

Tire Recycling Pilot Plant Using Microwave Technology

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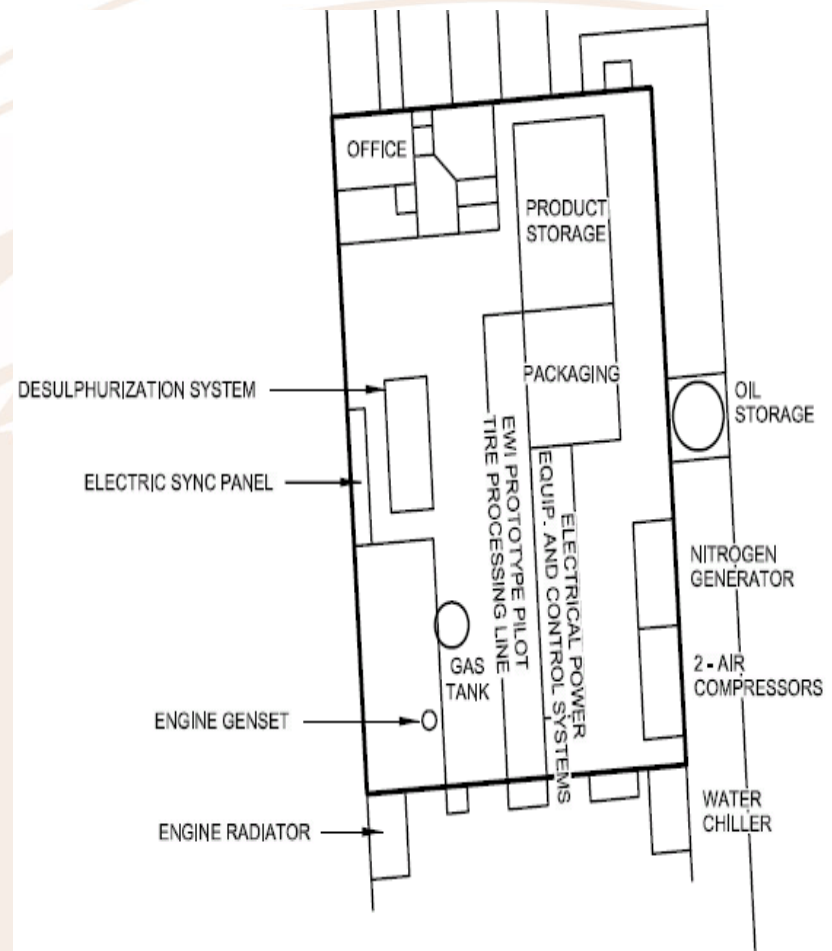


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The Pilot Plant Facility

- 🌐 Sault Ste. Marie, Ontario
- 🌐 Process up to 10 tonnes or 1,100 scrap tires per day
- 🌐 Operates 24/7



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The Process & Technology

- ④ Technology developed, licensed, and patented by Environmental Waste International (EWI)
- ④ Utilizes microwave energy through EWI's Microwave Delivery System (MDS)
- ④ Patented Reverse Polymerization (RP) process.
- ④ Oxygen free atmosphere, reduces organic compounds to simplest form creating by-products.



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Reverse Polymerization Process

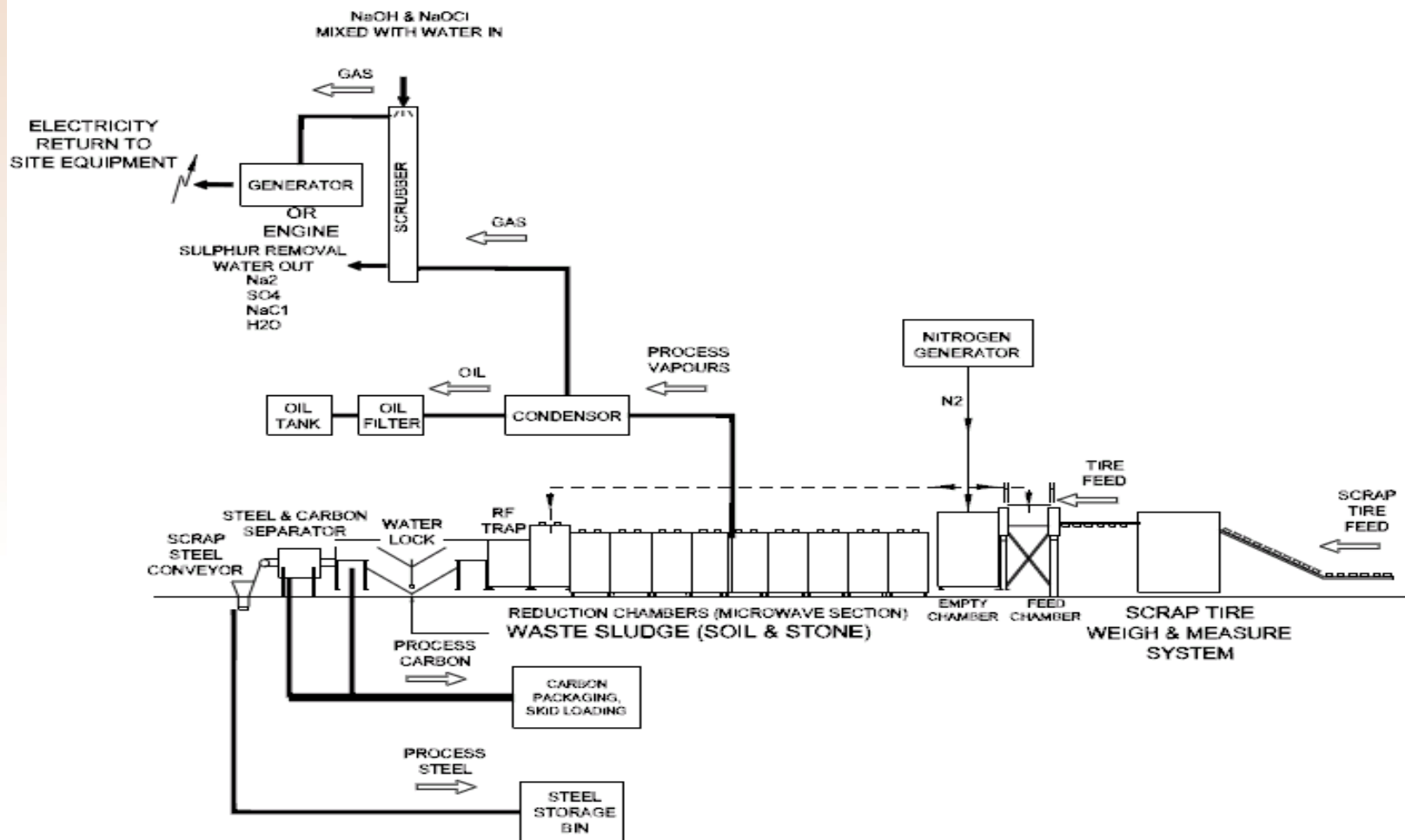
- ① Microwave energy breaks down the tires rubber molecules into smaller hydrocarbon molecules
- ② Hydrocarbon molecules are vaporized and are useable synthetic gas (syngas) to operate engine/generator
- ③ Useable by-products are created including, scrap steel, carbon black, oil, syngas, and ultimately electricity



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Process Flow



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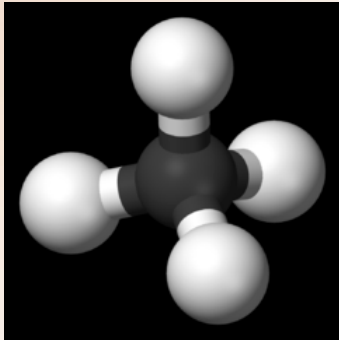
Process Flow



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Useable By- products



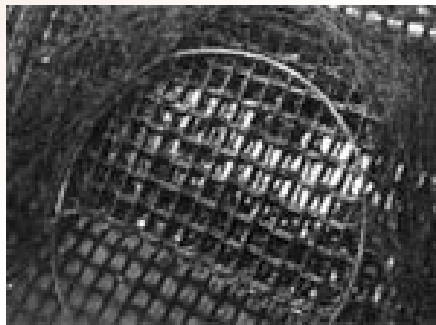
Hydrocarbon
gases



Carbon Black
for commercial
use



Hydrocarbon
oil for other
industries



Scrap steel



Electricity



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Scrap Tire Breakdown Into By-Products

🌐 Typical passenger car tire (25 lbs), 20 lbs when scrap and consists of:

- Carbon Black – 28%
- Synthetic rubber – 27%
- Steel – 14-15%
- Natural rubber – 14%
- Fabric, filters, accelerators, antiozants, etc. – 16-17%

🌐 A typical 20 lb scrap tire can be converted into the following based on the EWI Process

- 7.5 lb of Carbon Black
- 2.0 lb of steel
- 10.5 of Hydrocarbons



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By-Products

- ④ Scrap Steel
 - Sold to local scrap metal dealers
- ④ Carbon Black
 - Sold to customers
- ④ Syngas
 - Used for the production of electricity using the on-site internal combustion engine
 - Electricity used to power on-site equipment and excess sold to the Ontario power grid
- ④ Lubrication Oils
 - Sold to customers



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Facility Environmental Impact

- ④ The Facility is considered a Thermal Treatment Plant under Ontario Regulation (O.Reg.) 347/90.

- ④ Certificates of Approval were required for:
 - Air & Noise (O.Reg. 419/05, as amended)
 - Emission Summary and Dispersion Model
 - Acoustic Assessment Report

 - Waste (O. Reg. 347/90, as amended)
 - Design and Operations Report



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Emission Summary and Dispersion Model Report

🌐 Significant Contaminants:

- Products of Combustion: NO_x, SO₂, CO, THC, PM
- Volatile Organic Compounds
- Inorganics: Mercury, Lead, Cadmium
- Hydrogen Sulfide*
- Hydrochloric Acid

*Hydrogen Sulfide will be ultimately scrubbed out using a NaOH and NaOCl scrubber system



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Emission Summary and Dispersion Model Report

- ① Emission Rates calculated by
 - Generator manufacturer emission rates:
 - Scale up of 1995 EWI unit for 1,100 scrap tires per day
 - Researched emission rates based on source testing of similar technologies
- ① All contaminants modelled to be below all applicable standards and objectives using AERMOD modelling prior to any external controls
- ① Emission rates meet the requirements of the MOE Guideline A-7



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Noise Source Summary

④ Evaluated the following significant noise sources identified:

- 1 - Generator Exhaust Stack
- 1 - Exterior Generator Radiator
- 1 - 60-Ton Water Chiller
- 1 - General Exhaust Fan
- 1 - General Air Intake Fan
- Truck Route
- Building breakthrough sound (480 KW Generator, nitrogen generator, air compressors)



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Acoustic Assessment

- ④ Acoustic Abatement Action Plan for the Site includes the requirement for a silencer/muffler on the generator.



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Design and Operations Report

- ④ Maximum 10 tonnes of Tires per day to a maximum of 3,350 tonnes per annum
- ④ Maximum tire capacity of 5,000 tires at one time
- ④ Maximum solid waste capacity of 135 tonnes at one time



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CofA Air/Noise Conditions

- ① CEMS System (NO_x, SO₂, CO, O₂, THC)
- ① Stack Testing
- ① Annual, Semi-Annual and Quarterly Inspections and Reports
- ① Acoustic Audit
- ① CofA expires 365 days after receipt of tires



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CofA Waste Conditions

- ④ Financial Assurance
- ④ Development of a waste testing protocol
- ④ Development of a Contingency & Emergency Response Plan
- ④ Requirement for As-Built Drawings
- ④ Development of a Closure Plan
- ④ Quarterly and Annual Inspections
- ④ CofA expires 365 days after the receipt of Waste



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Questions?



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