BioEnergy Corporation – Delta Dynamics

Overview of Microturbines Powered by Steam

Colorado Wind and Distributed Energy Conference

* Direct Fired Combustion
* Steam Driven

Overview of Microturbines

- Direct Fire Combustion
  - Aeroderivative
  - High Speed
  - Additional Components
    - *Compressors
    - *Fuel Conditioning
    - * Inverters

Direct Fire Combustion

Direct Fire Combustion

Direct fire Combustion

Patented Recuperator
- Critical to high efficiency
- Designed for 80,000-hr life

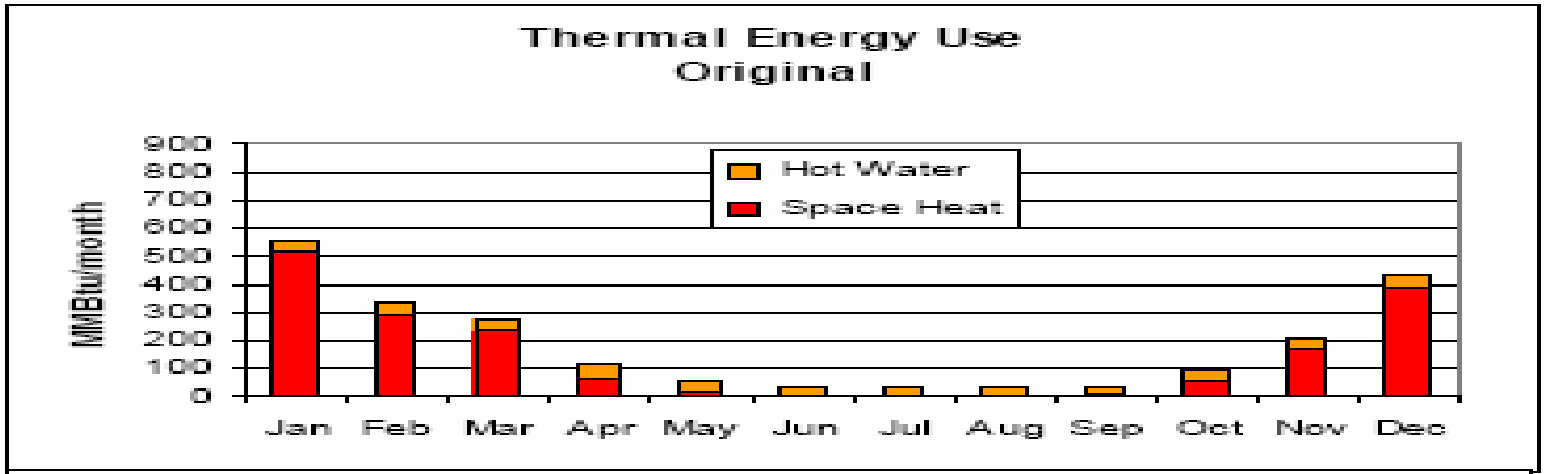
Patented Combustor
- Dry low NOx
- Easily meets stringent environmental regulations

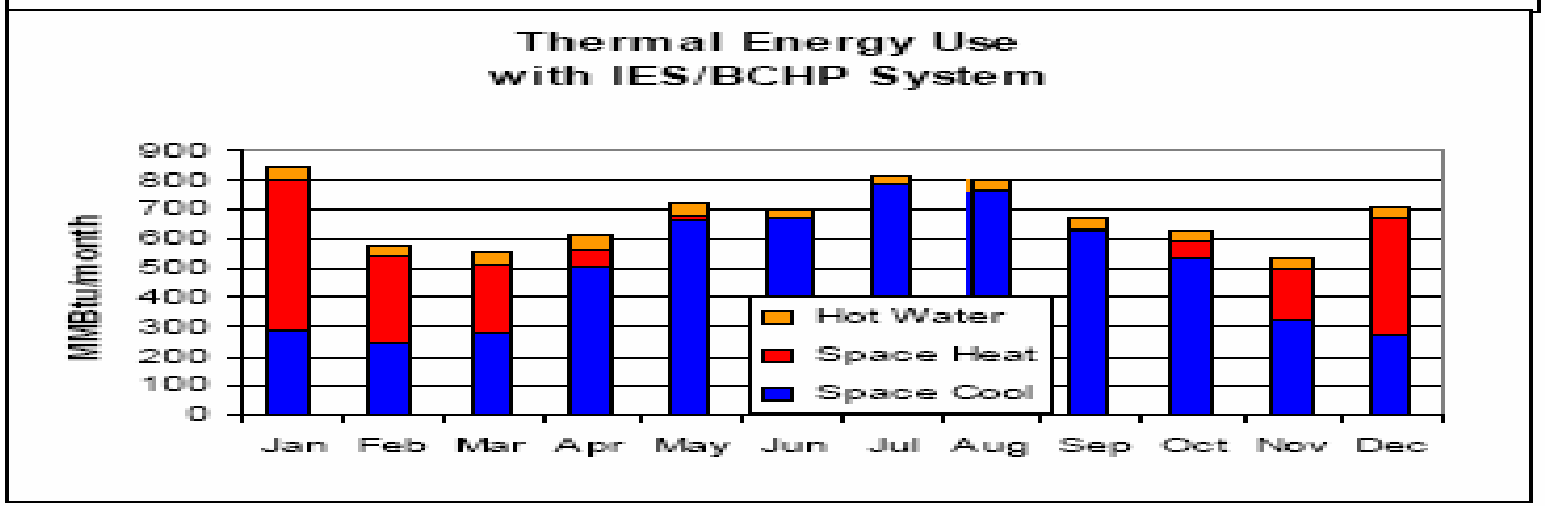
Proven Generator Technology
- Well-understood by utilities
- Same technology used by utilities to power the grid

Integrated Heat Recovery
- Controllable output level
- Small footprint

Fuel-Gas Booster
- Long-life design
- Fully integrated

Direct fire Combustion





Direct Fire Combustion

Direct Fire Combustion

Steam Turbines

- Standard for power generation
- Wide Choice of fuels
- Waste Heat Recovery
- Combined Heat and Power

Steam Turbines

Figure 2 – Impulse Turbine

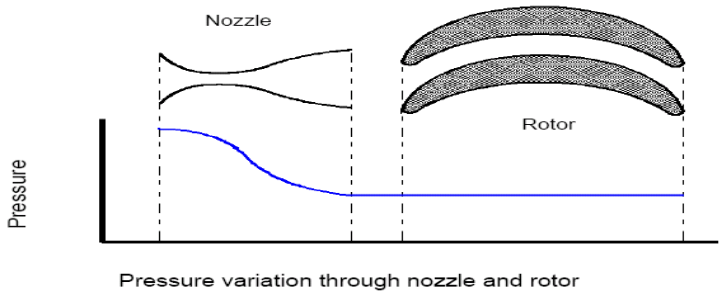
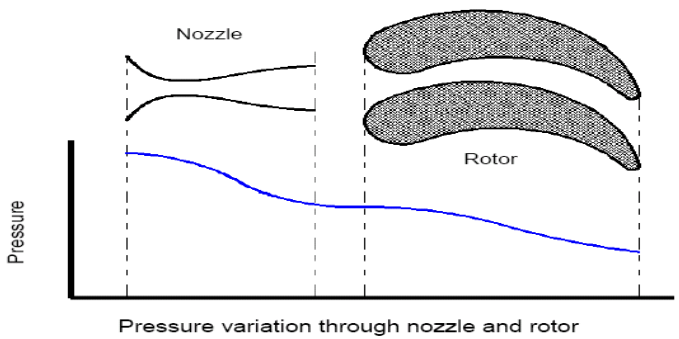


Figure 3 – Reaction Turbine



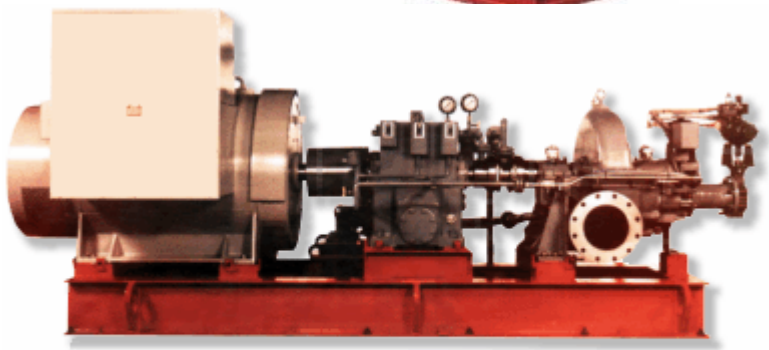
Steam Turbines

Steam Turbine

Advantages	Disadvantages
➢ Mature, proven technology	➢ Small steam turbines < 1 MW_{el} offer only limited efficiencies
➢ Broad power range available	➢ Low efficiency at partial load
➢ For large installations: high efficiencies can be obtained by high steam temperatures and pressures	➢ High specific investment costs for small turbines
➢ Separation between combustion and power generation enables the use of ash containing fuels	➢ For biomass application: limited super heater temperature because of risk of high temperature corrosion

Steam Turbines

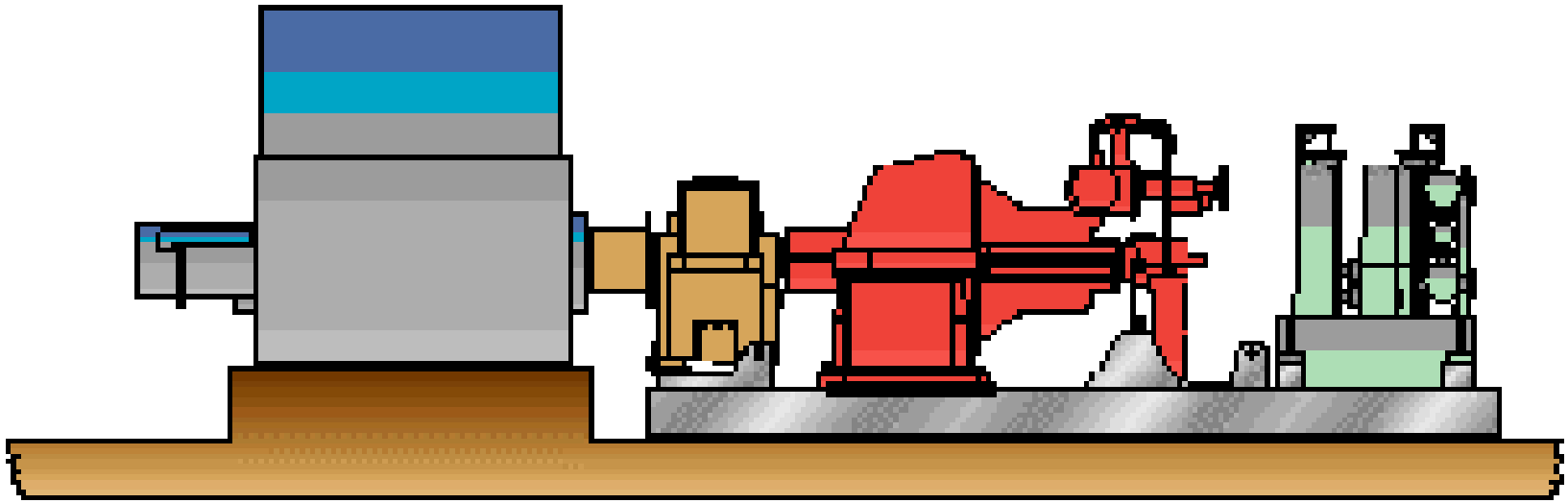
- Ingersol-Rand (Dresser-Rand)
- Coppus/Murray
- TurboSteam



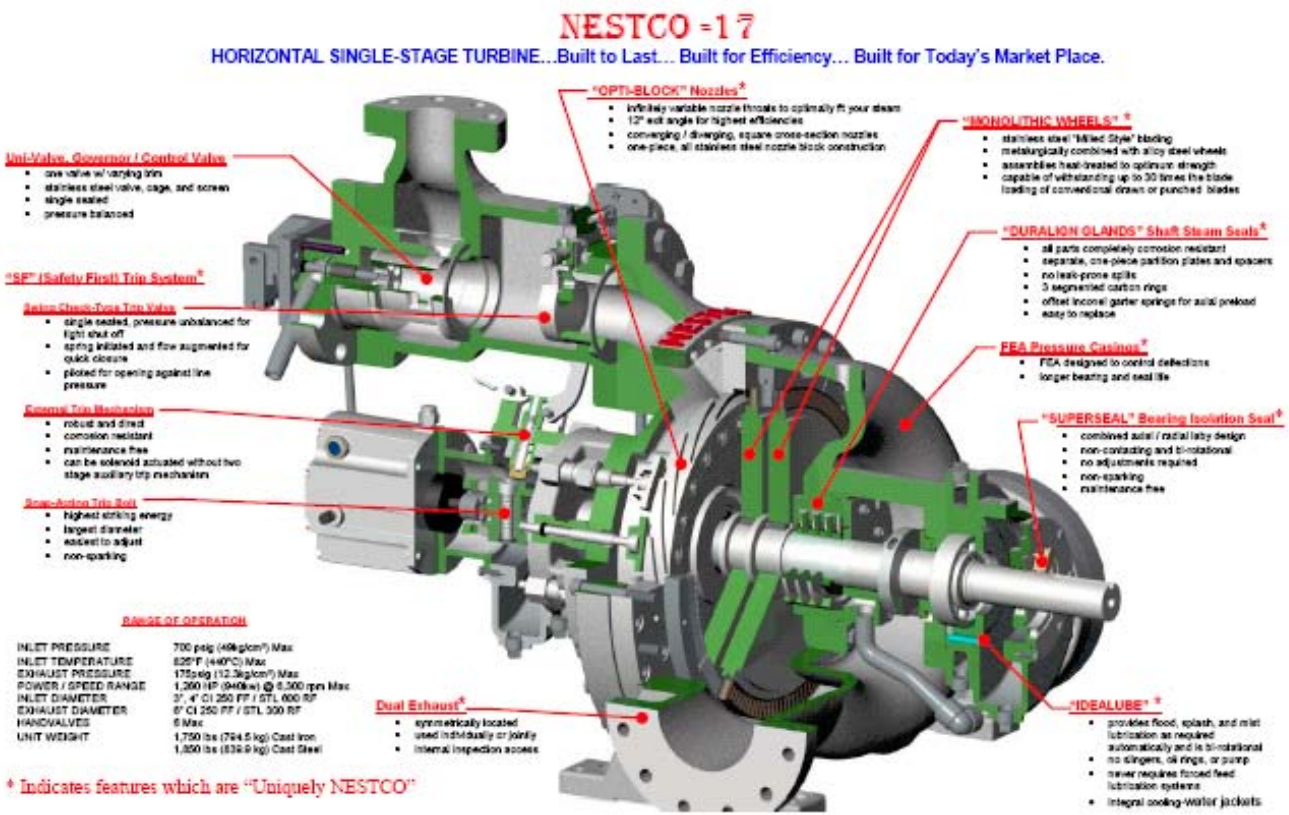
BP Series

Steam Turbines

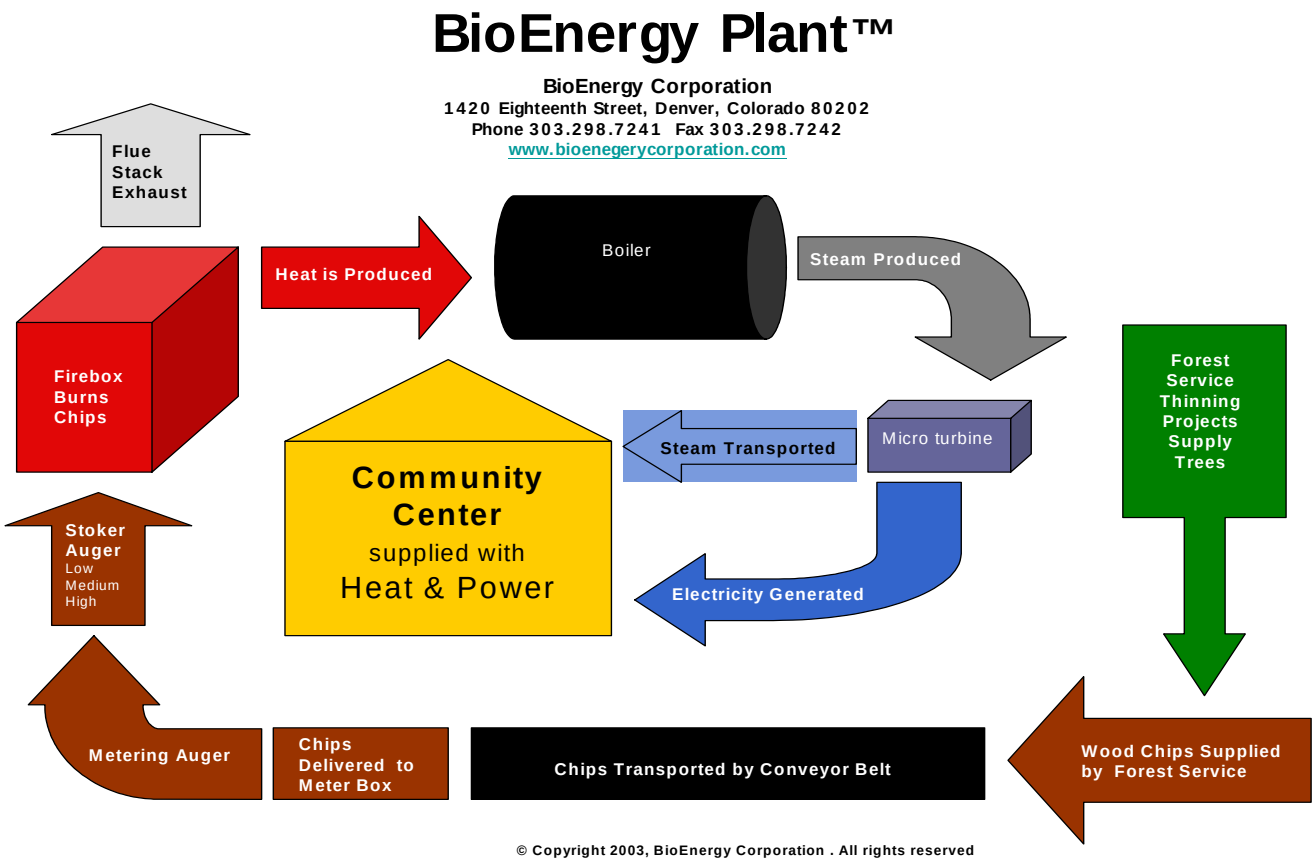
Steam Turbines



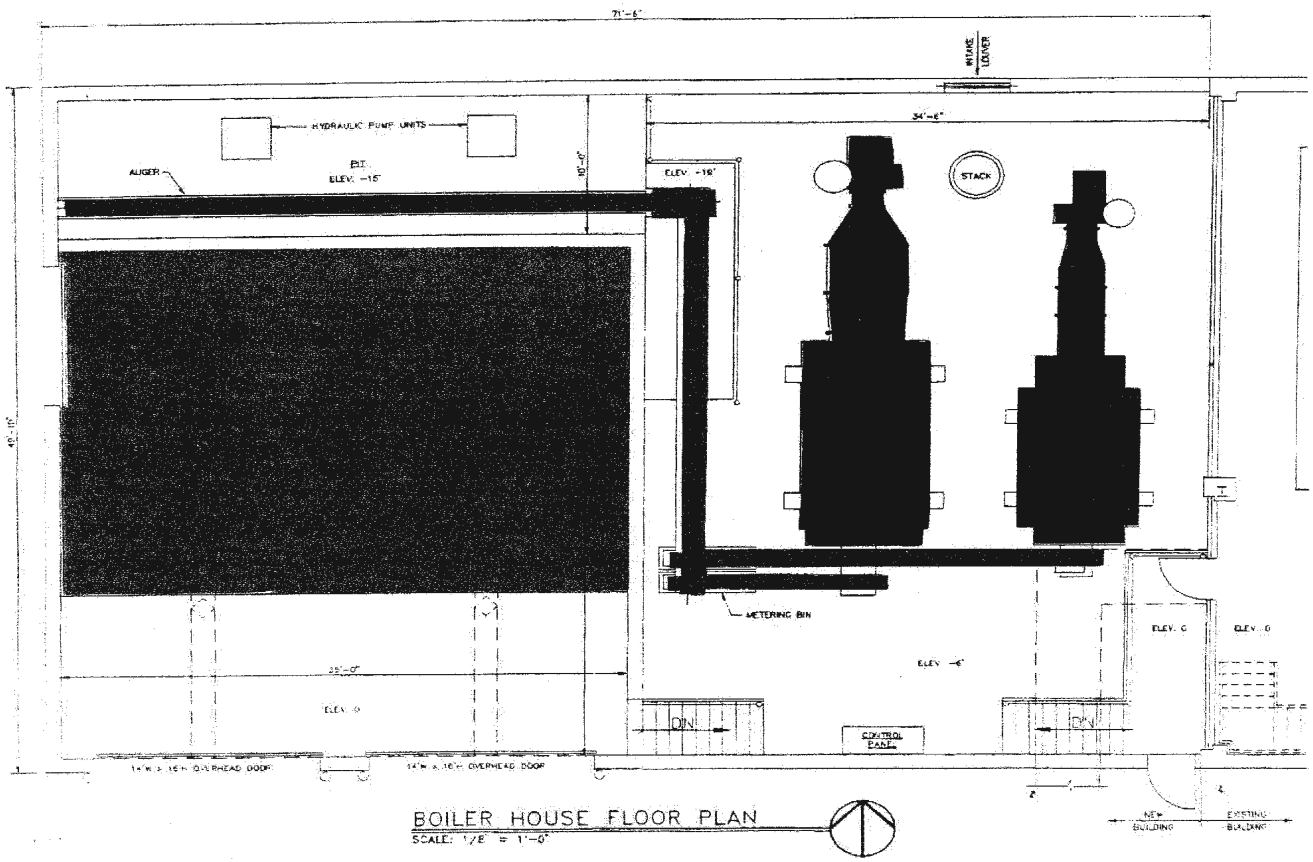
Steam Turbines



Biomass Steam Generation



Biomass Steam Generation



Biomass Combined Heat & Power

BioEnergy Corporation

THANK YOU

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