

Technology Developed by:



Environment Friendly
GREEN CARBON MANUFACTURING Plant
State-of-Art technology



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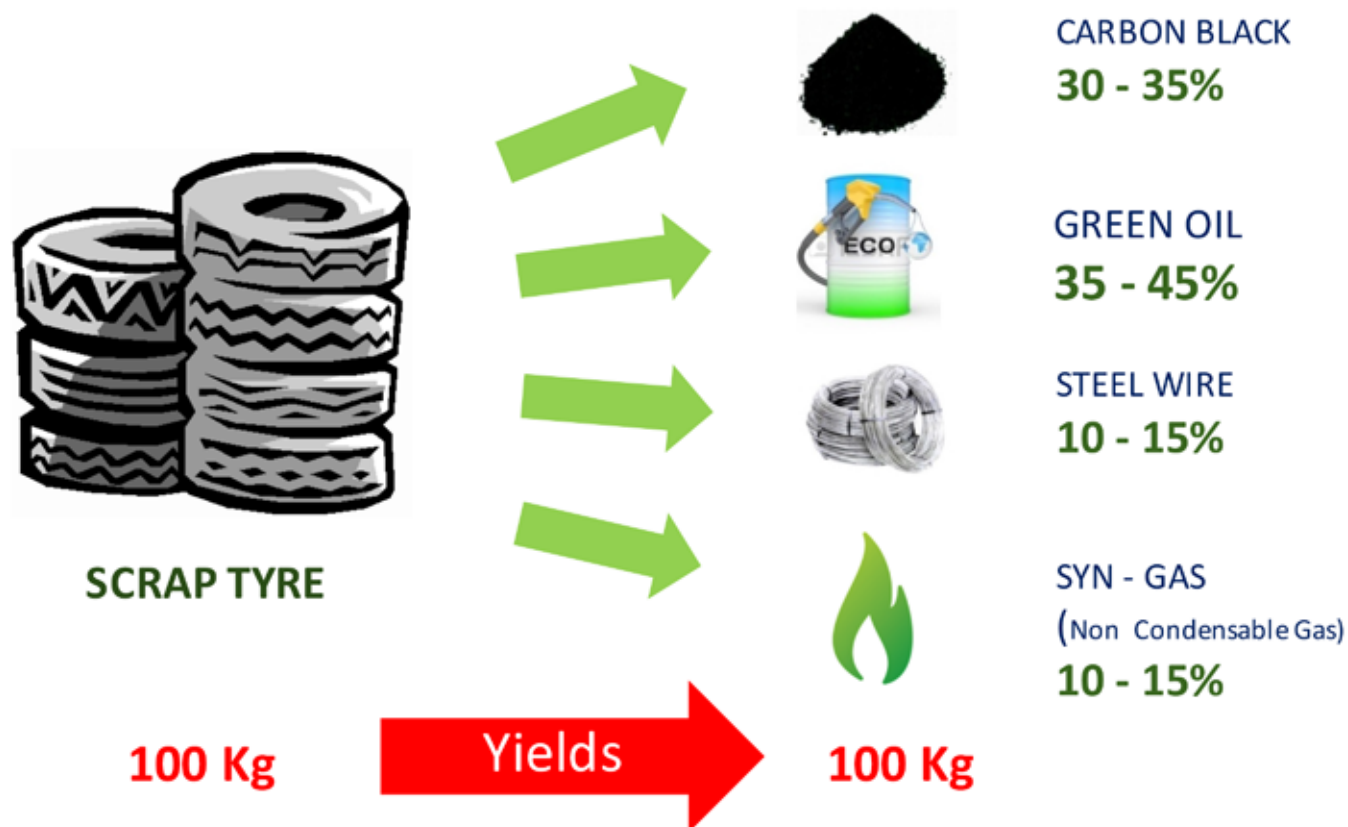
Project Operated by:

SHANTOL Green Energy (India) Pvt. Ltd.

STREBL Energy Pte Ltd (Singapore)

What is Pyrolysis ?

It's an ancient technique of breaking waste hydrocarbons into elemental hydrocarbons by indirect heating in the absence of Oxygen. Tire Pyrolysis gives following 4 products:



Types of Pyrolysis Processes

BATCH TYPE

X

X

X

X



X

Safety

Environment

Health

Efficiency

Investment

Equipment Life



CONTINUOUS



X

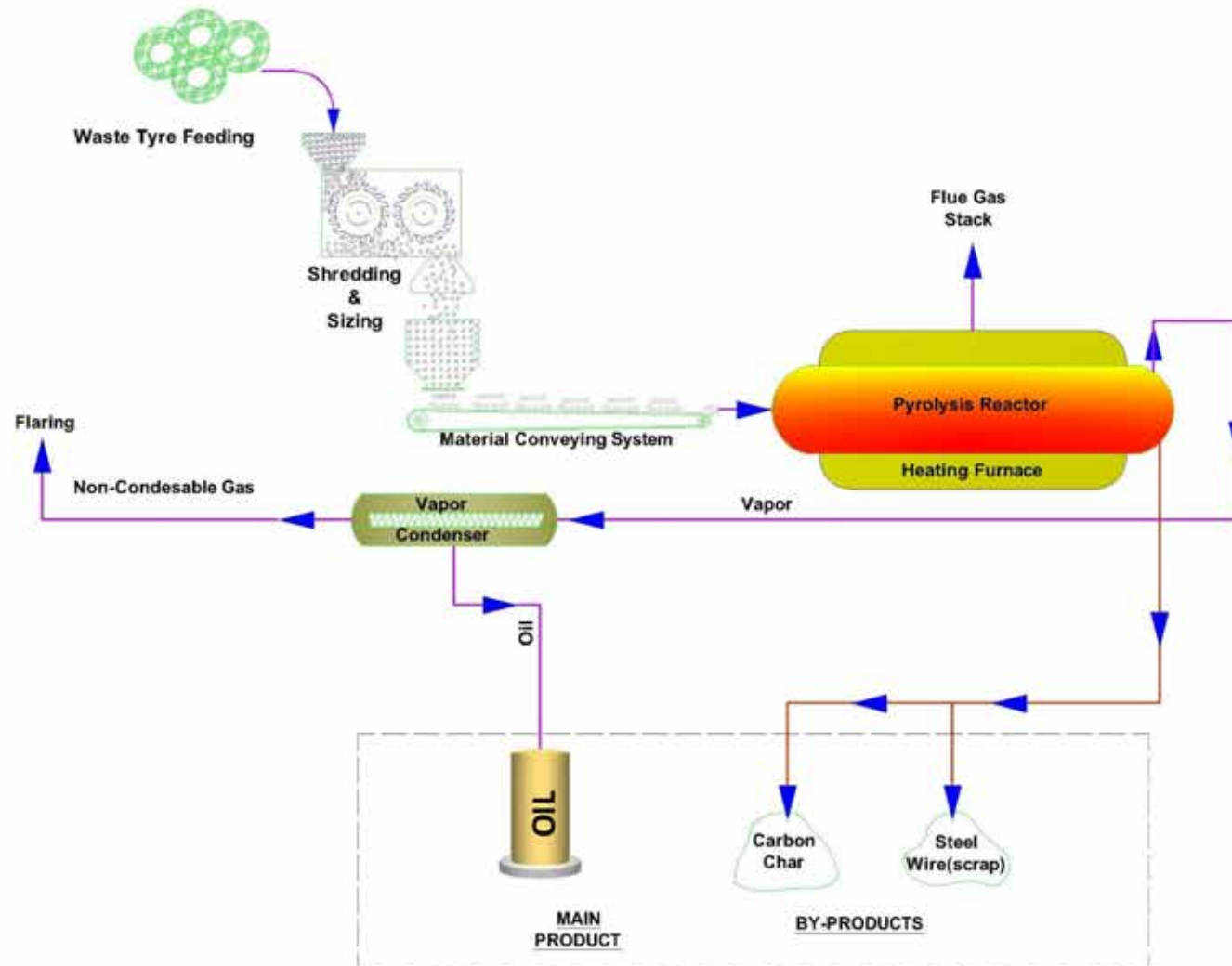


Typical Batch Type Pyrolysis Process

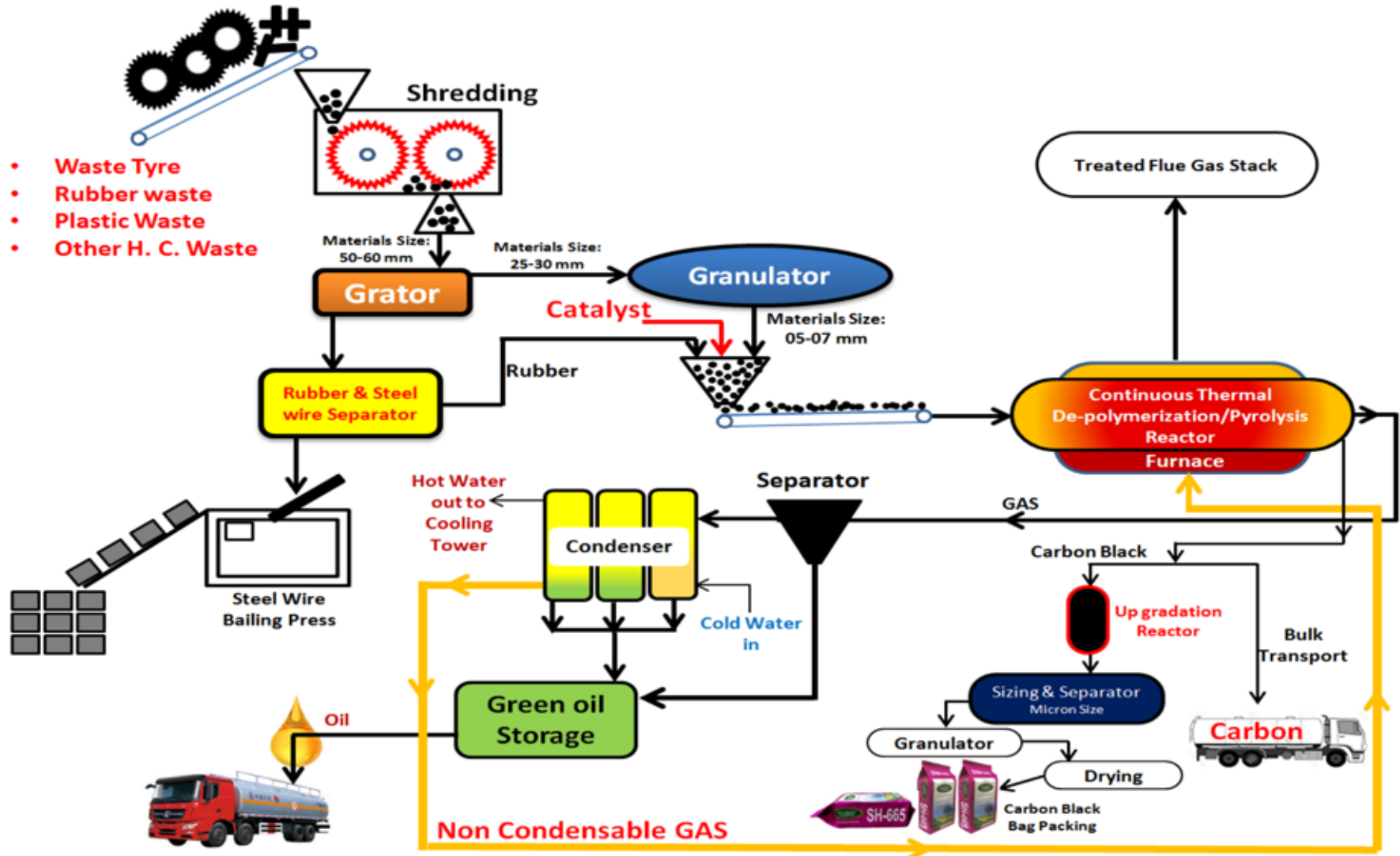


- Load the whole tires manually in the kiln
- Light the fire under the kiln using wood
- Once the pyrolysis oil stops flowing from the condenser unit, put off the fire under the Kiln
- Let the Kiln cool off for considerable amount of time, before opening the Loading/ Unloading door
- If there is no explosion, Labor will enter the Kiln and manually remove Steel Scrap Wires and Carbon Char
- During the process the non-flue gas is released directly in the air

Typical Continuous Pyrolysis Process



Radhe's Patented Continuous Pyrolysis Process



Design Philosophy of Radhe's Pyrolysis Plant

Our plant has been designed with 4 basic principles that guarantees **SUSTAINABLE** growth



Merits and Recommendations

- ❖ This innovative and patented Pyrolysis Technology has been developed by well experienced technical team of Radhe Group of Energy at its state-of-the-art in-house R & D set up, which has been approved by Department Of Scientific & Industrial Research, India. The R & D team at Radhe has rich experience of over 80 years combined in the area of Biomass / Coal Gasification, Biomass Briquetting, Combustion & Pyrolysis.
- ❖ Comparative study has been carried out by TERI (The Energy Research Institute, New Delhi) for batch type Pyrolysis & Continuous Pyrolysis Technology developed by Radhe Group of Energy, which provides strong recommendations
- ❖ Technological & Environmental Aspect assessment has been carried out by NEERI (National Environmental Engineering Research Institute – Nagpur, India) for continuous Pyrolysis Technology Developed by Radhe Group of Energy, which also authenticates superiority of this technology.

Salient Features



- ❖ Fully integrated Scrape Tire Pyrolysis plant with 24 x 7 operation at 100 tons per day capacity with fully automatic carbon black up-gradation, sizing, pelletizing, and packaging.
- ❖ Energy self sufficient design - No extra energy needed for process
- ❖ Precise process control by DCS - SCADA operating system incorporated for monitoring & process control
- ❖ World Class Instrumentation from Honeywell (USA) and Schneider (Germany) installed for higher reliability
- ❖ Plant and Reactor are made from Special Super Alloy material for long useful life and extra Reliability
- ❖ Plant equipped with waste heat recovery system from flue gases for better overall efficiency
- ❖ Plant is equipped with on-site nitrogen generation facility and nitrogen storage for nitrogen purging as and when needed
- ❖ Process area is equipped with CO / HC alarm system
- ❖ Superior Quality Tire Oil, Carbon Black and Steel Wire recovered for faster project payback

Environmental Features

- ❖ Entire process occurs below 750° C temperature so very negligible amount of NOx, Furan & Dioxin are formed.
- ❖ Flue gas is treated through scrubbers before discharging it into atmosphere and chimney height as per norms
- ❖ No toxic/hazardous Emissions from plant
- ❖ Fugitive Emissions are negligible due to completely automatic operation
- ❖ Automatic carbon black discharge, up-gradation, sizing, pelletizing and packaging avoids dust nuisance for workers and removes human health hazard from Plant area
- ❖ Waste water is disposed-off in a scientific way
- ❖ VOCs & odors control are taken care of.
- ❖ Environment friendly technology with zero discharge philosophy



- Focus Product: Recovered Carbon Black (rCB)
(New Definition added to ASTM D3053 per D24.67 committee)
- By Product # 1: Green Oil (Fuel Oil)
- By Product # 2: Steel
- By Product # 3: Syn-Gas

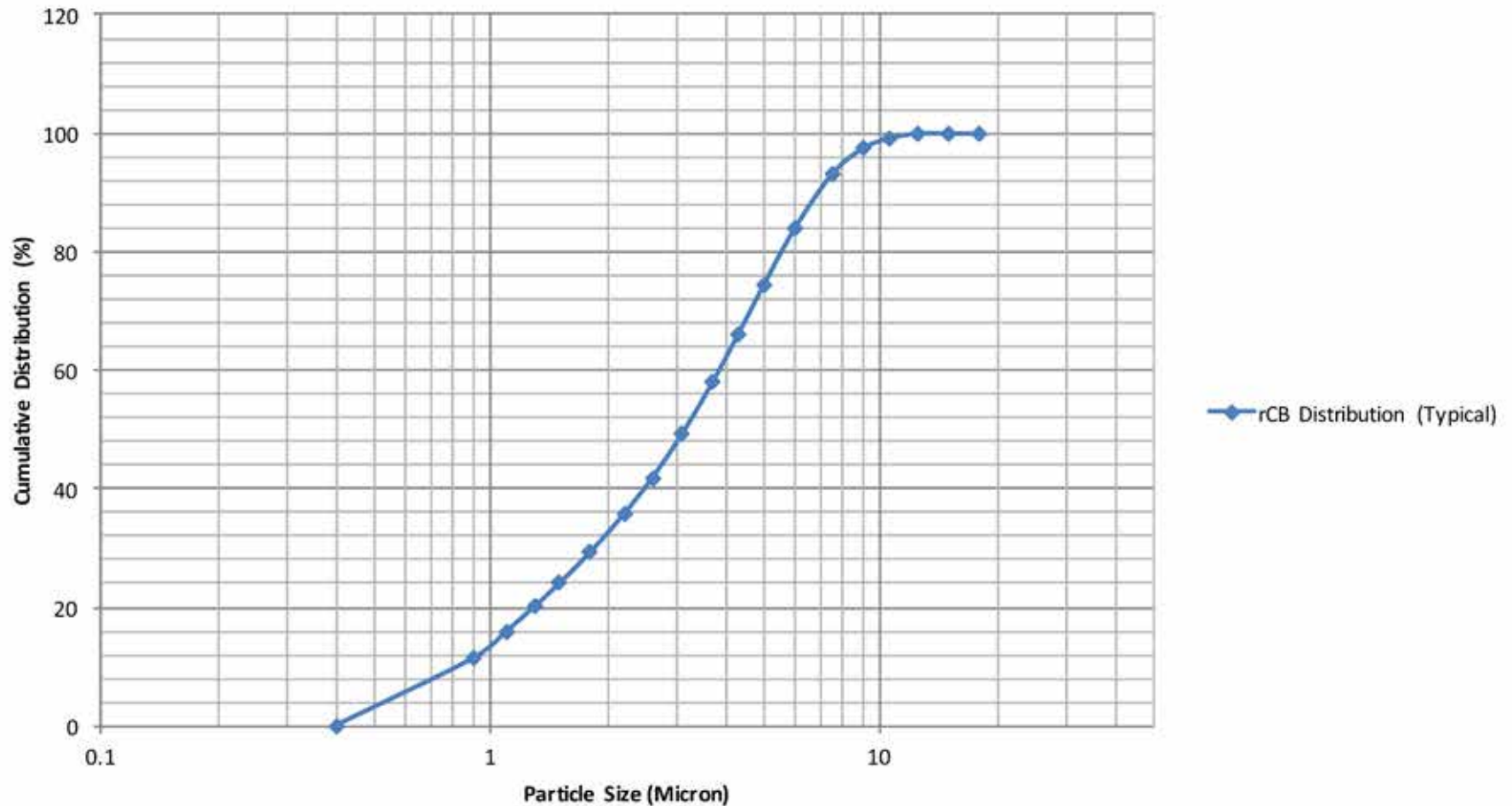
Focus Product: Recovered Carbon Black (rCB)

- About 30 – 35MT production per day
- Upgraded through our Patent Pending 3-Stage up-gradation system followed by sizing, pelletizing, and packaging
- 100% Steel Free and Fabric Free
- Consistent Quality and High Repeatability



Typical Hi-Green Carbon Particle Size Distribution

rCB Distribution (Typical)



By-Product # 1: Green Oil

- About 40 – 45MT production per day
- Gross Calorific Value – 10,550 to 11,000 Kcal/Kg
- Can be universally sold as Fuel Oil for process heat



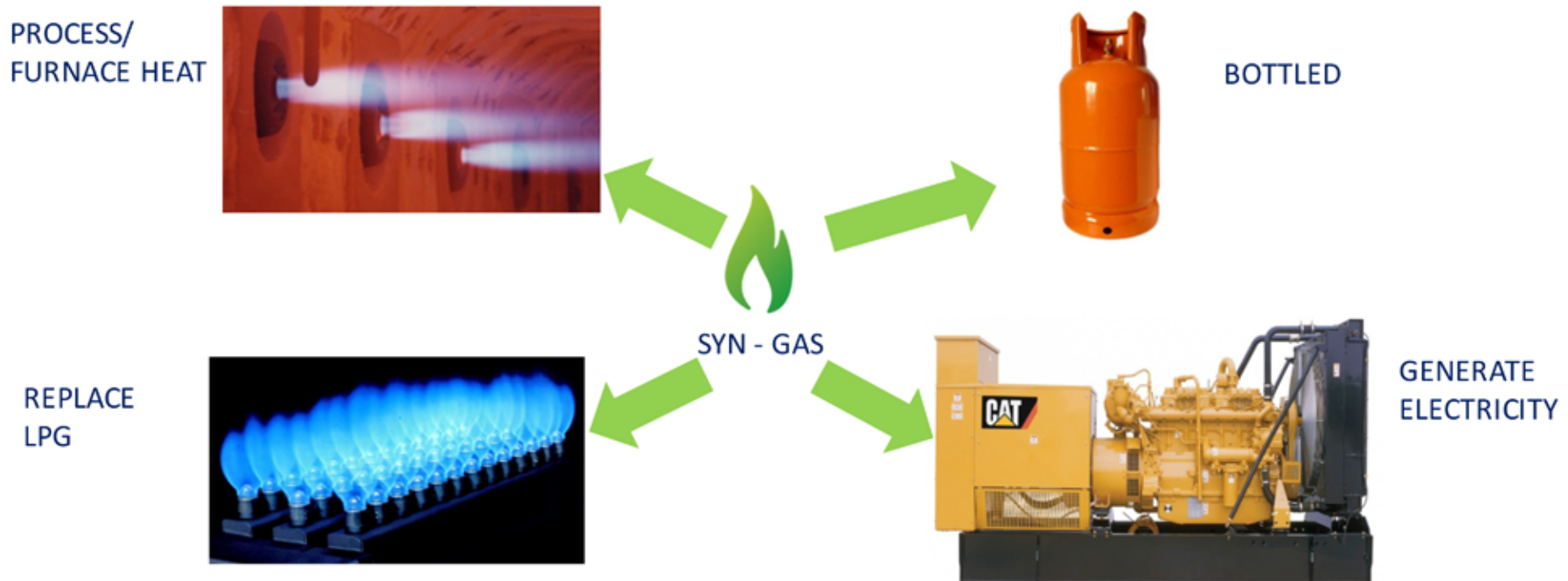
By-Product # 2 : Steel

- About 10 – 15MT production per day
- Melt and cast billets
- Can be universally sold to Foundries or steel processing units



By-Product # 3: Syn - Gas

- About 10 – 15MT production per day
- It is the non-condensable combustible gas that is recovered after the HC vapor goes through condensation process up to ambient temperature
- Gross Calorific Value - 10,550 to 11,000 Kcal/Kg
- Can be effectively used for process heat or can be bottled for commercial use or other industrial use to replace LPG



Socio-Economical and Environmental Benefits

Benefit # 1 Free-up Land & Control Arson Activity

In/Out 100 TPD	Socio-Economic Benefits	Environmental Benefits
Each 100 MTPD plant will process about 35000 MT of waste/scrap tires per annum	<ul style="list-style-type: none"> ➤ Saves huge landfill space ➤ Free-up precious land with existing scrap tire stockpiles ➤ Control over arson activities means savings in Emergency Management Systems' budget. ➤ Huge Employment Generation 	<ul style="list-style-type: none"> ➤ No breeding ground for mosquitoes and other harmful parasites ➤ Control over arson activities means less pollution and healthy and clean atmosphere ➤ Cultivate awareness and positive attitude towards recycling scrap tires in general public



Benefit # 2 Recovered Carbon Black (rCB – ASTM 3053)

In/Out 100 TPD	Socio-Economic Benefits	Environmental Benefits
It produces about 9000 MT of Green carbon black per year	<ul style="list-style-type: none">➤ Value of rCB - around 6 million USD➤ Reduces around 6 million USD worth of Carbon Black(CB) import burden➤ Reduces transportation, shipping, and other import cost to the end users➤ Saving of about 18000 MT (or 20 million liters) of furnace oil - conventionally used to produce equal amount of CB. Implies 15 million USD of additional savings	<ul style="list-style-type: none">➤ 1 MT of carbon black production, emits about 2 MT of CO₂. <p>Production of 9000 MT of rCB emits no CO₂ but saves about 18000 MT of CO₂ emission by replacing conventionally produced CB. This has long lasting positive impact on global warming.</p> <ul style="list-style-type: none">➤ This reduces total carbon emission that generates during production and transportation of furnace oil at world level.➤ Equal amount of natural resources will be saved for future generation



9000 MT/YR

= US\$6 MILLION CB + US\$15 MILLION OIL



Benefit # 3 Green Oil

In/Out 100 TPD	Socio-Economic Benefits	Environmental Benefits
Per year, it produces about 13 million liters of green oil (as good as Light Diesel Oil/used as heating oil)	<ul style="list-style-type: none">➤ Value of this green oil is around 10 million USD➤ Reduces around 10 million USD worth of oil import burden on any nation.➤ Reduces transportation, shipping, and other import cost to the end users	<ul style="list-style-type: none">➤ It reduces use of equivalent value of rapidly depleting fossil fuel➤ This reduces total carbon emission that generates during exploration and transportation of fossil fuel at world level.➤ Equal amount of natural resources will be saved for future generation



Benefit # 4 Scrap Steel

In/Out 100 TPD	Socio-Economic Benefits	Environmental Benefits
It produces around 5000 MT of steel scrap wires per year	<ul style="list-style-type: none">➤ Value of scrap steel is about 1.5 million USD➤ Reduces around 1.5 million USD worth of scrap steel import burden on any nation➤ Reduces transportation, shipping, and other import cost	<ul style="list-style-type: none">➤ It saves equal amount of natural resources like iron ore that needed to be mined in order to produce about 5000 MT of steel.➤ This saves CO₂ emission that results from mining activities, transportation, and some production level efforts.

5,000 MT/YR

**US\$1.5
MILLION**



**SAVES
HUGE
NATURAL
RESOURCES**



Benefit # 5 Syn – Gas

In/Out 100 TPD	Socio-Economic Benefits	Environmental Benefits
It produces about 3500 MT of clean Syn-gas per year. Syn gas has calorific value of about 10,000 to 11,000 K.Cal./kg, which is equivalent to Liquid Petroleum Gas (LPG).	<ul style="list-style-type: none"> ➤ Value of this Syn-gas is about 1.75 million USD ➤ Syn-gas can be reutilized for plant's process energy demand. Energy self-sufficient process. A little bit of extra gas remains, which can be burnt-off via flaring. ➤ Or process energy can be supplied using Biomass based fuel and the available Syn-gas can produce additional 1500-2000 KW/hour continuous electricity, which equates to 14,400 MW annually. Value of this electricity is around 1.75 million USD. 	<ul style="list-style-type: none"> ➤ It saves huge amount of coal or natural gas needed to produce process energy. So, use of our green electricity can save valuable and depleting natural resources. ➤ This saves CO₂ emission that results from mining activities, transportation, and transmission losses.



SYN - GAS

**3,500
MT/YR**

**US\$1.75
MILLION**



**14,400
MW/YR**



Benefit # 6

In/Out 100 TPD	Socio-Economic Benefits	Environmental Benefits
Huge employment generation	<ul style="list-style-type: none">➤ Each 100 MT/day plant creates about 30 to 40 direct full-time jobs and about 50 to 60 indirect jobs for raw material procurement, handling, processing, and transportation; also for finish goods handling, processing and transportation, etc.	<ul style="list-style-type: none">➤ This process is about recycling our non-biodegradable waste and generating resurgent energy out of it.➤ Our process will co-exist with daily waste generation due to today's society's lifestyle. This will provide permanent and continuous cleaning of environment and will stop polluting land, water and atmosphere.

**100 DIRECT/INDIRECT
JOBS CREATED PER PLANT**



Benefit Summary

In/Out 100 TPD	Socio-Economic Benefits	Environmental Benefits
Net Benefits:	<ul style="list-style-type: none">➤ Approx. up to 34 million USD of net saving to any country's foreign exchange.➤ Creation of about 100 new jobs per plant for longer sustainable period➤ Invaluable Carbon tax credit of about 500,000 USD per plant per year	<ul style="list-style-type: none">➤ Cleaner lands, streams, atmosphere➤ Saving of precious and depleting natural resources➤ Overall, unbelievable positive impact on environment and a sizable step towards reducing global warming



**CLEAN
ENVIRONMENT**

100 JOBS

**US\$ 0.5 MILLION
CARBON TAX CREDIT**

**US\$ 34.75 MILLION
NET SAVINGS**



Thank You

Looking Forward to the Sustainable growth

we

Live Green
Love Green
Leave Green

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