

Overview

January 12, 2010



Terra Green Energy, LLC

Biomass Pre-treatment Technology

GreenCoal™ torrefied biomass

*“The ultimate solution enabling the full utilization
of all types of biomass”*



Biomass is a difficult energy source

Production – Harvesting & Collection – Handling
– Transportation – Storage – Pre-treatment –
Feeding – Conversion

- Every aspect is expensive!

Torrefaction dramatically reduces these costs!



Terra Green Energy, LLC

- Terra Green Energy, LLC is a torrefaction technology licensing company
- Terra Green Industries, LLC will build, own, and operate the commercial sized torrefaction demonstration facility



Torrefaction is a mild pyrolysis (roasting) process carried out in the absence of oxygen which renders the biomass, including feedstocks such as forestry residues, waste wood and switchgrass, dry, energy dense, easily grind-able, hydrophobic, and cleaner burning.



Terra Green Energy, LLC

Significant Events

- \$1M Grant from the Pennsylvania Energy Development Agency
- \$130,000 Loan from the Ben Franklin Technology Partnership
- Letter from FirstEnergy
- Option on Wyssmont Turbodryer



Design Team Partners

Pegasus TSI

Advanced Recycling Equipment (ARE)

Aeroglide /Onix

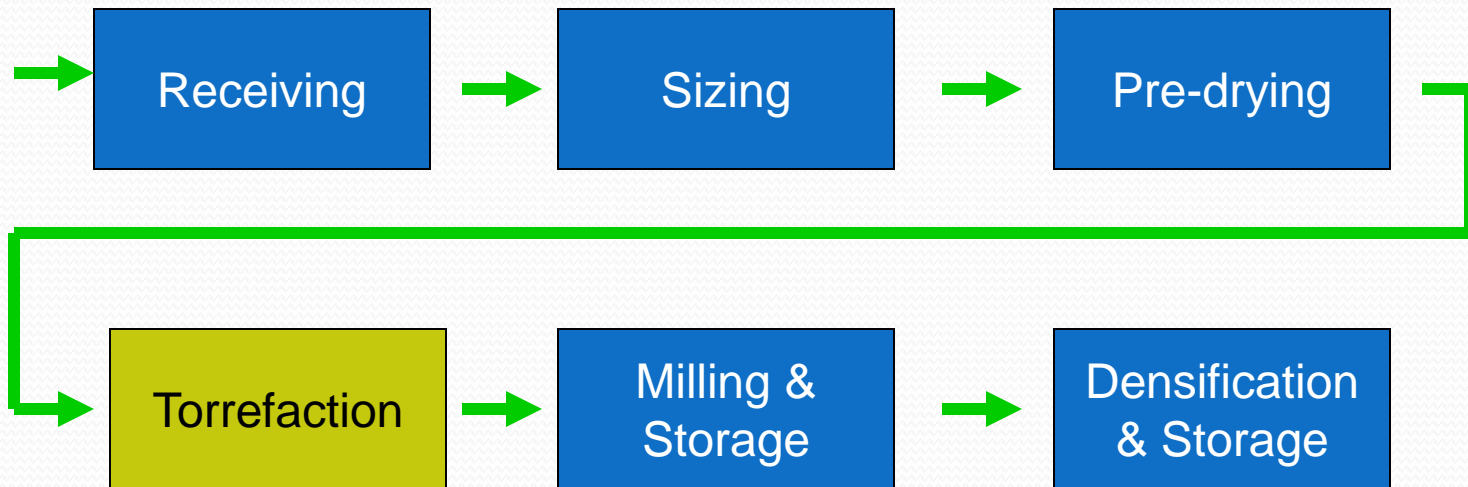
American Refining Group (ARG)

MACTEC

Terra Green Energy

- ***“Bringing together the experts to make the project happen and happen smartly”***

Torrefaction Process Steps



Advantages of Torrefaction

**Renewable, sustainable,
carbon neutral**

Allows coal burning facilities to meet RPS requirements

Cleaner burning

lower NO_x & SO_x which are primary targets of EPA

Lower ash content than coal

1% vs. 15% in coal

**Co-fire with coal without
CAPEX**

No need for special storage, handling or pulverizing equipment, use existing assets

Resists water uptake

Untreated biomass turns to mush with moisture

Advantages of Torrefaction

Lower operating costs

As much as 30% lower than wood pelletization

Higher heat content

10,000 Btu/lb. vs. 7,800 for wood pellets
Avoid de-rating boiler system capacity

Higher Bulk Density

800 kg/m³ vs. 650 kg/m³

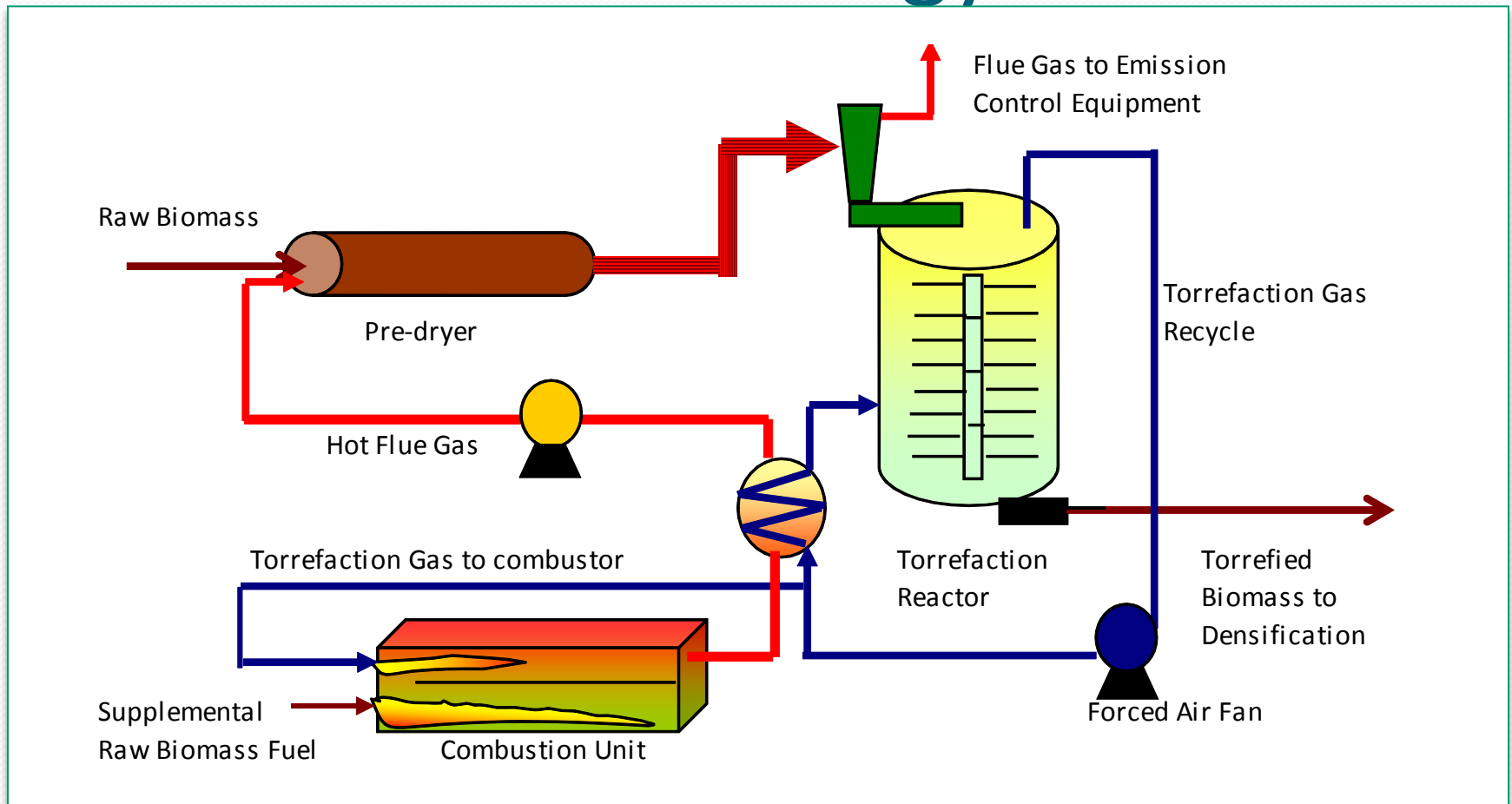
Auto thermal operation

Little if any supplemental fuel required

Wider range of potential feedstocks

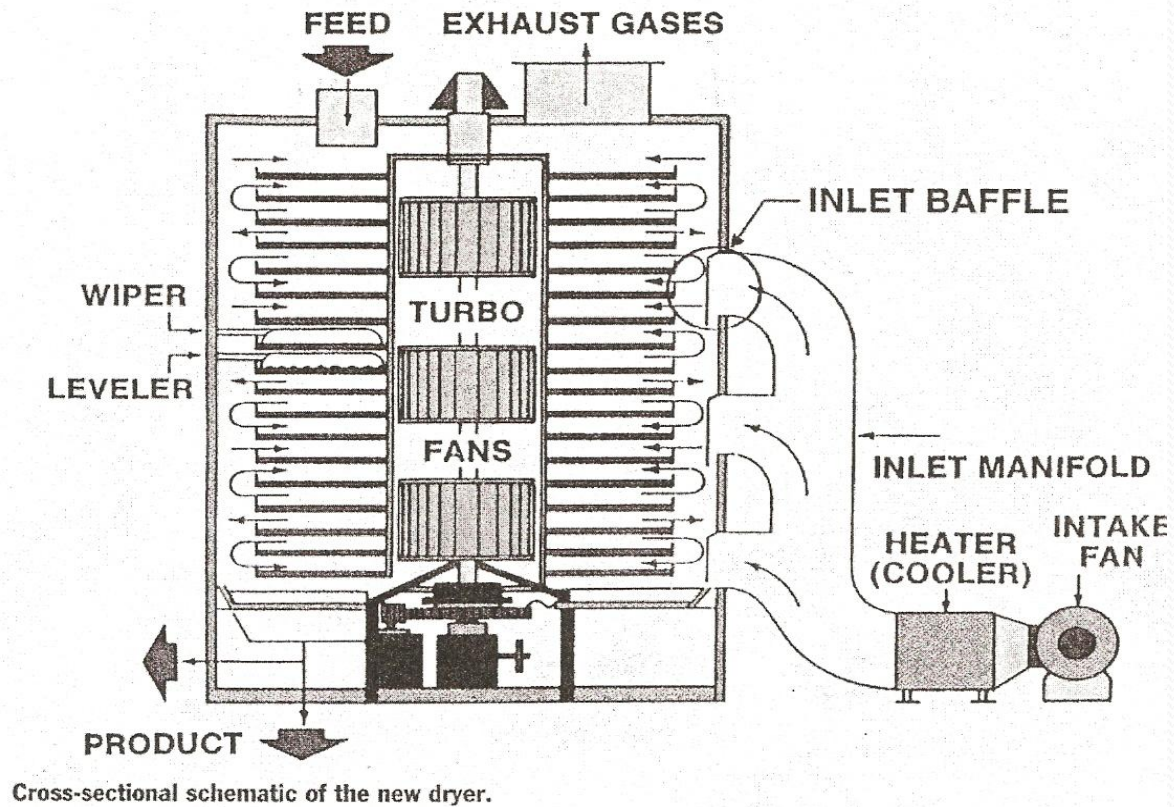
Forestry residue, switchgrass, other grown-on-purpose crops

Terra Green Energy's Torrefaction Technology





Wyssmont Turbodryer





GreenCoal™ Torrefied Biomass

Important Product Characteristics

- Heat Content 9,500 – 10,500 btu/#
- Ash Content <2%
- Moisture <2%
- Carbon, total 55% typical
- Carbon, fixed 29% typical
- Oxygen 38% typical
- Volatiles 68% typical
- Chlorine 29 mg/kg
- Sulfur 0.01 weight % typical

Initial testing indicates that torrefaction reduces the chlorine content



Terra Green Energy, LLC

Current Activities

- 1) Completing the 2nd phase of engineering
- 2) Equipment design specification underway
- 3) Completed option on used V37 system
- 4) Site selection complete – option in negotiation
- 5) Air permitting underway

Wyssmont V37 Turbodryer



Wyssmont V37 Turbodryer





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