Sustainable Energy from Biomass and Wastes, the Taylor Gasification Process

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Residue Based Fuels Can Have a Significant Impact

- *Replacements for natural gas and petroleum based products*
- *Supply of biomass is sustainable and cost competitive*
- *Use of MSW provides the ability to offset fossil fuel*
- *Reduced greenhouse gas production*

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Fractions of Residue Materials

- Recyclables
  - Stone, metals, glass, paper
- "Biomass" (Fuel) Components
  - Wood, organic residues, food, leather, plastics, carpeting, synthetics
- Hazardous
  - Pesticides, cleaners, medical, pressure treated lumber, painted lumber

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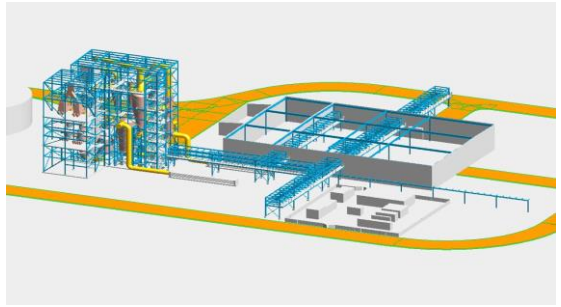
Operations in Montgomery, New York

Converting Residual Materials Into Useful Products



Taylor Gasification Process Provides Many Advantages

- State-of-the-art based on stoker boilers

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  - Low efficiency, High cost
  - Intolerant of contamination
    - Chlorine (emission concerns)
    - Alkali (slagging / fouling)
    - Plastics (temperature control)

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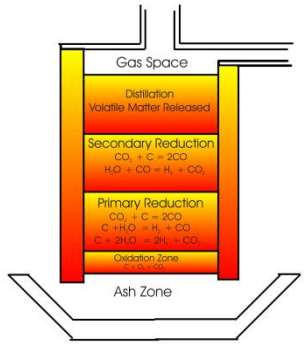
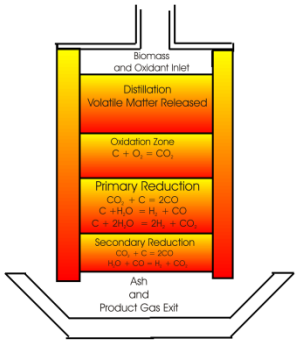
Generic Types of Gasifiers



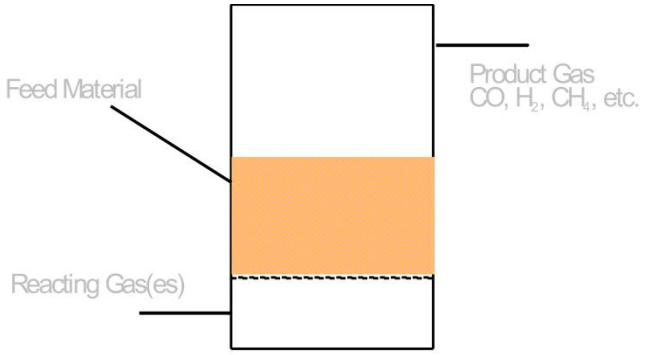
Fixed Bed Gasifier – Updraft Configuration



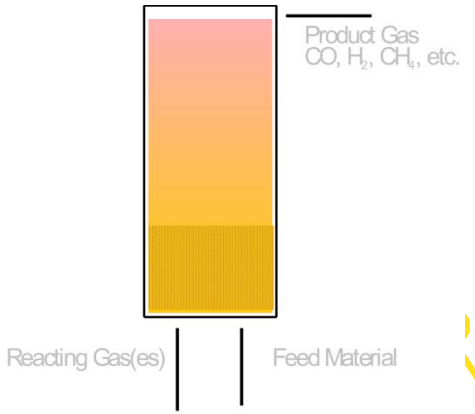
Fixed Bed Gasifier – Downdraft Configuration

All can be either "air" or "oxygen" blown

Heat provided by "burning" within the reactor



Fluid Bed Gasifier



Entrained Gasifier

Types of Gasification Systems

- Air blown -- ~150 Btu/scf (3.5-7 MJ/Nm3)
- Oxygen blown -- ~300 Btu/scf (7-15 MJ/Nm3)
- **Indirect -- ~350-500 Btu/scf (13-20 MJ/Nm3)**

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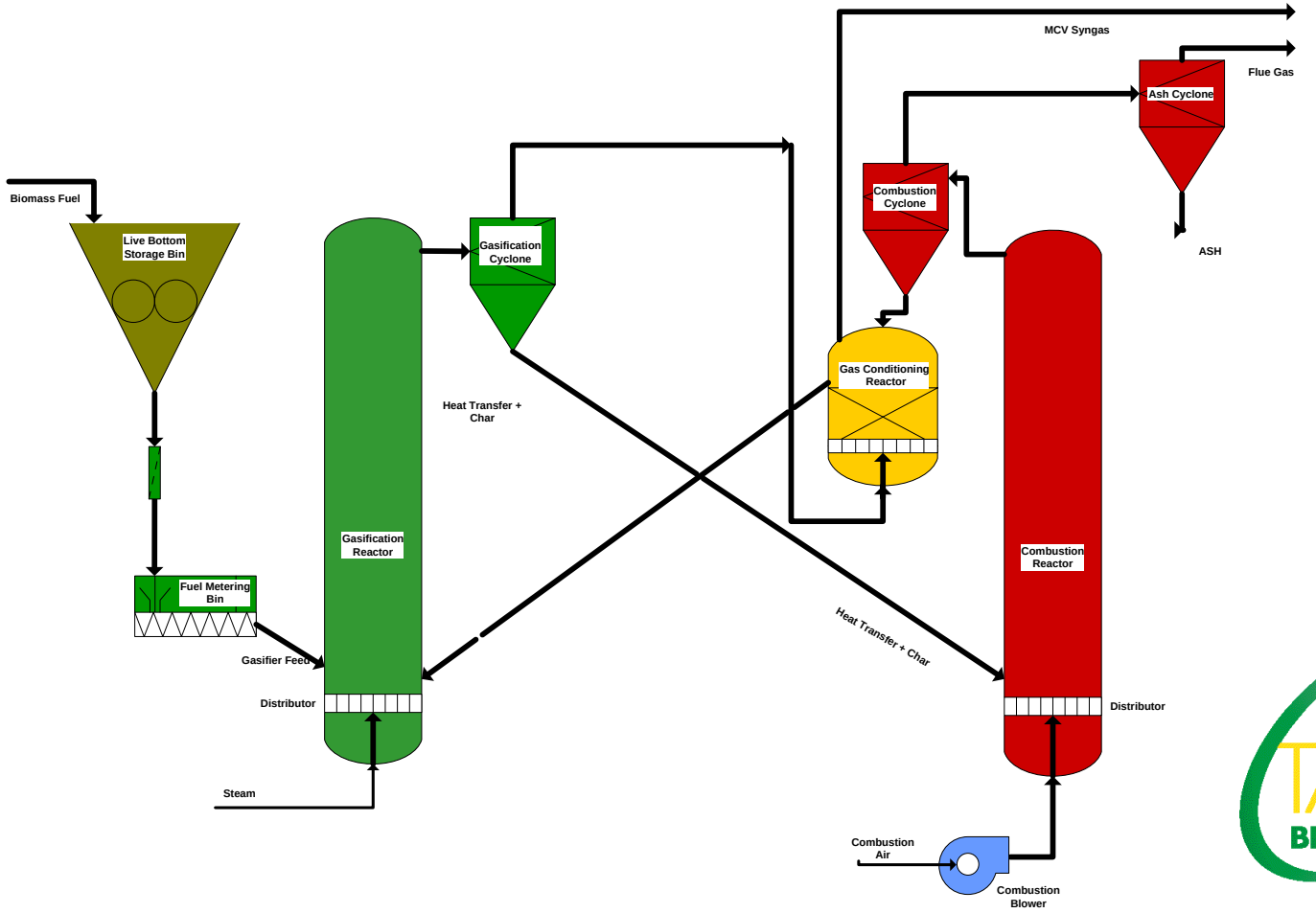
Taylor Gasification Schematic Process Diagram



Characteristics of the Taylor Process

- *MCV gas without oxygen*
- *Stable gas composition*
- *Atmospheric pressure process*
  - *Simplifies feeding*
  - *Expands range of acceptable biomass*
- *Allows use of solid biomass as a source of syngas or gas turbine fuel*
  - *High process efficiencies to power*

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MCV Gas Advantages

- *Simplified / lower cost gas cleanup*
- *Use as synthesis gas*
- *Direct interchangeability with natural gas*

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Higher Efficiencies Are Possible

- ***Efficient gasification technology***
  - ***Over 90% of incoming energy available for end use***
    - *Simple, low maintenance process*
  - ***Other gasification processes require high energy inputs***
    - *Plasma*
    - *Air blown*
- ***Use of high efficiency power generation***
  - ***40 % power generation efficiency***
    - *25% maximum using convention technologies*

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Taylor Gasification Process Environmental Characteristics

- MCV gas is a clean burning fuel
- Process conditions minimize emissions
  - NOx from process combustor low
- Chlorine containing fuels not a problem
  - Cl removed before syngas is used
- Fuel bound nitrogen
  - Elemental nitrogen, not ammonia
- Reduced CO2 emissions

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The Taylor Gasifier Provides Significant Advantages

- Tars converted to additional syngas
  - Higher temperature enhances performance
  - 90% of heavy hydrocarbons converted
- A significantly higher hydrogen content
  - Improves environmental performance
- Modular construction
  - Lowers cost
  - Faster assembly on site

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Program Underway to Utilize the Taylor Gasification Process

- *Expand capacity of the current C&D operations in Montgomery, NY*
  - *Add capacity for 500 tons per day of MSW*
- *Construct modular gasification facility*
- *Install gas turbine based combined cycle system*
- *Sell green energy to NY grid*

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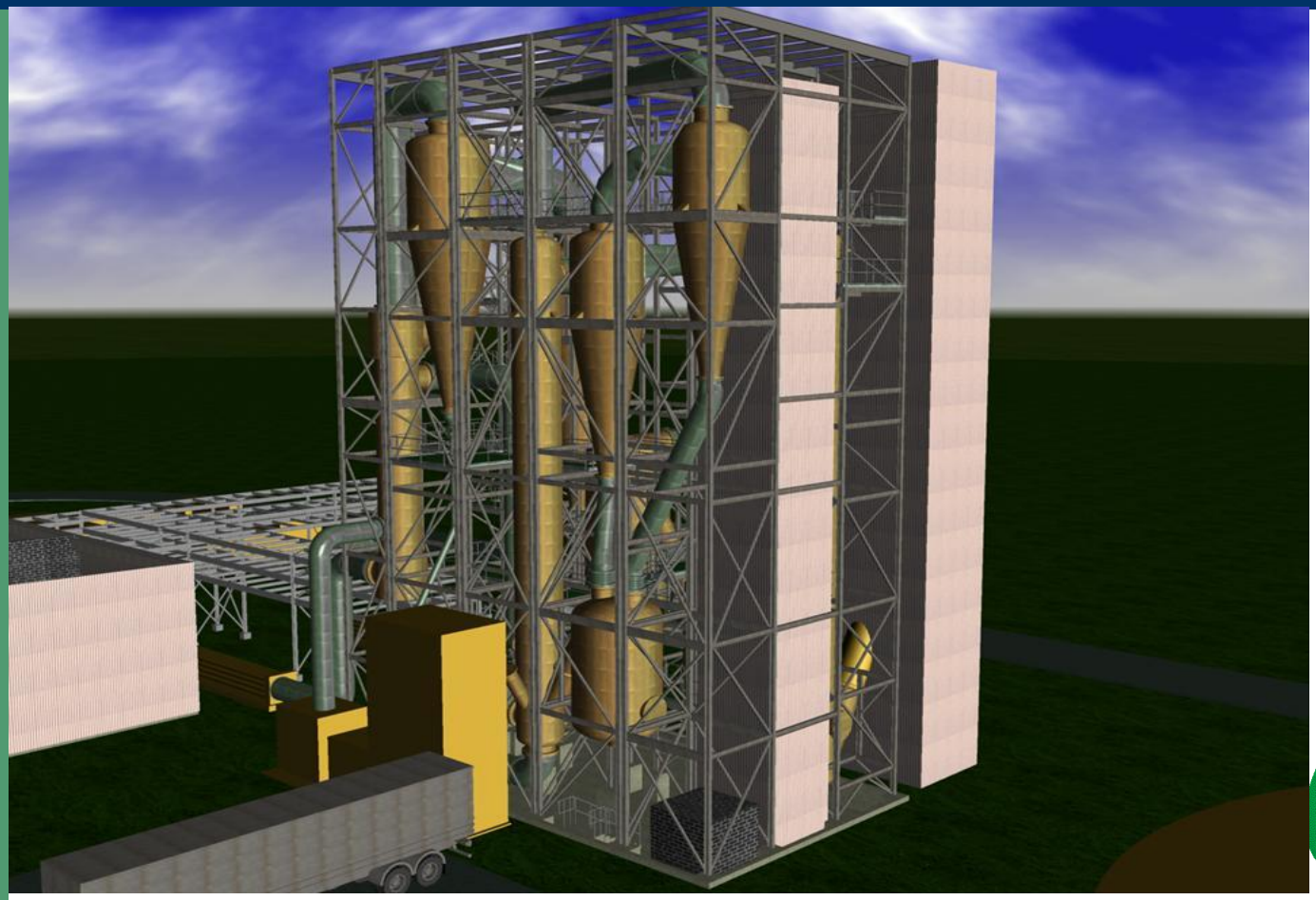
Gasifier Module Layout



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Conclusions

- *Biomass supplies can be significantly enhanced by exploiting the "residue resource"*

- *The Taylor gasifier provides a route to sustainable energy from these reliable energy supplies*

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