

A large, circular cross-section of a log is the central focus, showing distinct wood grain patterns and a dark, charred outer ring. The log is surrounded by other smaller logs and branches, creating a textured, natural background. Overlaid on the center of the log is the text "Bio-Coal Wood Torrefaction" in a bold, black, sans-serif font.

**Bio-Coal
Wood Torrefaction**

Wood Torrefaction - Basics

| | Coal | Torrified Wood Pellets |
|---------------|-------------|-------------------------------|
| Caloric Value | 25 GJ/Mt | 15 – 24 GJ/m ³ |
| Ash | 10% | 1-3% |
| Sulfur | 3% | 0.1% |
| Nitrogen | 1.5% | 0.2% |
| Chlorine | 0.05% | 0.01% |

Wood Torrefaction - Basics

General Process

| | |
|-----------------------|--|
| Temperature: | 200 – 300 °C |
| Reactor Atmosphere: | Pressure=atmospheric No oxygen |
| Residence Time: | 30 – 90 min |
| Heating Rate: | < 50 °C/min |
| Energy Densification: | 130% ~ 70 - 75% of mass is retained |

Wood vs Wood Pellets vs Torrefied

| | BTU/lb | Density(lb/ft³) | Specific Gravity |
|--------------------------------|---------------|-----------------------------------|-------------------------|
| • Green Wood | 4500 | 21.3 | 0.34 |
| • Wood Pellets | 7300 | 40.0 | 0.64 |
| • Torrefied Wood | 11000 | 23.7 | 0.20 |
| • Pelletized Torrefied Wood | 11000 | 28.4 | 0.75 |

Wood vs Torrefied

| | %C | H | O | N | H/C | O/C |
|------------------|-----------|----------|----------|----------|------------|------------|
| Birch/raw | 45.5 | 6.2 | 48.2 | 0.1 | 1.64 | 0.79 |
| Birch/230 °C-2 h | 50.8 | 6.0 | 43.0 | 0.16 | 1.42 | 0.63 |
| Birch/280 °C-2 h | 56.6 | 5.6 | 37.6 | 0.17 | 1.19 | 0.50 |
| Pine/raw | 46.6 | 6.4 | 46.9 | 0.06 | 1.65 | 0.75 |
| Pine/230 °C-2 h | 50.0 | 5.9 | 44.0 | 0.05 | 1.42 | 0.66 |
| Pine/230 °C-2 h | 59.1 | 5.6 | 35.2 | 0.07 | 1.14 | 0.45 |

Torrefaction Properties

| | %Yield | Solid | Liquid | Gas |
|------------------|---------------|--------------|---------------|------------|
| Pine/230 °C-2 h | | 90 | 9 | 1 |
| Pine/280 °C-2 h | | 69 | 26 | 5 |
| Birch/230 °C-2 h | | 87 | 11 | 2 |
| Birch/280 °C-2 h | | 69 | 26 | 5 |

Overview of Torrefaction Process

