Transforming Waste Tires into Valuable Products

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Introduction

Microwavable Renewable Technologies

- First mobile tire recycling machine
- The pyrolysis process:

Rubber → "Tire Hog" → Gas, Oil, Biochar

- MRT seeks to optimize the value of these products for industrial use and to decrease carbon footprint

Objective – To characterize rubber feedstock, pyrolysis oil, and biochar - considering their end uses: biochar as carbon black and pyrolysis oil as heating source.

Testing

Feedstock & Biochar

- Moisture Content (Biochar Only)
- Bulk Density
- FTIR

Pyrolysis Oil

- Specific Gravity
- Heat Capacity
- Conductivity
- Viscosity
- pH

Importance

- **Rubber feedstock** properties influence its performance during pyrolysis, which in turn affects both process efficiency and the quality of the byproducts.

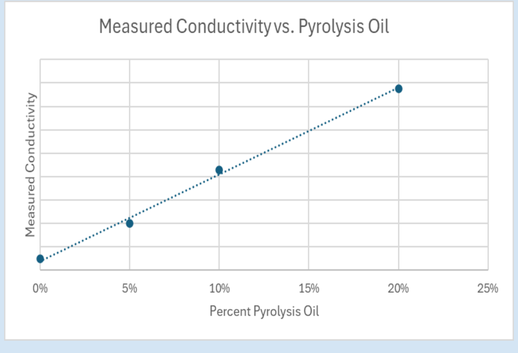
- **Pyrolysis oil** is a liquid fuel produced by the thermal decomposition of organic materials in the absence of oxygen.

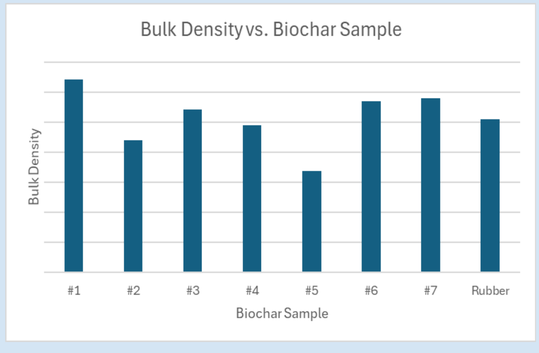
End Goal: use as fuel source

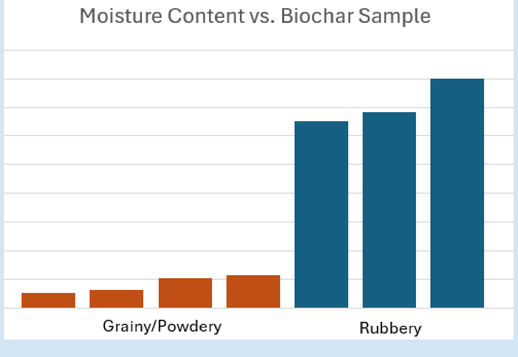
- **Biochar** is a carbon-rich substance produced by heating organic waste in a low-oxygen environment.

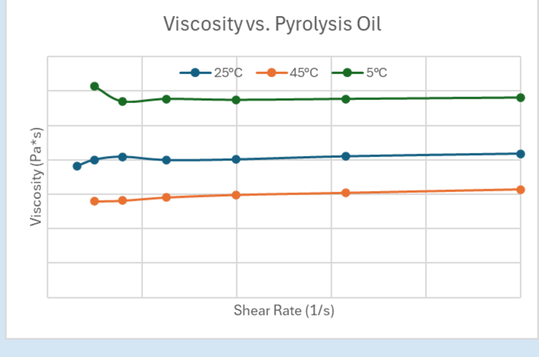
End Goal: use as additive in tire production

Data









Deliverables

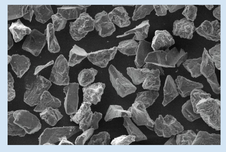
Prelab → Lab → Post Lab Style

- Post lab reports for all tests
  - → Procedure
  - → Results
  - → Recommendations
- Key Findings and Future Comprehensive Testing Report

Future Considerations

Current Capabilities

- Ash Content – Muffle Furnace
- Particle Size – Calipers/SEM
- Elemental Analysis – SEM-XRD



Biochar

- Tensile Strength – Universal Testing Machine
- Abrasion Resistance – Rotary Drum Abrasion
- Hardness – Shore Durometer
- Surface Area – High Vacuum Physisorption Analyzer
- Particle Size – Laser Diffraction Analyzer
- CO_2 Adsorption Capacity – Rheometer
- Pore Structure - TGA

Estimated Cost : $500,000

Pyrolysis Oil

- ASTM D936 – Fuel Oils
- ASTM D975 – Diesel Fuels
- ASTM D7566 – Jet Fuel