



Hygimed deashing – an innovative non-heating technological process for production rCB from scrap tires.

Hygimed deashing technology is a three-stage process to valorized pyrolysis carbon black (pCB) to recovered carbon black (rCB), executed without heating or harmful chemical, with high efficiency, minimal environmental impact, low CapEx and low OpEx.

Key Facts and Figures

Globally, over 1.5 billion tires are produced annually, leading to around 25 million tons of waste tires each year. Tire disposal remains a major environmental issue, with around 300 million waste tires generated in the U.S. alone. Due to their complex composition, tires are difficult to recycle, resulting in costly and environmentally harmful disposal methods. Improper disposal can cause fire hazards, toxic chemical leakage, and create breeding grounds for disease-carrying mosquitoes, exacerbating the environmental impact.

As environmental concerns grow, industries are increasingly shifting toward sustainability, creating demand for better tire waste management solutions. The automotive sector is embracing circular economy principles, recycling tires into products like rubberized asphalt and eco-friendly footwear, while the construction industry is using shredded tires in low-carbon concrete and building insulation. The energy sector is also exploring tire-derived fuel (TDF) as a cleaner alternative to coal. Rising awareness of the environmental and economic impacts of tire waste, coupled with stricter regulations and consumer demand for eco-friendly solutions, is driving innovation in tire recycling across various industries.

Governments worldwide are tightening regulations on tire disposal, pushing for extended producer responsibility (EPR) and mandatory recycling quotas, particularly in regions like Europe, North America, and Asia. This has created a growing demand for innovative solutions to recycle and reuse waste tires. As industries focus on carbon reduction and a circular economy, tire valorization technologies that convert waste into valuable resources, such as recycled rubber, fuel, and industrial products, are becoming increasingly important. Companies that offer scalable, sustainable tire recycling solutions not only meet regulatory demands but also position themselves as leaders in the green economy.

Recovered Carbon Black (rCB): Transforming Scrap Tires into High-Value Material

Performance Advantages in Rubber Applications, including tires manufacturing, and graphite for battery production. When integrated into synthetic rubber during tire manufacturing, Recovered Carbon Black (rCB) delivers:

- Extended tire service life
- Enhanced tensile strength and tear resistance
- Superior wear durability
- Improved longevity of rubber products

Produced through pyrolysis of scrap tires, rCB has become a commercially vital material, creating a circular solution for tire waste.

Why rCB Matters for Industry

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- Economic Opportunity: Access premium markets with high-purity rCB.
- Waste Mitigation: Convert hazardous tire waste into a functional resource.
- Performance Parity: Meets virgin carbon black specifications in critical applications.
- Regulatory demand for 30-50%

Post-treatment rCB commands \$850–\$2,000/ton, representing an 8–20x value increases over raw material.

The Technical Challenge: Ash Contamination. While rCB is the most valuable output of tire pyrolysis, its quality is often limited by:

- High ash content (18–27%) from additives (ZnO, CaCO₃, silica)
- Classification as hazardous waste in untreated form
- Low market value (~\$100/ton) for raw, ash-rich material

The Solution: Precision Deashing for Industrial-Grade rCB. To achieve <1% ash content (industry standard for premium applications demand ash below 0.3%), rCB requires:

- Specialized purification to remove inorganic residues
- Energy-intensive processing (traditional methods)
- Hazardous chemical treatments (conventional approaches)

Unlocking Value from Scrap Tires, enhancing tire performance & sustainability rCB is a game-changer for the rubber industry. When incorporated into synthetic rubber during tire manufacturing, rCB delivers measurable benefits:

- Extended tire lifespan
- Higher tensile and tear resistance
- Improved wear durability
- Prolonged service life of rubber products

Derived from the pyrolysis of scrap tires, rCB has emerged as a highly sought-after commercial product, closing the loop in tire recycling.

Why Invest in Hygimed Deashing system?

1. Profitability: Tap into the premium-priced, high-demand rCB market.
2. Sustainability: Turn hazardous waste into a circular economy asset.
3. Performance: Supply tire manufacturers with superior-grade material.
4. Low environmental foot-print and low power consumption meaning low cost and safe process with positive carbon dioxide credit.

Market overview

The global carbon black market has experienced steady growth, with its value increasing from USD 12.61 billion in 2021 to USD 13.22 billion in 2022, and is projected to reach USD 18.09 billion by 2029, reflecting an average annual growth rate (CAGR) of 4.6%. The tire segment is expected to remain the largest driver of this market, primarily due to the rapid expansion of the automotive industry, which accounts for around 30% of the overall weight of a tire. The demand for carbon black in tires is further supported by the increasing requirement for at least 25% recycled carbon black (rCB) in new tire



production, which is expected to elevate both market demand and rCB prices, currently pegged at approximately \$1,340 per metric ton. The Asia-Pacific region, which stood at USD 7.15 billion in 2021, is anticipated to continue leading the market, driven by the robust growth in automotive manufacturing and the rising adoption of sustainable materials in tire production. As the automotive sector grows, particularly in emerging economies, the demand for both traditional and recycled carbon black is poised for significant expansion. The rCB global market is emerging, driven by increasing demand for sustainable tire recycling solutions, but remains in the early stages of development compared to more mature markets.

The Opportunity

Our tire valorization technology offers an effective, sustainable solution to the global tire waste problem by converting discarded tires into valuable, reusable products through advanced recycling methods like pyrolysis, mechanical shredding, and deashing. This closed-loop process recovers key materials such as rubber, carbon black, steel, and oil, which can be reintegrated into various industries, helping reduce the environmental burden of tire disposal while supporting the growing demand for circular economy solutions. With the market for recycled tire products expanding in sectors like automotive, construction, and energy, our technology not only addresses environmental concerns but also presents a profitable business opportunity for companies seeking eco-friendly innovations.

Technology Overview: How the Technology Works

Our innovative approach focuses on a low-carbon emission process that transforms waste into valuable resources, with minimal environmental impact. Operating in an oxygen-free environment, our process ensures that treated materials do not come into contact with the atmosphere, effectively eliminating the risk of polluting emissions or the release of toxic substances. Using a thermal conversion process, we produce a hydrogen-rich synthetic gas internally, which enables the efficient recycling of plastics, rubber tires, used motor oil, and biomass. The results of our valorization process include synthetic fuels (such as non-standard synthetic diesel), recovered Carbon Black (rCB) for use in tire production, and carbon briquettes or biochar. This process is environmentally sustainable, with zero water and solid waste discharge, extremely low carbon emissions, and minimal environmental footprint. Additionally, the system is self-sustaining (autothermic), meaning it requires no external heating power. This solution provides an effective and eco-friendly way to address waste management while producing high-value products for various industries.

Hygimed Deashing utilizes a three-stage process combining two complementary solutions and three powerful pieces of physical equipment to achieve an ash level of less than 0.3%, as required by industry standards. The process involves no heating, aggressive chemicals, or harmful residues, and operates continuously for 3 hours to effectively wash ash from both the external and internal surfaces of the carbon matrix. This solution is adaptable for both small-scale on-site applications and large-scale plants. The technology, which is based on an innovative approach considering the unique structure of carbon black particles, ensures optimal ash removal. After washing, the recycled carbon black (rCB) is transferred to a horizontal turning reactor for drying.

The small-scale equipment is compactly packed within a 20-foot container, while the medium-sized system, also housed in a 20-foot container, can process up to one ton of carbon black per hour. Larger systems are designed and customized based on specific client needs. This versatile technology delivers

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consistent and reliable results, as demonstrated by the successful treatment outcomes we have achieved.



\$100/T



\$2,000/T

Comparison: Industrial-Scale vs. Hygimed Deashing Process

Parameter	Industrial-Scale Process	Hygimed Deashing
Energy Consumption		
Electricity	High	Low
Heat Requirement	Very High	Very Low (drying only)
Emissions		
Carbon Emissions	Very High	Very Low
NOx/SOx Emissions	Very High	None
Infrastructure		
Capital Investment	Very High	Low
System Complexity	High	Simple
Mobility	No	Yes
Scalability	Complex & Expensive	Modular Design
Environmental Impact		
Hazardous Waste Generated	High	None



Parameter	Industrial-Scale Process	Hygimed Deashing
Environmental Rating*	1 (Worst)	10 (Best)
Operational Costs	Very High	Very Low

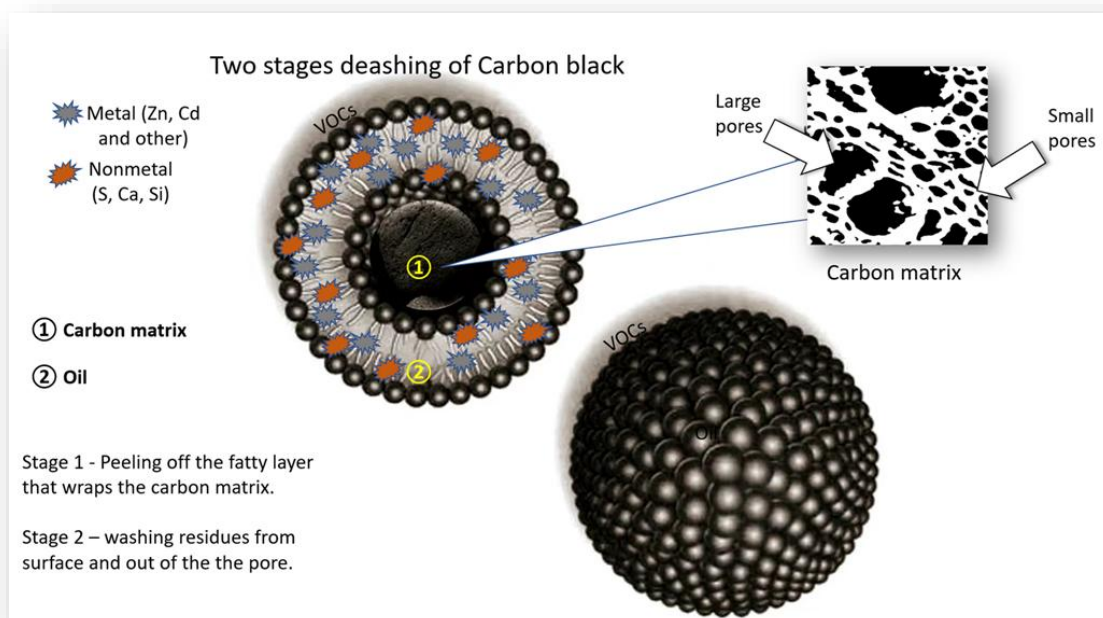
*Environmental Protection Ranking Scale: 1 (Poor) to 10 (Excellent)

Key Advantages of Hygimed Deashing:

- ✓ Lower operational costs (energy & maintenance)
- ✓ Minimal environmental impact (zero hazardous waste, low emissions)
- ✓ Modular and mobile system for flexible deployment
- ✓ Easier scalability compared to traditional systems
- ✓ Reduced capital expenditure requirements

How It Works

The system's three-stage deashing process combines two complementary chemical solutions and three advanced physical systems to purify carbon black (CB), reducing impurities to below 0.3%, comply with the highest industry standards.



Key Advantages:

- No heating required – Energy-efficient and safe operation.
- No corrosive chemicals – Eliminates hazardous byproducts.

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- No harmful residues – Fully clean, sustainable process.
- Deep purification – Removes impurities from both the interior and exterior of the carbon matrix in just 3 hours of continuous treatment.

Process Breakdown

Stage 1: Detergent Washing

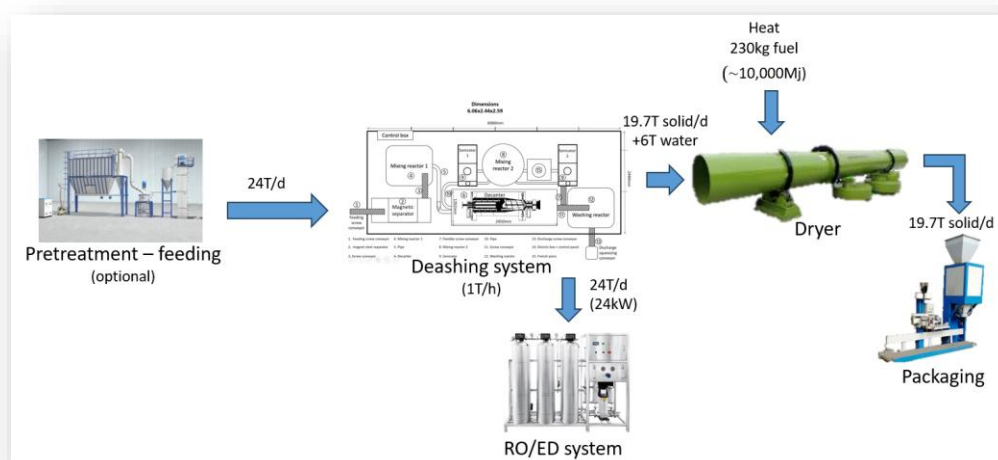
- The pre-treated CB (pCB) is mixed with a specialized detergent solution to degrade residual oils and volatile organic compounds (VOCs) from both the surface and porous structure of the carbon matrix.
- The detergent chemically reacts with inorganic impurities, facilitating their removal through mechanical washing.
- A continuous centrifuge separates the purified CB solids from the liquid solution.

Stage 2: Acidic Washing

- The CB solids from Stage 1 are transferred to a mixing reactor containing a mild acidic solution.
- The suspension is circulated through a high-efficiency washing device, ensuring the acid reacts with any remaining inorganic impurities (both externally and internally bound).
- Impurities are removed via continuous centrifugation.
- An automated sensor monitors zinc (Zn) content—if levels remain high, the system initiates a second acidic wash for optimal purity.

Stage 3: Final Rinsing & Recovery

- The CB undergoes a soft water rinse and final centrifugation before being transferred to a drying system.
- Waste solutions from Stages 1 and 2 are combined and processed in a reverse osmosis (R/O) system, recovering water for closed-loop reuse.





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Scalable options:

The technology is adaptable for both small-scale on-site applications and large industrial plants. It leverages the intrinsic properties of CB particles, which consist of a target carbon matrix. Post-treatment, the purified recycled carbon black (rCB) is transferred to a horizontal rotary reactor for drying.

Available Systems:

We offer two standardized models; both housed in 20-foot containers (660 × 244 × 259 cm):

- Model A: 500 kg/hour capacity
- Model B: 1,000 kg/hour capacity

For higher capacities, we provide custom-engineered solutions tailored to specific production needs.

2. Economic Value:

The business model stems from the following market characteristics:

- Insufficient supply of recycled carbon black (rCB), while tire sales grow at a compound annual growth rate (CAGR) of 3.5%.
- Regulatory changes in the EU regarding the integration of rCB in new tire manufacturing, increasing the required rCB proportion from 25% to 50%.
- Regulatory shifts concerning the recycling demand for end-of-life tires, along with the need to address the accumulation of waste tires in developing countries.
- Climate convention-related regulatory changes and international commitments to reduce carbon emissions.
- Reduced permits for oil production through tire pyrolysis, diminishing its profitability, while pyrolysis serves as the source of raw material for producing rCB from primary carbon black (pCB).

Currently, the bottleneck in the recycled carbon black industry lies in the processing stage, while the price of primary carbon black is declining, and rCB prices are rising.

As a manufacturer of deashing equipment, our chosen business model involves leasing deashing equipment or forming partnerships, along with considering the attractiveness of establishing rCB plants in China. The cost of an rCB production line is relatively low (no more than 1 million RMB), and under high rCB prices, a small-scale system producing 20 tons of rCB per day can generate an operating profit exceeding \$6 million. This means the total investment in such a factory can be recouped in just 2 weeks! Moreover, the monthly profit equals the cost of 4 sets of systems.

Therefore, our business model revolves around leasing or partnerships, with the difference lying in the payment structure for the deashing equipment and the distribution of rCB sales revenue.

- In the leasing model, the system remains under our ownership, and the customer pays a monthly rental fee based on the specific case.



- In the partnership model, the partner must pay for their share of the equipment, and profits will be distributed according to the agreement. Other options can also be considered. Additionally, establishing our own rCB plant is recommended.

P/L - Example for single site of 24T/h Hygimed Deashing units

Deashig 24T/day

Investment	
Hgimed deashing 11/h	\$ 178,571.43
Dryer	\$ 12,714.29
RO/ED	\$ 6,000.00
Packaging machine	\$ 8,142.86
Infrastructure	\$ 7,142.86
Installation and delivery	\$ 12,857.14
Total	\$ 225,428.57
Engineering and unexpected (10% of total)	\$ 22,542.86
Total investment	\$ 247,971.43

Value of Zn was calculated as 0
Purchase price of raw CB added as 0
Market price of rCB was added as \$1,324, according to SunSirs
All prices are based on Chinese market prices

Income and operating expenses				
	Quantity/ Day/T	Price/T	Sales/ Month	Sales/YEAR
Carbon Black	24	\$ 1,085.68	\$ 703,520.64	\$ 7,738,727.04
Zn	0	\$ -	\$ -	\$ -
TOTAL			\$ 703,520.64	\$ 7,738,727.04
	Quantity	Cost/day/u	COST/ Month	COST/YEAR
Employees	4	\$ 42.86	\$ (4,628.57)	\$ (55,542.86)
Management	1	\$ 317.14	\$ (8,562.86)	\$ (102,754.29)
Electricity	175	\$ 0.14	\$ (675.00)	\$ (8,100.00)
Gas	451	\$ 0.61	\$ (7,445.37)	\$ (89,344.39)
Purchase pCB	24	\$ -	\$ -	\$ -
Chemical and disposable	24	\$ 107.14	\$ (69,428.57)	\$ (833,142.86)
TOTAL			\$ (90,740.37)	\$ (1,088,884.39)
EBIDTA			\$ 612,780.27	\$ 6,649,842.65

ROI	
Balance accumulate	Month
\$ -82,657	0
\$ -165,314	1
\$ -247,971	2
\$ -247,971	3
\$ 364,809	4
\$ 977,589	5
\$ 1,590,369	6
\$ 2,203,150	7
\$ 2,815,930	8
\$ 3,428,710	9
\$ 4,041,490	10
\$ 4,654,271	11
\$ 5,267,051	12
\$ 5,879,831	13
\$ 6,492,612	14
\$ 7,105,392	15
\$ 7,718,172	16
\$ 8,330,952	17
\$ 8,943,733	18
\$ 9,556,513	19
\$ 10,169,293	20
\$ 10,782,074	21
\$ 11,394,854	22
\$ 12,007,634	23
\$ 12,620,414	24

Balance (accumulate)

4 months

Month	Balance (accumulate)
0	\$ -82,657
1	\$ -165,314
2	\$ -247,971
3	\$ -247,971
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20	\$ 10,169,293
21	\$ 10,782,074
22	\$ 11,394,854
23	\$ 12,007,634
24	\$ 12,620,414

Key numbers (example for process of 24T CB/day):

- US\$250,000 investment
- 24T pCB daily process
- output 19.68T/rCB day
- US\$1,086 sale price/ton rCB standard N330/N550
- US\$703,520 monthly income
- US\$525,500monthly profit (EBIDTA)

US\$6.6 million annual profit (EBIDTA)

Our tire valorization technology offers significant cost-efficiency for customers in several key ways:

Reduced Disposal Costs: Instead of incurring high costs for tire disposal, which may include landfill fees, illegal dumping risks, or incineration expenses, customers can leverage our technology to recycle and valorize their tire waste, turning it into valuable resources at a fraction of the disposal cost.

Revenue Generation: By transforming waste tires into valuable by-products such as rubber, oil, carbon black, and steel, customers can create new revenue streams. These materials can be sold to various industries, including automotive, construction, and energy, making tire waste a profitable asset rather than a liability.

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Long-Term Savings: Our solution helps customers reduce long-term costs by mitigating regulatory penalties, waste management fees, and carbon taxes. As governments impose stricter regulations on tire disposal and waste management, adopting our technology can help customers stay compliant, avoid fines, and potentially qualify for incentives related to sustainable waste practices. Additionally, the environmental benefits of tire recycling, such as lower carbon emissions, can reduce carbon tax liabilities over time.

Overall, our technology not only provides an eco-friendly waste management solution but also offers substantial financial advantages, enabling customers to turn tire waste into a cost-effective, revenue-generating resource.

3.Application Areas:

Our recycled carbon black (rCB) technology offers significant benefits across multiple industries by transforming tire waste into valuable, sustainable resources:

Automotive: Recycled carbon black can be used to produce high-quality rubber for new tires, improving the sustainability of the automotive sector. By incorporating rCB into tire manufacturing, companies can reduce their reliance on virgin materials, lower production costs, and meet the growing demand for eco-friendly solutions.

Construction: The construction industry can benefit from rCB by utilizing it in the production of rubberized asphalt, which improves road durability and reduces noise. Additionally, recycled tire materials can be used for manufacturing mats, tiles, and other construction products, contributing to more sustainable building practices.

Energy: Our technology also facilitates the recovery of fuel through tire pyrolysis, providing a cleaner alternative to traditional fossil fuels. This tire-derived fuel (TDF) can be used in various industrial applications, helping to reduce the carbon footprint of energy production while utilizing waste materials effectively.

Consumer Goods: Recycled tire materials can be incorporated into a wide range of consumer goods, such as footwear, gym mats, playground surfaces, and industrial products. This helps reduce waste, conserve natural resources, and offer consumers sustainable alternatives to traditional products made from virgin materials.

By converting tire waste into valuable, reusable resources, our technology supports sustainability goals and offers diverse business opportunities across these industries.

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Why Choose Us?

Proven Efficiency and Reliability: Our technology offers up to 90% conversion efficiency, providing high-yield, sustainable solutions with minimal operational downtime.

Customer Support and Partnership Opportunities: We offer ongoing support, tailored solutions, and collaborative partnership opportunities to ensure seamless integration and long-term success.

Compliance with Regulations and Sustainability Goals: Our system meets global environmental standards, helping customers comply with regulations while advancing their sustainability objectives by reducing waste and carbon emissions.

Have more questions? Do you want more information ? You're welcome to apply to us:

WE THANK YOU FOR YOUR ATTENTION

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