CIBO

Technical Focus Group
Environmental & Energy Committee Meetings

September 2009

KeLa Engineered Fuel

A coal derived fuel made up of coal fines, recycled binding materials, and renewable biomass.

Coal

KeLa Engineered Fuel

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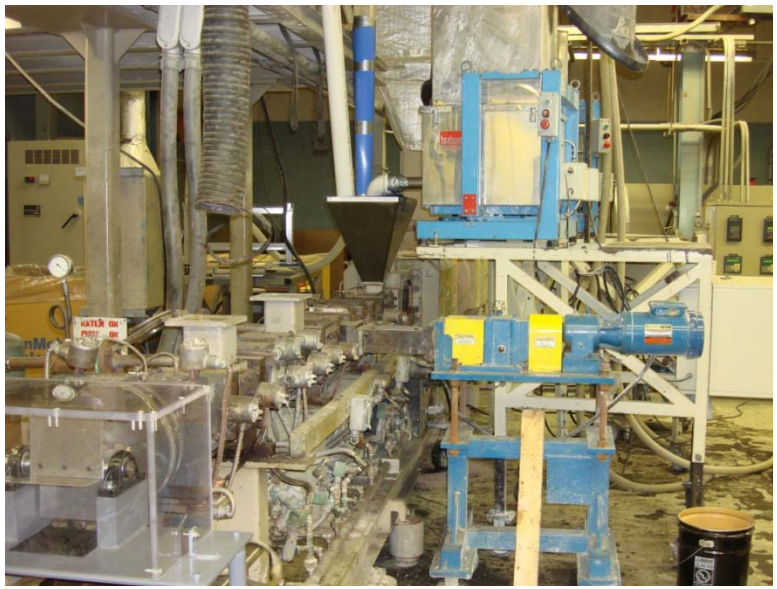
KeLa Engineered Fuel

- Engineered to meet the needs of the customer in terms of Air Emissions, Heating Value, and Biomass content.
- Fuel Rank – High-Volatile A Bituminous
- Handled and processed like coal



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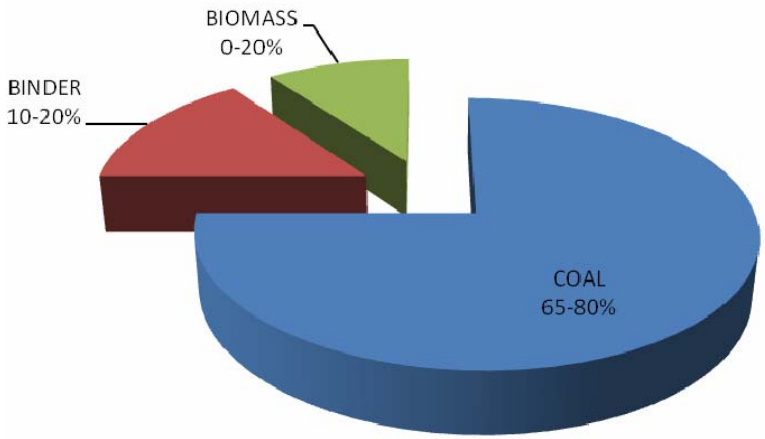
KeLa Engineered Fuel

Utilizes a readily available stream of recovered, recycled, and renewable waste materials*



- Recovered Coal Fines
- Recycled Carpet
- Recycled Plastic
- Renewable Biomass

*Up to 35% Renewable/Recycled Content

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The KeLa Process©

- Extrusion based technology
- Computer controlled metering and mixing of raw materials
- Heat and water recovery
- Easy change-over between blends
- Fuel properties modified by blend change

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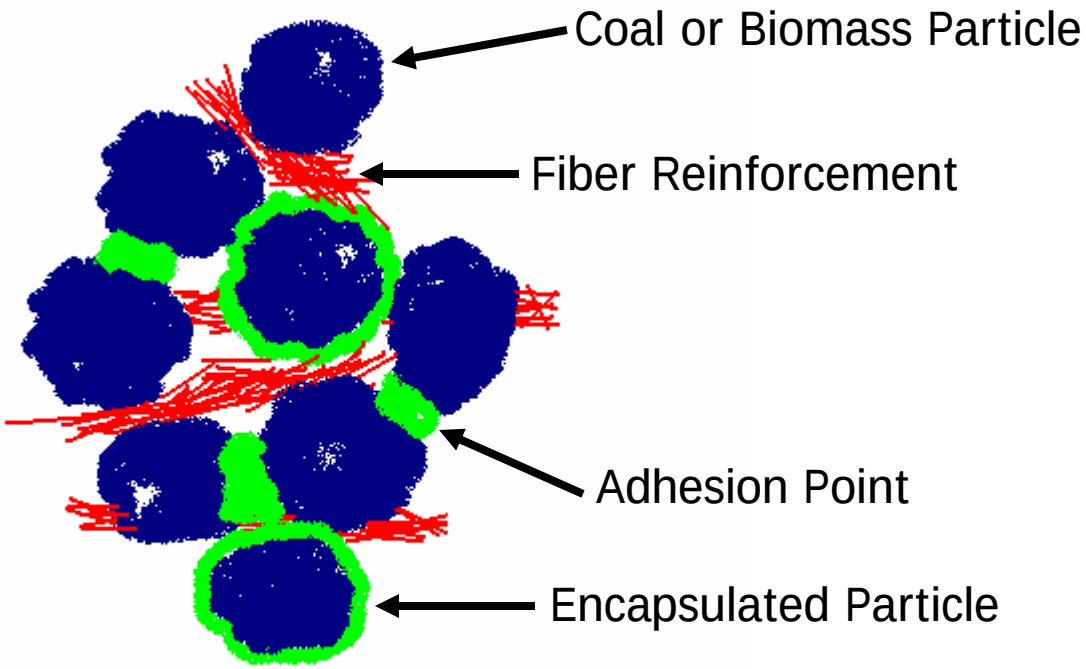
The KeLa Process©



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The KeLa Process©

- Process lowers the moisture content of produced fuel
- Final fuel not affected by water or moisture
- Biomass is integrated into fuel pellet
- Produced pellet ready for immediate use

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Raw Materials

- Coal Fines - Waste fines from prep plants
- Carpet – Recycled, Landfill diversion (PC/PI)
- Plastic – Recycled, mixed polyolefin, (PC/PI)
- Biomass – Waste from timber, mill, agricultural, urban sources

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Combustion Tests

- Ignites easier than coal with less smoke
- No moisture absorption during storage, less moisture added during combustion
- Pellet doesn't fracture, less material loss through grate
- Consistent pellet size
- Less unburned carbon (28% vs. 2%)
- Flame temperatures slightly higher than coal

Based on stoker fuel plant trials.

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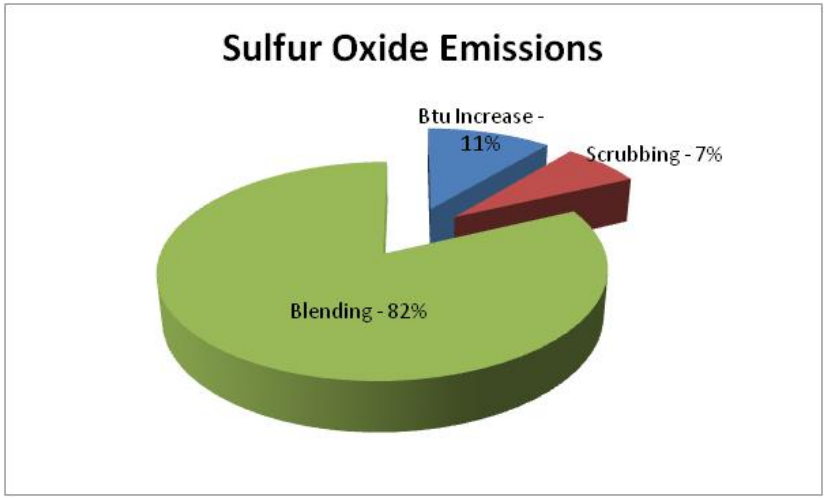
Sulfur Oxide Emissions

Lower SO_2 emissions (35% to 41%)

- Blending with binder
- Increased Btu (binder & moisture)
- Scrubbing ($CaCO_3$ in binder)

Based on stoker fuel plant trials.



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Nitrous Oxide Emissions

Lower NO_x emissions (14% - 41%)

- Biomass, lower combustion temps, lower NO_x
- Improved fuel burning, lower excess air, lower NO_x
- Higher Btu, less fuel required, lower NO_x

Based on stoker fuel plant trials.

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Carbon Dioxide Emissions

Lower CO_2 emissions (3% - 13%)

- Blending with binder
- Higher Btu, less fuel required, lower CO_2

Based on stoker fuel plant trials.

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HAP's and VOC's

- Reduced by blending
- Reduced by higher heating value

Based on stoker fuel plant trials.

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Handling & Use Benefits

- Transported like coal
- Stored and handled like coal
- No pellet break-down in wet storage
- Biomass contained in the fuel pellet
- Equal or greater heating value
- Higher hydrogen content

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Environmental Benefits

- Cleaner burning fuel
- Contains renewable biomass
- Makes use of recovered coal fines
- Binder based on recycled materials
- No binder leaching during outside storage

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