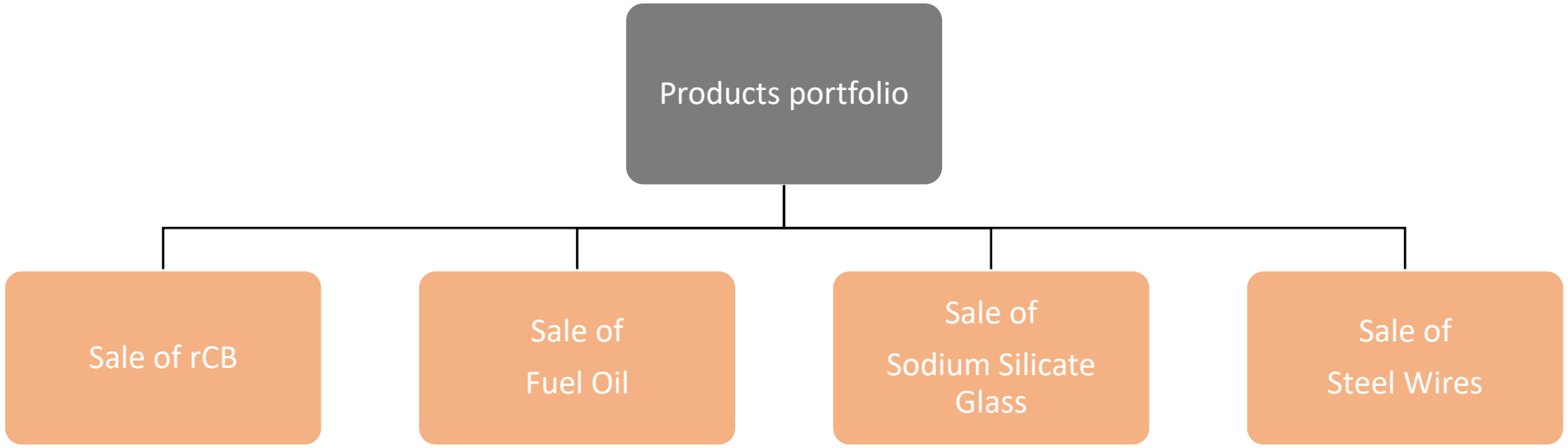
Pyrolysis Process

Hi-Green use a continuous-type pyrolysis machine that operates through a fully automated and continuous process managed by SCADA (Supervisory Control and Data Acquisition). This advanced system enhances operational efficiency and ensures consistent quality in the production of end products. The key stages of the pyrolysis process are as follows:

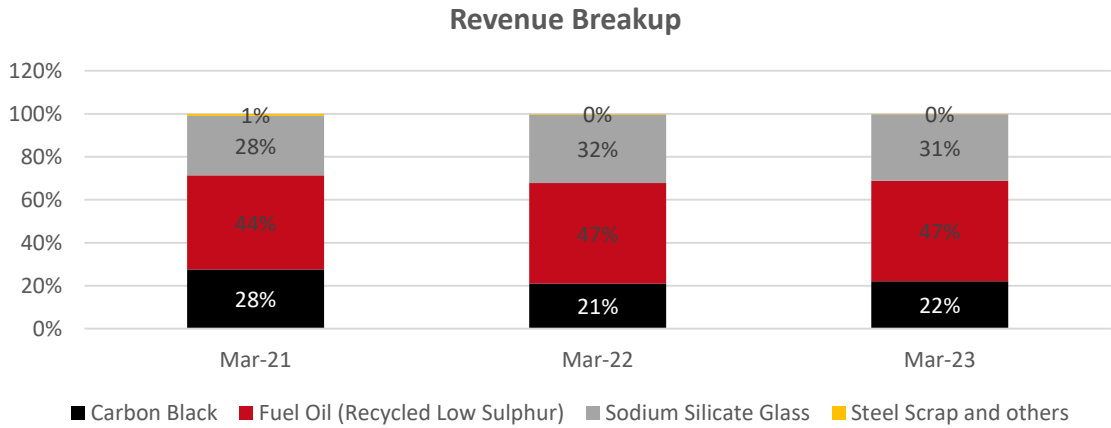
1. Feeding: Waste tyres are first shredded into smaller pieces, typically less than 15 mm, to ensure uniformity for optimal processing in subsequent stages. These shredded tyre particles are then introduced into the reactor using an automatic feeding system.
2. Transport: The shredded tyre particles are transported to a sealed silo via a high-angle belt conveyor. To prevent combustion during this transportation, a nitrogen protection system is employed to eliminate excess air from the tyre particles.
3. Heating: The reactor is heated using a burner that can be fueled by diesel, natural gas, or LPG. As the temperature rises—typically within the range of 300 °C to 600 °C—thermal decomposition occurs, breaking down the components of the tyres into gaseous and liquid products.
4. Cooling: After pyrolysis, the resulting oil and gas are cooled using a four-step condensation system. This system is crucial for cooling and collecting the condensable components as pyrolysis oil, while non-condensable gases are directed to the combustion system for energy recovery.
5. Gas Recovery: The non-condensable gases generated during pyrolysis are recycled back into the reactor to provide heat, thereby reducing overall fuel costs and enhancing the efficiency of the process.
6. Flue Gas Treatment: In accordance with regulatory standards, flue gases produced during the process are treated to minimize their environmental impact.
7. Discharge of By-products: Once cooling is complete, residual materials such as carbon black and steel wire are extracted from the reactor for further processing or recycling.

The quality of recovered carbon black (rCB) is influenced by several critical factors, including the composition and condition of the input tires. The uniformity of the tires used in the process is also essential, as it affects the consistency of the output. Additionally, the pyrolysis temperature plays a significant role in determining the quality of rCB, as it impacts the degradation and transformation of the materials during processing.

Business Overview



Source: company, oaken capital



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Business Overview

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Recovered carbon Black

- The global carbon black market was valued at USD 22.2 billion in 2023 and grew at a CAGR of 4.4% from 2024 to 2033. The market is expected to reach USD 34.15 billion by 2033.
- The consumption of virgin carbon black releases an enormous amount of CO2, leading to environmental pollution. Replacing virgin carbon black with Rcb would reduce approximately 2,000 Kilo of CO2 per ton of production.
- The Global rCB market was 117,000 mt in 2023 and it is estimated to be of 1,000,000 Mt by 2033.
- Currently less than 1% rCB is used new tire production and it is suppose to be 7% by 2033 backed by the tire manufacturing companies' initiative to use more and more sustainable product in their tire making, rCB market is supposed to grow at 11% over next ten year globally.
- Studies have shown that blending 10-30% recovered carbon black (rCB) with virgin carbon black can achieve performance properties comparable to those of virgin carbon black. The effectiveness of this blending depends on the purity and quality requirements of the carbon black, which vary based on the specific application.

Carbon black applications:

- In plastics, it enhances master-batch applications for conductive packaging, films, fibers, moldings, pipes, and semi-conductive cable compounds.
- In toners and printing inks, it improves formulations and provides color flexibility. For coatings, carbon black offers pigmentation, conductivity, and UV protection in marine, aerospace, and industrial applications.
- Additionally, it is processed into activated carbon, which is in high demand for filters and purifiers and can be sold at four times the value of recovered carbon black (rCB).
- As a fuel source, carbon black serves as a cleaner alternative to coal and pet-coke in firing applications.
- It is also crucial in the production of tires and industrial rubber products, being used in inner liners, carcasses, sidewalls, treads, and various rubber goods like belts and hoses.

Business Overview

Fuel Oil

- Fuel Oil produced from Pyrolysis, sometimes also known as bio-crude or bio-oil, is a synthetic fuel under investigation as substitute for petroleum.
- Fuel oil produced from tyre pyrolysis is also known TDF (tyre driven fuel) which has higher energy content. This allows a furnace to burn less fuel, for each BTU of heat produced, as well as often times reducing the cost of fuel in industrial application like Boilers, Furnaces, kilns, Hot water generators, Hot air generators etc.
- It can use this kind of fuel oil in farming equipment's as well. Addition to that fuel oil can be further distilled and various valuable chemicals and petro-products can be derived.
- Major end users for Fuel Oil are cement manufactures and oil refineries.

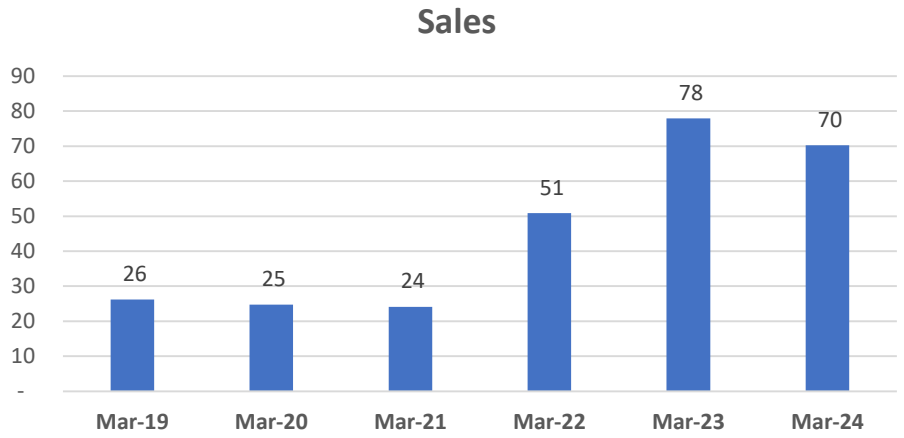
Sodium Silicate

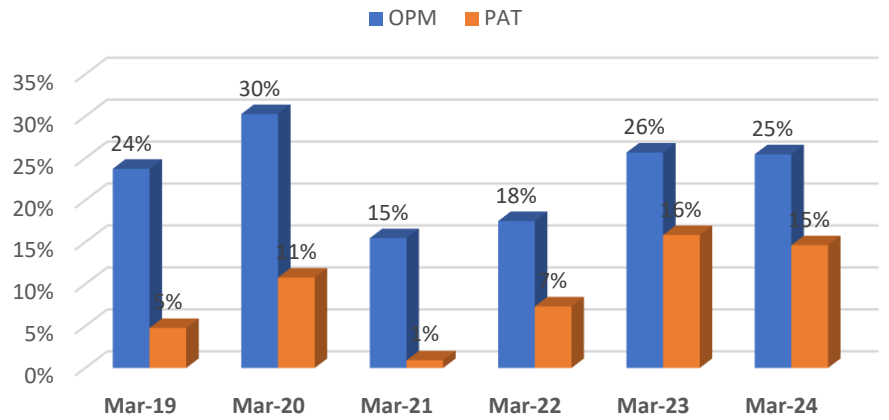
- Sodium silicate is produced by mixing silica sand with sodium carbonate in a reactor under high temperature and pressure. The establishment of a sodium silicate plant aims to utilize excess gas for the manufacturing process, thereby reducing energy loss.
- Sodium silicates can appear as colorless glassy or crystalline solids, or as white powders.
- It serves various applications, including its use in soaps and detergents, as well as in the production of silica gel. It functions as a cement, binder, filler, and adhesive, and is also utilized in wall coatings, concrete formulations, fireproofing materials, and sealants. Additionally, sodium silicate is employed for wood preservation. The primary end users of sodium silicate include glass manufacturers and manufacturers of fast-moving consumer goods (FMCG).

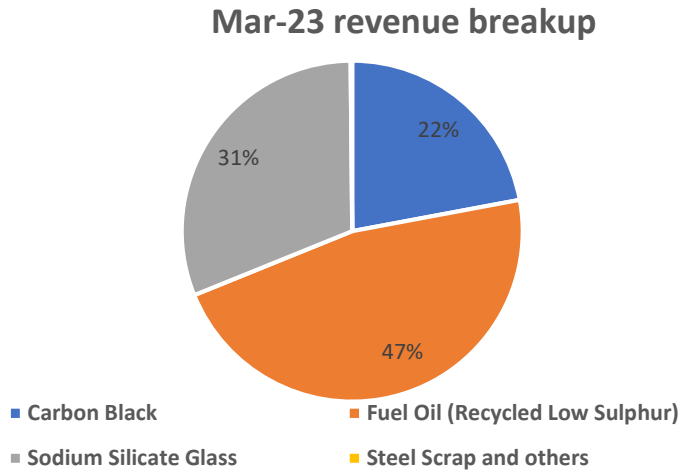
Steel Wires

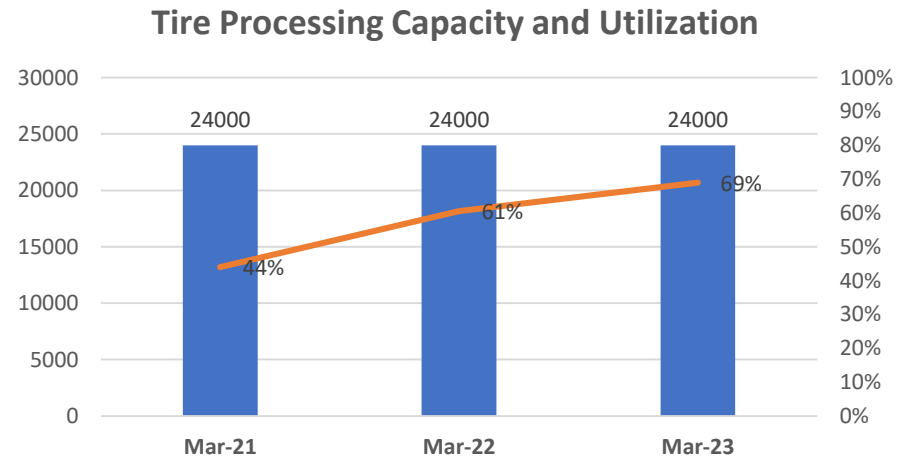
- Steel tyre wire scrap from shredding of waste tyres. This scrap is derived from shredding of waste Tyres. This scrap has also carbon content. The scrap wires are utilised by scrap dealers and tyre manufactures for their use, respectively.

Financial Highlights









Source: company, oaken capital

Industry Overview

- The tire recycling industry is pivotal in addressing the environmental challenges posed by the accumulation of scrap tires. Each year, billions of tires are produced and similarly discarded, resulting in significant waste management issues. Despite the pressing need for effective recycling solutions, only a fraction of these tires—millions—are processed annually, highlighting a substantial gap in recycling capabilities.
- Globally, it is estimated that between 1 billion and 1.8 billion tires reach the end of their useful life each year, contributing to approximately 2-3% of total waste produced. Currently, around 4 billion tires are stockpiled in landfills worldwide, which can take centuries to decompose. This accumulation poses long-term ecological threats, as tires can leach harmful chemicals into soil and water systems and contribute to air pollution when burned. Additionally, as tires degrade, they break down into microplastics, further threatening marine ecosystems.
- The global tire recycling market was valued at approximately $11.98 billion in 2018 and is projected to reach around $18.14 billion by 2032, growing at a compound annual growth rate (CAGR) of 3.3% from 2023 to 2032. The market's growth is driven by increasing awareness regarding sustainability and stringent governmental regulations aimed at managing tire waste more effectively.
- In India, ~2 million metric tons (MT) of tires are discarded annually, with an additional 0.8 million MT imported from countries where tire recycling is not permitted. which brings the total tyre waste handled in India to 2.8 million MT.
- Countries such as Japan, South Korea, the United States, and various European nations have achieved high tire recycling rates. For instance, Europe improved its recycling rate from about 50% in 1996 to approximately 95% by 2019. However, the global average recycling rate remains low at only 25%, indicating significant potential for growth in this sector. The European Union has taken steps to mitigate this issue by outlawing the landfilling of tires since 2003 due to environmental concerns. Despite these regulations, many discarded tires are still shipped to developing countries where they often end up in landfills.

The main methods employed in tire recycling include:

- Shredding: This process involves breaking down tires into smaller pieces and accounted for about 78.35% of the market share in 2021. Shredded tires can be used in construction, manufacturing, and as fuel.
- Pyrolysis: This technique heats tires in the absence of oxygen to produce valuable products like tire pyrolysis oil (TPO) and recovered carbon black (rCB). Pyrolysis is gaining popularity due to its ability to convert waste into high-value materials while minimizing environmental impact.
- Refurbishing: This involves repairing and retreading used tires to extend their life cycles, contributing to resource efficiency.

Risk to Environment

Environmental Impact of Improper Tire Disposal

Improper disposal of discarded tires poses significant environmental and health risks. Tires can leach harmful chemicals, such as heavy metals and hydrocarbons, into the soil and groundwater, degrading water quality and threatening human health and aquatic ecosystems.

Burning tires releases toxic fumes, including volatile organic compounds (VOCs) and particulate matter, contributing to air pollution and respiratory issues in nearby communities. Additionally, improperly disposed tires can create stagnant water pools that serve as breeding grounds for mosquitoes. They also provide shelter for rodents, leading to property damage and disease spread.

Tires are highly flammable and difficult to extinguish once ignited, posing further fire hazards. In landfills, they emit methane—a potent greenhouse gas—contributing to climate change. Moreover, when disposed of in oceans or rivers, tires can trap marine animals; over 200 hermit crabs are estimated to become trapped in discarded tires annually, leading to starvation.

World's Biggest Tire Graveyard in Sulabiya, Kuwait

- In 2021 fire in graveyard was visible from space and required massive resources to extinguish.

The Osborne Reef

- Created in the 1970s by dumping approximately 2 million tires off the coast of Fort Lauderdale, Florida, was intended to serve as an artificial reef to enhance marine habitats. Instead of enhancing marine life, the tire dump has led to habitat destruction, pollution, and ongoing challenges for local ecosystems.

Growth Drivers

Government Policy Boosts Industry Growth

The introduction of Extended Producer Responsibility (EPR) regulations for waste tyres by the Ministry of Environment, Forests and Climate Change (MoEFCC) in India marks a significant step towards enhancing environmental sustainability and promoting growth within the tyre recycling industry. This initiative holds producers and importers accountable for the safe disposal of end-of-life tyres, thereby addressing a critical environmental challenge.

For the fiscal year 2022-23, producers were required to fulfill an EPR obligation of 35% of their tyre production or imports from the previous year. This obligation is set to increase to 70% for 2023-24 and will reach 100% from 2024-25 onwards.

The Tyre and Rubber Recycling Association of India (TRRAI) serves as a crucial platform for rubber and tyre recyclers, advocating for their interests and promoting best practices within the industry. As a member-driven organization, TRRAI fosters collaboration between recyclers and producers, enhancing operational efficiency and environmental sustainability in tyre recycling.

Key Initiatives by global Tyre Manufacturing Companies

Apollo Tyres has developed a concept agricultural tyre made from 75% sustainable materials. This includes components such as recycled rubber, sustainable carbon black from end-of-life tyres, bio-based oil, recycled nylon, and bead wire with higher recycled content. The company aims to increase the use of sustainable materials in its products to 40% by 2030. Following the agricultural tyres, Apollo has also introduced passenger vehicle tyres containing 75% sustainable materials, which are currently undergoing extensive testing before commercialization.

Bridgestone has launched a comprehensive global recycling program aimed at collecting used tyres at retail locations. This initiative focuses on material recycling and energy recovery, showcasing Bridgestone's commitment to sustainable practices in tyre lifecycle management.

Nokian Tyres has introduced the Green Step concept tire, which is composed of an impressive 93% recycled or renewable materials. The company is targeting a goal of using 50% sustainable materials by 2030

Michelin has made significant advancements in the sustainability of its racing tyres for the MotoE series, now incorporating 49% renewable and recycled materials in the front tyres and 53% in the rear tyres for the 2024 season, compared to 33% and 40% respectively in 2021.

Opportunity

- In India, ~2 million metric tons (MT) of tires are discarded annually, with an additional 0.8 million MT imported from countries where tire recycling is not permitted. which brings the total tyre waste handled in India to 2.8 million MT. Hi-Green Carbon have a capacity of 24000 MT in one plant.
- That means to recycle 2.8 Mn MT tyre waste recycling per annum require ~115 numbers of 100 MT plants in India. That clearly show that there is opportunity in Industry.
- In India only about 20% of discarded tyres are recycled. This figure highlights a significant gap in effective waste management practices, as the remaining 80% often end up in landfills or are incinerated, contributing to environmental pollution.
- The EPR initiative is expected to significantly boost the growth of the tyre recycling sector in India. Vishesh Aggarwal, Director of AIRTRA, has highlighted that the Indian tyre and rubber recycling industry could potentially grow ten times to INR 350 billion within the next five to ten years.

Strengths

- Radhe Group heavily invests heavily in research and development to create innovative waste processing technologies. The company has established a state-of-the-art processing plant and developed patented technology for continuous pyrolysis of tyre recycling, specifically for the use of Hi-Green Carbon.

Threats

- Any unfavourable changes in government policy can significantly impact industry.
- Tyres are highly inflammable and Company's property and stock are subject to risk of loss due to fire.

Future Outlook

	Mar-19	Mar-20	Mar-21	Mar-22	Mar-23	Mar-24	FY25	FY26	FY27
Sales	**26**	**25**	**24**	**51**	**78**	**70**	**100.00**	**170.00**	**216.00**
Expenses	19.98	17.28	20.38	41.96	57.94	52.36	78.00	130.90	162.00
Operating Profit	**6.22**	**7.50**	**3.73**	**8.91**	**20.01**	**17.89**	**22.00**	**39.10**	**54.00**
	24%	30%	15%	18%	26%	25%	22%	23%	25%
Profit before tax	**2.20**	**3.66**	**0.26**	**4.69**	**15.99**	**14.00**	**17.00**	**29.10**	**41.00**
Tax	0.96	0.99	0.04	0.96	3.63	3.72	4.25	7.28	10.25
Net profit	**1.25**	**2.67**	**0.22**	**3.73**	**12.35**	**10.28**	**12.75**	**21.83**	**30.75**
	5%	11%	1%	7%	16%	15%	13%	13%	14%

Source: company, oaken capital

- The company plans to commence operations at its third plant in Madhya Pradesh during the second half of FY26. Following this expansion, the company anticipates operating at three times the capacity it had in FY24.
- At its Rajasthan facility, the company is currently utilizing excess gas to produce sodium silicate; however, this process yields a very low operating margin, which negatively impacts the overall profitability of the company.
- In Maharashtra, the company is exploring the use of syngas for power generation. For the Madhya Pradesh plant, research and development efforts are underway to utilize this gas as liquefied petroleum gas (LPG), which would be stored in cylinders.
- If the company successfully identifies an efficient method for syngas utilization, it could significantly enhance its profit margins.

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