



**Gasification: Real World Opportunities**

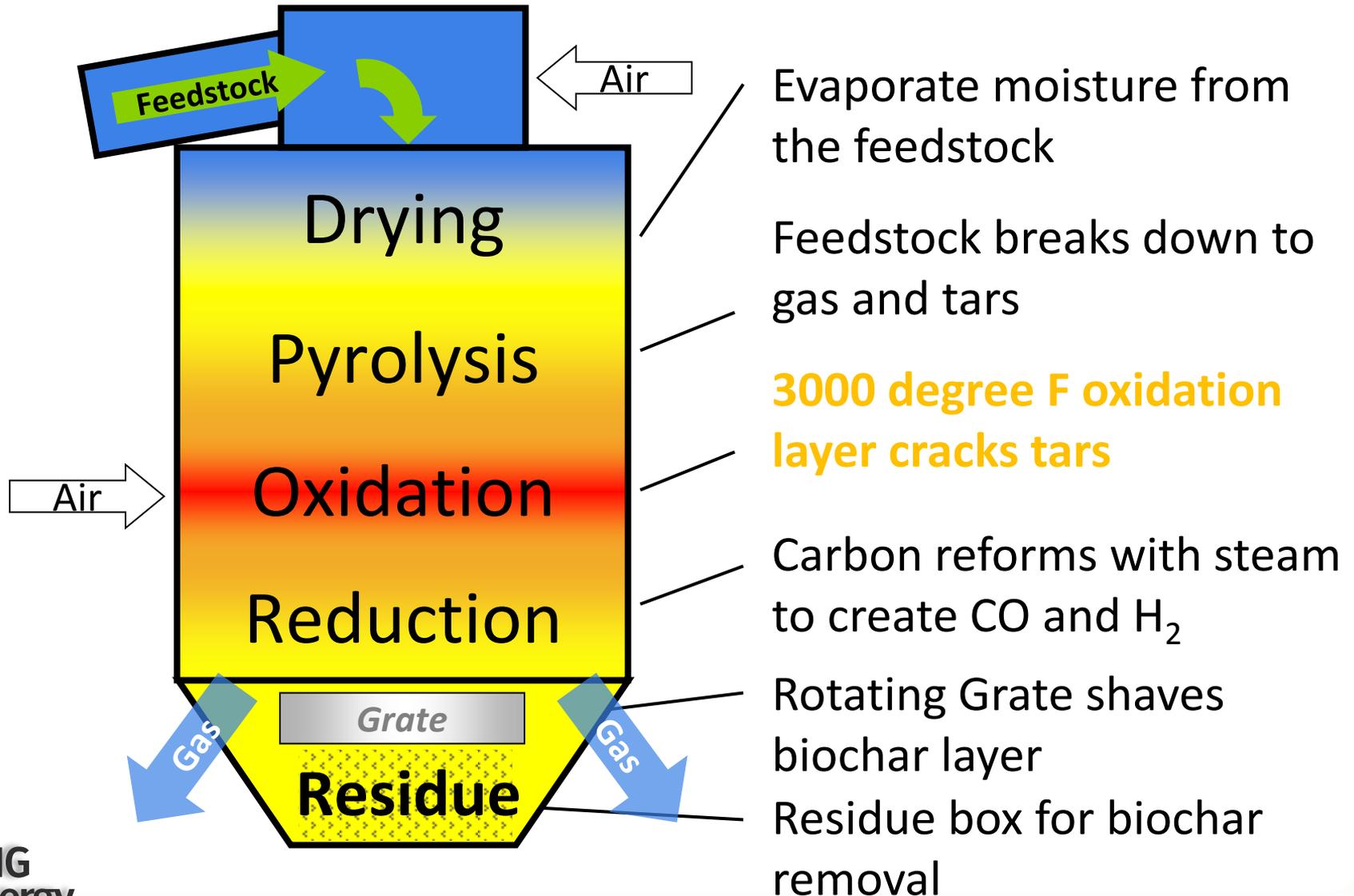


# PHG Energy: Industrial Grade Gasification

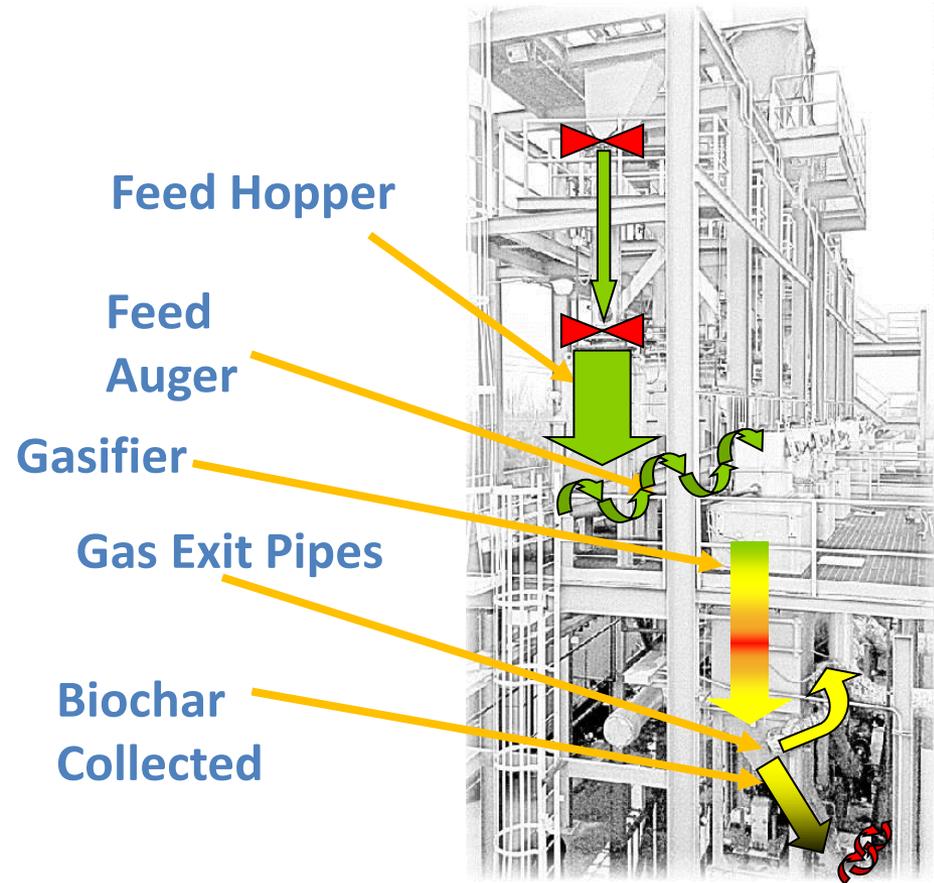


**PHG-LF Gasifier (32MMBTU/hr) – Greenwood, Mississippi**

# Downdraft Gasification

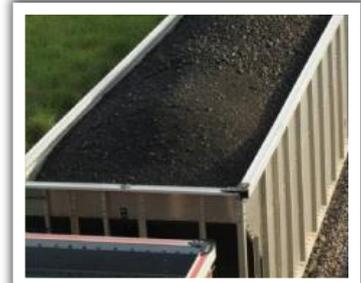


# The Flow of Material to Gas



# What Can You “Gasify?”

- Woodchips
  - Utility trimmings
  - Scrap pallets/Construction
  - Bark or waste wood
  - Commercial waste
- Agricultural and animal waste
- Scrap tires and rubber products
- Food processing and other manufacturing waste
- Switchgrass, miscanthus and other purpose-grown energy crops
- Mixtures improve performance



# Feedstock Specifications

- Consistent feedstock = consistent gas
- Moisture content is key (< 30%)
- Feedstock size: 1/4" to 4"
- Ash content < 10%
- Minimum bulk density: 14lbs/ft<sup>3</sup>
- Low cost waste streams from other processes can greatly improve economics
- Feedstock "Blends" offer further flexibility





**Real World Application**

# City of Covington, TN- Project Goals



Covington, TN USA  
Population: 9,063  
Area: 10.3 sq. miles

- Serve the Community
- Reduce Landfilled Material
- Help Our Environment
- SAVE THE CITY MONEY

# Waste Material Is Feedstock

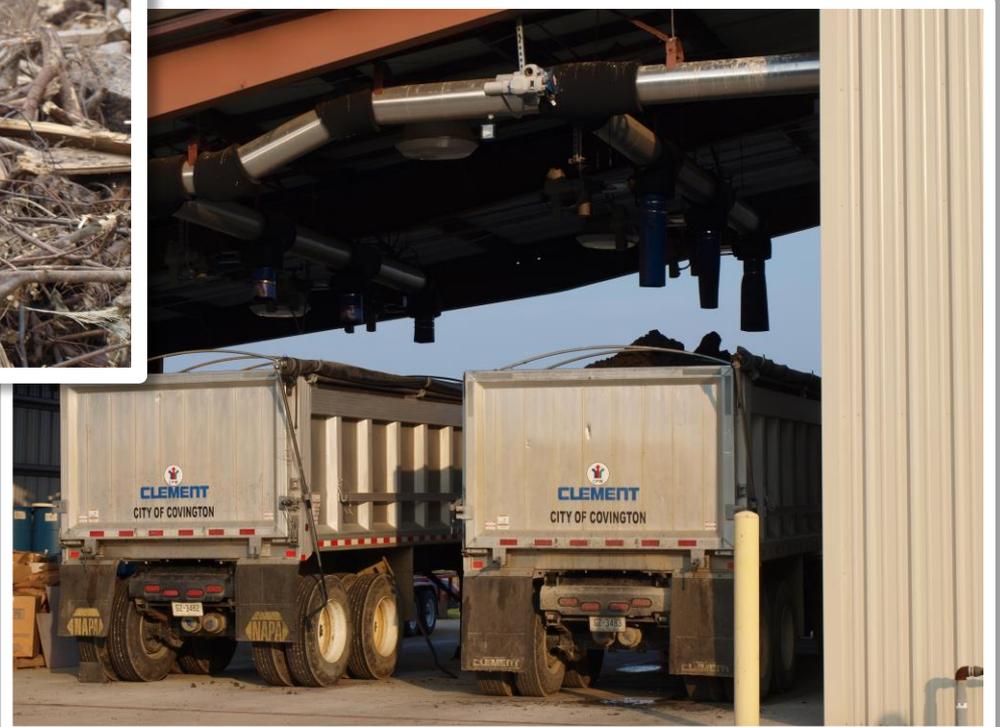


## City Wood Waste

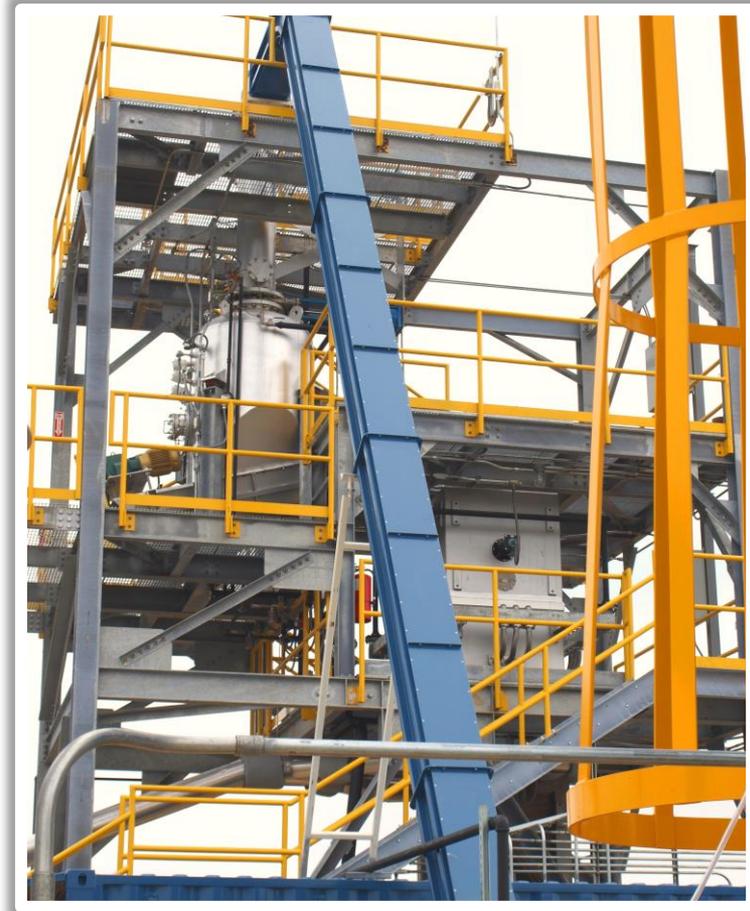
Chipped and used as fuel

## Sludge From Sewer Plant

Diverted from landfill



# Waste Combines

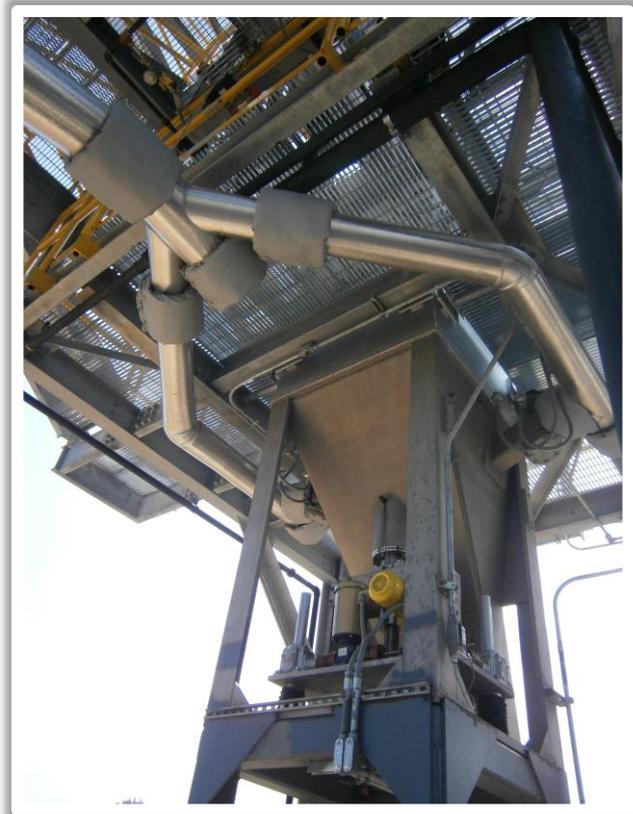


**Wood Chip and Sludge** are combined, dried and sent to the top of the Gasifier by conveyor equipment

# Clean Conversion To Fuel Gas



**Thermo-chemical Gasification** process converts feedstock to fuel gas **without** incineration



# Electric Power Production



**1. Fuel Gas is Combusted** in a thermal oxidizer to cleanly produce heat

**2. Oil Is Heated** to 350 Degrees

**3. Hot Oil Drives Organic Rankine Cycle (ORC) Generator** and uses WWTP effluent for condensing the working fluid

# Covington Waste-To-Energy Plant



# Conclusion

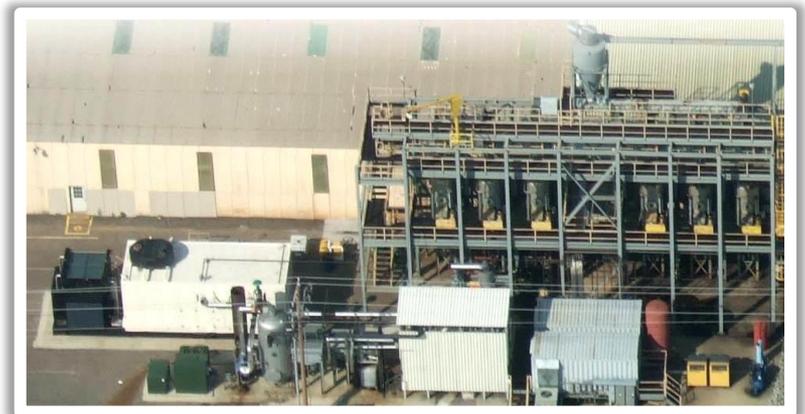


## Economically Viable Energy

- Convert Waste or Biomass to Electricity
- Deliver Clean Burning Fuel Gas
- Reduce or eliminate costly waste streams
- Help achieve sustainability goals

## Every Project is Situational

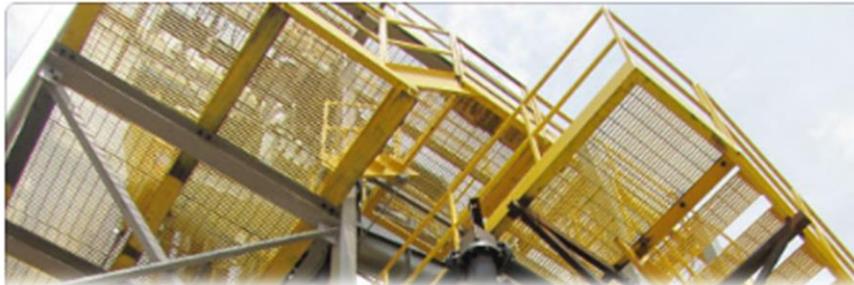
- Feedstock
- Application
- Economics
- Environmental





## Converting Waste Problems to Energy Opportunities

### Economically Sound and Environmentally Sensible



### Industrial Grade Downdraft Gasification

PHG Energy is proud to deliver an alternative energy technology to customers seeking an industrial grade, renewable, cost effective solution that competes with traditional fossil fuels. PHG Energy provides:

- Breakthrough technology in downdraft gasification that has been proven in over 40,000 hours of operation in industrial applications.
- The clean conversion of recycled waste or a variety of biomass feedstock into usable energy without incineration.
- Scalable technology to meet the demands of your process