

# Gasification – An Introduction

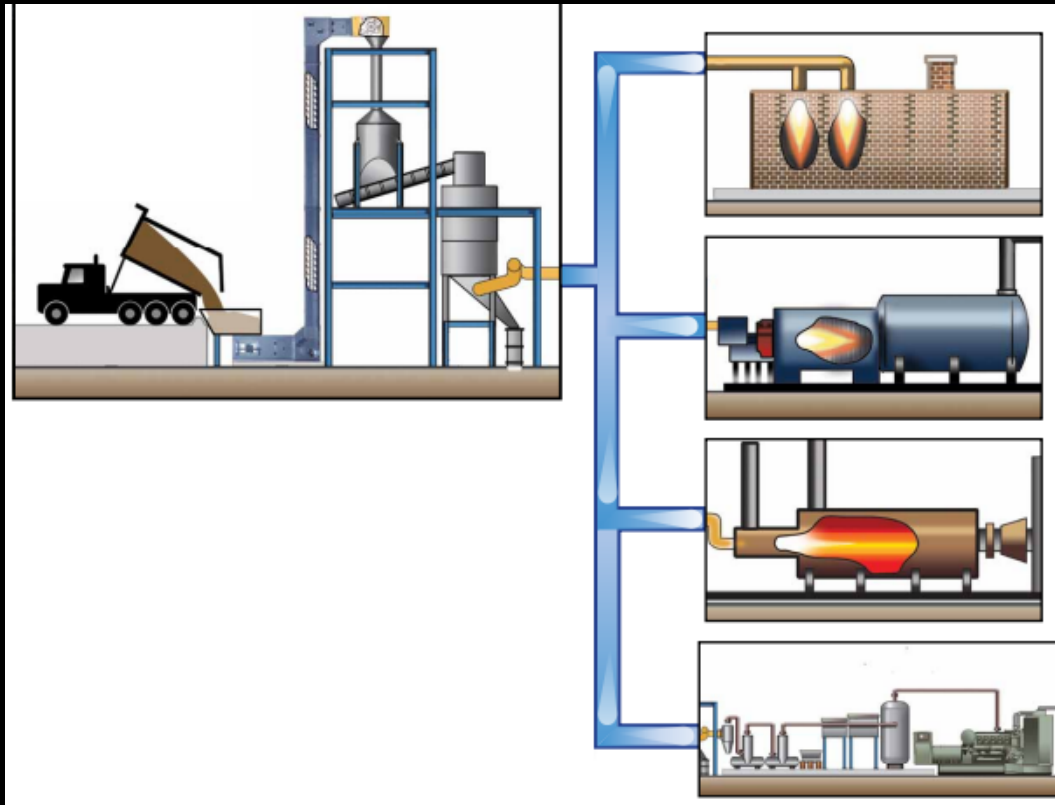


# Gasification v. Combustion

- Gaseous fuel more versatile than solid fuel
- Lower emissions (air and water)
- Less expensive labor needed at facility
- Produces bio-char, an added value product
- However, syngas cleanup is still an issue...
- Small scale thermal use very well commercialized (hundreds of vendors)
- However, the integration of electricity generation (via steam cycle) is very limited on the small-scale.
- Higher air and water emissions, as well as higher water supply needs.

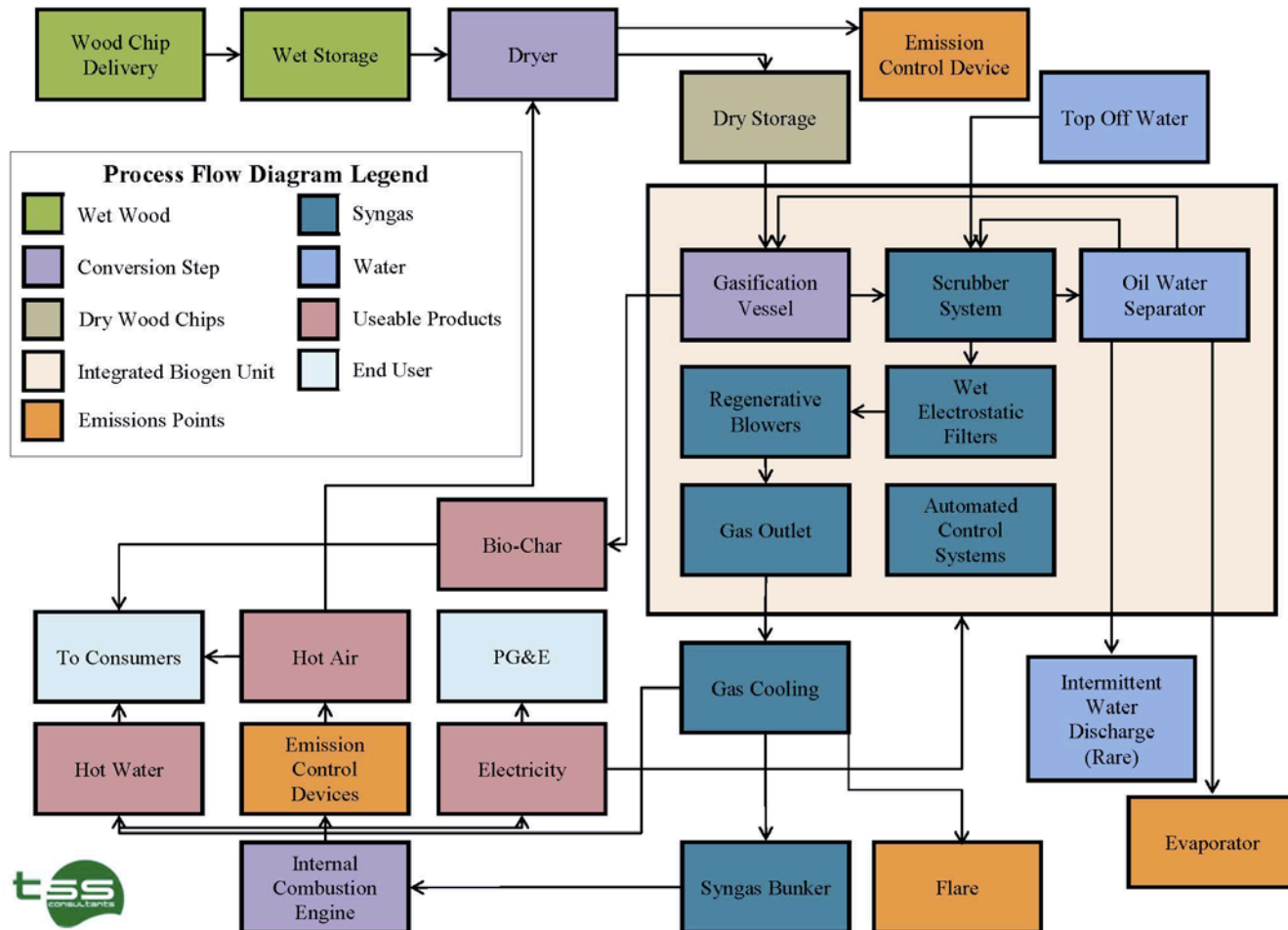
# Gasification

Gasification converts biomass to a combustible gas (a.k.a. syngas)



# Gasification

Process Flow Diagram



# Reliable Renewables (Biogen)





# Phoenix Energy (Ankur)



# Nexterra



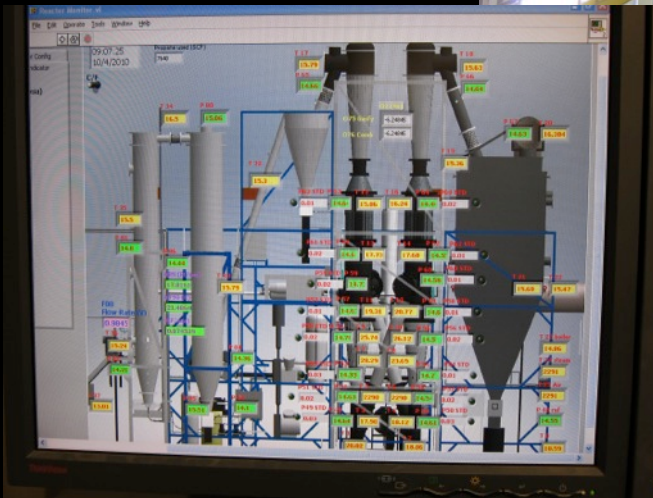


# Radian Bioenergy

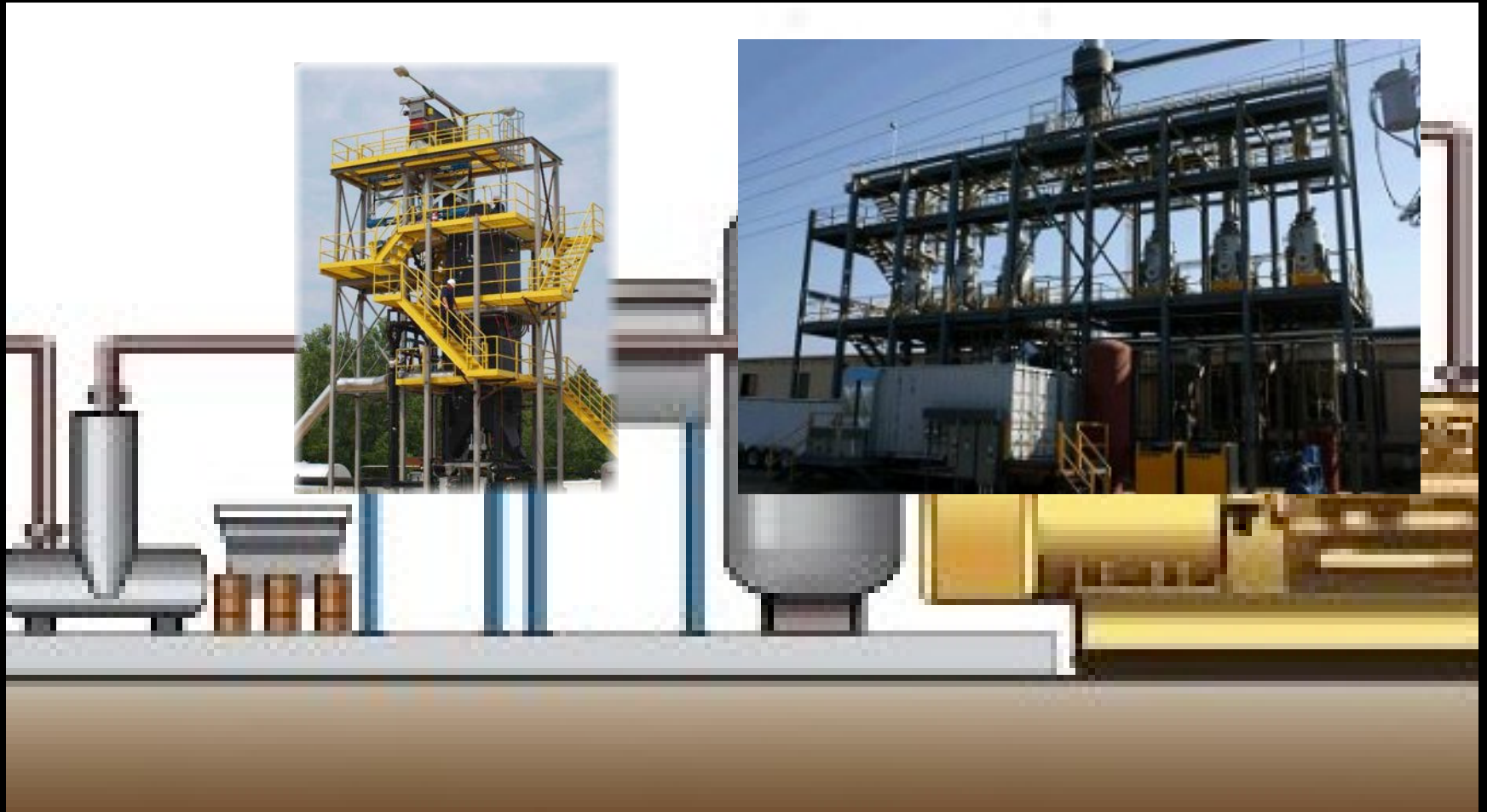




# West Biofuels



# PHG





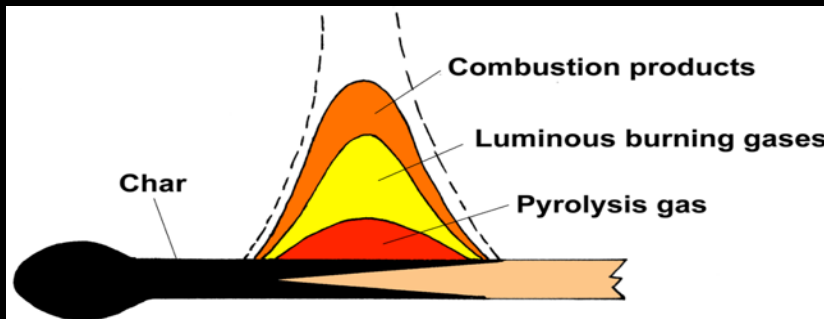
# All Power Labs



# Biochar

- Process

- ✓ Thermochemical treatment, developed through gasification
- ✓ Separates water, VOCs, & hemicellulose in woody biomass.  
Also breaks the cellulosic structure of the wood at 700-1000°C
- ✓ Produces a carbonaceous residue  
Biochar can be between 75%-85% fixed carbon
- ✓ Results yield 7%-20% of the original mass





# Biochar

- Benefits

- ✓ High fixed carbon content makes it ideal for soil amendment

Retains about 50% of the total carbon in 15% of the mass

- ✓ Moisture Content is effectively 0%.

Makes biomass hydrophobic

Lower transport costs

Outdoor storage

- ✓ Negligible decomposition or mold

Longer life without fuel degradation

- ✓ Can be a byproduct of syngas production



*Price range: \$500 to \$4,500 per ton*

*Primary market: Soil amendment*

# Biochar

- Drawbacks

- ✓ When biochar is the primary product, the yield per unit input is very low, for 1 ton of biochar, a gasifier must consume 5-10 tons of wood feedstock – syngas produced and must be flared if not used for energy source
- ✓ Expensive to process biochar into a combustible form, biochar is typically crushed through the gasification process (by screw augurs)