Who is Aries Clean Energy?

Thompson Machinery’s outstanding 75-year history of providing equipment solutions to the construction, power generation, forestry and agricultural industries through engineering and product support excellence.

Franklin, Tenn, based Aries Clean Energy develops turnkey gasification projects and provides manufacturing, installation and ongoing service for gasification technologies, processes, and equipment.
What is Gasification?
What is Gasification?

“The clean, efficient conversion of biomass into a synthetic gas in an oxygen-starved environment”

• **NOT Incineration.**
• More oxygen than pyrolysis
• Less oxygen than incineration
• Only biochar remains

**BENEFITS INCLUDE:**

• Green renewable energy
• Reduction of greenhouse gases
• Beneficial biochar
• Reduce landfill volumes
• Biosolids disposal
• Scalable Systems
• Readily permitted
Feedstocks

- Woodchips
- Green waste
- Ag waste
- Biosolids
- Size ¼” to 3”
- Ash content: < 10%
- Moisture content: < 30%
- Minimum bulk density: 14 lbs./ft³

Energy Production

- Electricity
- Steam
- Direct Thermal
- Combustion
Fluidized Bed Gasification

Fluidized Bed

- Bubbling*
- Circulation

Feedstocks

- Biosolids
- Food waste
- Size <1”
- Moisture content: < 30%

Energy Production

- Electricity
- Steam
- Direct Thermal
- Combustion

Selected by the Bay Area Biosolids Coalition as one of two preferred technologies for Biosolids Disposal in 2014
Feedstock = 0.24 MDG of Liquid Biosolids
Mass Flowrate = 1000 tons/day
Solids Content = 2%
Heat value = 7000 Btu/LB (dry basis)
Ash Content = 25%
Volatile Solids = 60-70%

Mass Reduction
Compared to Liquid Biosolids
\[\frac{(1000 \text{ tpd} - 5 \text{ tpd})}{1000 \text{ tpd}} \times 100\% = 99.5\% \text{ Reduction}\]

*Energy value dependent on fuel quantity and quality (i.e. volatile solids, ash content, calorific value)
Biosolids Gasification Process Flow

- Dewatered Biosolids
- Storage
- Drying

Pre-Processing

FLUIDIZED BED GASIFIER
- Feed System
- Gasifier
- Cyclone
- Process Heater

ENERGY RECOVERY
- Heat Exchanger

EMISSIONS CONTROL
- Air Emissions Equipment

Char (10-20%)
California SB 1383- How does it apply to biosolids?

- According to CalRecycle and the California Air Resource Board biosolids are considered organic waste for SB 1383 (SLCP Organics presentation by CalRecycle)

- Use of organic waste as Alternative Daily Cover (ADC) at a landfill creates methane and constitutes disposal. (per CalRecycle)

- An estimated 70% of biosolids are still being land applied in California

- CalRecycle recognized there is not adequate recovery/conversion facilities to meet 2025 diversion requirements

- Sec.2 39730.5 (a) C allows for “Potential for new innovation in technology, energy, & resource management practices”
East County Bioenergy Project has completed CEQA approval process

- Partnered with a Franchised Waste hauler
- Received Engineered Municipal Solid Waste (EMSW) concurrence from CalRecycle
- Permitted to process biosolids, food waste, wood waste and RDF
- 150 TPD capacity
- Electrical production of 3MW gross
Sanford, FL, Fluidized Bed System
Project Partners

- **City Sanford WWTP**
  - 70 WTPD (25% moisture)

- **Aries Clean Energy (Formerly MaxWest)**
  - Technology provider
  - Build, Own and Operate
Sanford Operational Information

- Commercial operations began December 2012
- Processed biosolids from several local WWTP
- Processed both undigested and digested biosolids
- 18 months of commercial operations
- 24/4 operating schedule based on biosolids availability
• 12/16/13 the EPA Ruled that both fluidized bed gasification and the thermal oxidizer is NOT a sewage sludge incinerator, and would not be regulated under the SSI rule.

• Typically process does not require supplemental heat other than startup.

“...we do not believe the gasifier is a sewage sludge incinerator...”
Project Partners

- **City of Lebanon**
  - Own the facility
  - 4MGD Avg Daily flow WWTP

- **Aries Clean Energy**
  - Technology provider
  - General contractor
  - Contract operator

- **Rockwood**
  - Wood waste processing
Lebanon Waste-to-Energy Project

**Operating Parameters:**

- 32 TPD material processed (Up to 45 TPD)
- 3 tons sludge, 28 tons wood waste
- 300 kW (net) electrical production
- 3 TPD of high-quality Biochar
Lebanon Operational Information

- January 2017 commercially operational
- Over 8000 operational hours
- Achieved 100 continuous operational days
- Over 80% up time
Project Snapshot

• State of the art, patented fluidized bed facility located in a re-purposed building within the Linden Roselle Sewerage Authority complex
• Process 400 tons per day of biosolids
• Producing 23 tons of beneficial biochar daily
• Closed-loop system requires no fossil fuels during operations
• Construction begins Q3 2019
• Full operations in Q4 2020
Local Benefits

- Diverts 130,000 tons of biosolids from landfills annually
- Lowest cost option for biosolids disposal in NY/NJ Metropolitan area
- System is carbon negative and captures methane (with a global warming impact 23 times greater than CO2) that would otherwise be released into the atmosphere
- Reduce Greenhouse Gases due to reduction in trucking miles of conventional disposal methods
- Aries Clean Energy Build-Own-Operate model provides no financial risk to Linden Roselle Sewerage Authority
- Host Community Benefits to City of Linden
Aries Holloway Bioenergy Facility

**Project Snapshot**
- Aries patented downdraft gasifiers
- Process 165 tons of agricultural biomass
  Generates 86 MW of electricity daily; 72 MW to the grid
- Produces 5000 TPY of biochar that will be used as a soil amendment
- Construction start Q2 2020; Full operations in Q3 2021
- Five-acre site to house gasifiers, feedstock prep, biochar collection
- Project qualifies under SB 1122 CAT BioMAT programs
- Gasification is an approved method of using agricultural waste to generate electricity. This project will help meet California’s Renewable Energy goals.

**Local Kern County Area Benefits**
- Reduction of fossil fuels & greenhouse gas emissions associated with current disposal methods
- Reduces or eliminates open burning
- Effective conversion of biomass waste to renewable energy
- Biochar will improve soil quality
PFAS
The Social Science Environmental Health Institute and the Environmental Working Group produced this map using data from the EPA.
Gasification Can Address PFAS - Per- And Polyfluoroalkyl Substances

- A class of man-made chemicals that is resistant to low temperature heat, water, and oils etc. (also called forever chemicals)
- Contains chains of carbon (C) atoms, surrounded by fluorine (F) atoms
- PFAS chemicals are persistent and resist degradation in the environment
- Will bioaccumulate over time in the body and bind to blood protein ... EPA issued a LHA
PFAS - Aries Solution/Opportunity

- Aries Fluidized Bed and Downdraft gasifiers ideal options for dealing with PFAS

- PFAS is destroyed at temperatures above 800°F (FB 1250°F -- DD 1500°F)

- Thermal oxidizer in both systems 1800°F – clearly above destruction temperatures
Questions?
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