Torrefied wood briquettes as a coal replacement to reduce pollutant air emissions and true cost of energy

Holli Parrow
Vice-President: Finance
ecoTECH Energy Group
Torrefied Wood
What is Torrefaction?

Torrefaction is the roasting of wood or other biomass to create a product that -

- (1) has increased energy density;
- (2) has characteristics that make it easy to handle and transport;
- (3) is practical to co-fire in existing coal plants.
Torrefied Wood
ecoTECH System

- The ecoTECH torrefaction process is illustrated by the chart on right:

Hot, Carbon Dioxide & Nitrogen exhaust gases are drawn from CHP stack into an airless drying & pre-roast tunnel for accelerated dehydration of the wood chips, which are finish roasted to fuel char in the ecoTECH 700°F pass-through oven at the end of the tunnel. The depleted-energy gases and moisture lift steam are used in a heat exchanger to pre-heat incoming air for the ecoTECH reactors.
The torrefaction process reduces mass of the input wood circa 50%

The resultant torrefied material has double the entrained energy by weight of the input wood.

e.g. Hemlock standard combustion energy value = 9,132 BTU oven dry lb i.e. 6,500 BTU @ 35% TMC, when torrefied over 16,000 BTU/lb.

Moreover, NONE of the usual tramp materials found in coal; ash, heavy metals, sulphur, uranium, etc. exist, so an equivalent mass of coal, may only contain 70% combustibles. Therefore, each case and site varies.
Comparison to Coal
Sub-bituminous rank example

Powder River Basin Coal

- 8800 BTU/lb or 55% of ecoTECH torrefied briquettes
- ∴ Energy is: 1 ton ecoTECH TB = 1.82 tons PRB coal.
- Scrubbing emissions cost per ton PRB coal = $128 minimum
- So, 1 ton ecoTECH torrefied briquettes = 32,000 Mbtu
- 32,000 Mbtu = 182% the cost of scrubbing = $232.73
- + cost of coal purchased for equivalent energy yield = $13.25 x 182% = $24.09,
  for a total cost of energy equivalency using coal to one ton of torrefied briquettes of $256.82 versus $155 for ecoTECH briquettes, means a savings of over $100 per ton/ecoTECH briquettes energy equivalent.
- ∴ In overall terms, ecoTECH briquettes cost 60% of PRB coal for equivalent energy production.
- The savings over high sulphur coal are several magnitudes greater!
Comparison to Coal
Further advantages from torrefied wood briquettes

Used with Powder River Basin Coal, ecoTECH torrefied fuel provides:
- No tramp materials = no grit, oxides and other abrasives
- Complete, next to instantaneous oxidation with no particulate lift
- No abrasives = reduced boiler tubes and faces surface erosion
- Zero SO$_2$ in the torrefied fuel = less corrosion
- Scrubber life extended
- Limestone reduction directly proportional to amount of ecoTECH fuel used
- Helps meet renewable fuels mandated criteria
- Less downtime
- Less Operator Stress!
- Enhanced bottom line by a minimum $100 per ton of ecoTECH briquettes cofired in the system.
- Used in lieu of coals (other than PRB) have many fold dramatic savings over those shown in this low sulphur coal example!