

GREENING SMES TOWARDS CIRCULAR SOCIETY (SDG 9) INCLUDING THE ROLE OF PPP (PUBLIC-PRIVATE PARTNERSHIP)

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"To build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation"

Circular Economy on Waste Tyres & Rubber Industry

Infrastructure

- Collection of waste (tyres)
 & recycling eco-system (regional hubs) through PPP model.
- Non-conventional / renewable energy ecosystem for SMEs
- Common recycled material processing facilities to achieve consistent quality through PPP model

Industry 4.0

- Adoption of advanced recycling technologies.
- Incorporation of digital & AI based technologies.
- Strengthen EPR implementation to enable recyclers to upgrade to Industry 4.0

Innovation

- Encourage & incentivize green environmentally safe processes for recycling.
- Encourage use of renewable / recycled materials to achieve carbon neutrality.
- Funds to be allotted for R&D institutes for innovation on recycling technologies.



- The global tire industry is reported to be **22.75 million tonnes** in 2024.
- The issue of tyre waste management is a growing global concern, with some staggering statistics that highlight the urgency of addressing this challenge. Each year, over **280 million tyres** reach the end of their useful life worldwide, yet only a fraction of these around **30 million are retreaded or reused**. This leaves an overwhelming **250 million scrap tyres needing proper disposal or recycling.**
- Investing in and developing advanced technologies for tyre recycling is crucial and needs PPP model to be adopted.

Reduce

Efforts are being put forward by Tyre Manufactures, vehicles OEM's and association to increase the consumer awareness on tyre safety and tyre maintenance towards enhancement of tyre life.

- Maintaining tyre inflation pressure
- Don't spin your tyres excessively
- Check tyres for wear
- Maintain vehicle suspension
- Wheel alignment, & balancing
- Rotation of tyres
- Not overloading vehicle

Redesigning of tyres, while maintaining road safety involves innovations in materials, tread patterns, structural design, and smart technology integration.

- Reducing fuel consumption
- Optimum use of materials
- Increasing tyre life cycle
- Improving recyclability
- Reducing complexity
- Strengthen tyre carcass to increase number of retreads









Run-flat tire with reinforced sidewall



Airless tire



Self-sealing tire



Self-inflating tire



Embedded tire sensor



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Reuse

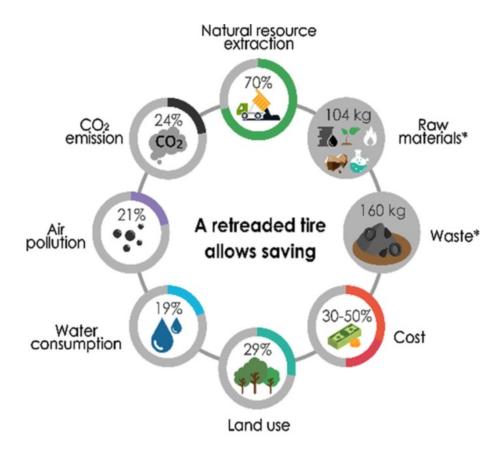


Retreading – A win-win solution

Retreading is a sustainable process where the worn-out tread of a tyre is replaced with a new one, significantly extending its lifespan and reducing waste.

The Indian retreading industry, largely driven by small and medium enterprises (SMEs), provides employment to thousands of workers, contributing to both economic growth and sustainability.

- Highly unorganized sector
- No access to information/data
- Poor skill level of manpower
- Quality is not assured as the structural integrity of tyres is not being verified with any established / proven techniques.



Recycle

In India, crumb rubber production is an essential part of the tyre recycling industry, supporting sustainability and resource conservation.





Water jet technology is an emerging and eco-friendly method for producing crumb rubber, offering a sustainable alternative to conventional mechanical and cryogenic grinding techniques. This technology involves using high-pressure water jets to break down waste tyres into fine rubber particles without generating excessive heat or requiring chemical treatments.

Although still in its early stages of adoption in India, water jet technology holds great promise for revolutionizing the country's tyre recycling industry by offering a cleaner, more efficient, and sustainable method for producing crumb rubber.

Crumb Rubber Modified Bitumen (CRMB) is an innovative and sustainable solution that enhances the properties of conventional bitumen by incorporating recycled rubber granules obtained from end-of-life tires.

Crumb rubber is widely used in playgrounds in India due to its durability, safety, and eco-friendly nature.



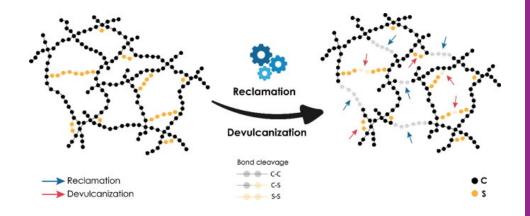
Recycle

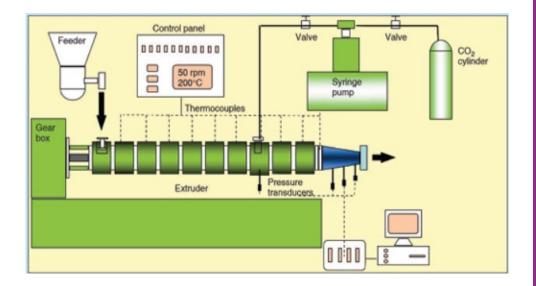
Reclaimed rubber, produced by recycling end-of-life tyres and rubber products, plays a vital role in India's rubber industry by promoting sustainability and resource efficiency.

Various technologies are used to achieve this, improving efficiency, cost-effectiveness, and environmental sustainability

Mechanical and chemical methods dominate due to costeffectiveness and ease of use. Thermal and microwave methods are gaining popularity in large-scale operations.

One of the processes contributing significantly to the Circular Economy for End of Life Tyres and Tyre to Tyre (T2T) Recycling is DEVULCANIZATION.





Recycle

Pyrolysis of waste tires produces a series of valuable chemical compounds in solid, liquid and gaseous phases, which can become value-added products as additives and starting materials for other products that can be used in the petrochemical, energy or steel industries.

Tyre pyrolysis technology is evolving in India, driven by environmental regulations, market demand for sustainable products, and advancements in efficiency and emission control.

- Advanced Gas Cleaning & Emission Control Systems
- Upgrading Pyrolysis Oil into Biofuel
- Recovered Carbon Black (rCB) Purification & Upgrading
- Waste Heat Recovery & Energy Utilization



Summary



Tyre Retreading & Reuse

- Encourage retreading to extend tyre life by up to three times, reducing raw material consumption.
- **Promote high-quality retread compounds** to ensure safety and performance.
- Adopt government incentives for businesses and fleets using retreaded tyres.

Advanced Recycling & Material Recovery

- Use mechanical and cryogenic grinding to produce high-quality crumb rubber for roads, playgrounds, and construction.
- Promote reclaimed rubber in new tyre manufacturing to reduce dependence on virgin rubber.
- Encourage pyrolysis plants with advanced emission controls to produce sustainable fuels and recovered carbon black (rCB) reducing net GHG emission by replacing the petroleum based materials.

Sustainable Tyre Design & Manufacturing

- Integrate recyclable materials like bio-based rubber and silica to improve longevity and recyclability.
- Optimize tread designs for longer wear life to reduce tyre waste.



Summary



Consumer Awareness & Collection Systems

- Implement efficient waste tyre collection networks to prevent illegal dumping.
- Educate consumers on sustainable tyre disposal options and benefits of using recycled products.
- Encourage buy-back schemes where manufacturers offer incentives for returning used tyres.

Policy & Industry Collaboration

- Strengthen EPR implementation, requiring tyre manufacturers to support recycling and reuse initiatives.
- **Promote public-private partnerships** for tyre waste management infrastructure.
- Encourage research and development in sustainable tyre recycling technologies.



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