Biosolids & Renewable Energy Seminars
October 13-14, 2021
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1. Company Overview

Aries Clean Technology
Aries Clean Technologies Overview

Based in Nashville, Tennessee, Aries Clean Technologies, LLC is a patent holder, manufacturer and system integrator that develops projects using its proven, proprietary downdraft and fluidized bed gasification systems for municipal and industrial customers.

- closes-loop energy neutral system
- 95% volumetric reduction
- Compliments de-watering systems
- Eliminates land application and incineration
- Eliminates odor problems
- Eliminates harmful run-off
- Solution to PFAS problem
- Sustainable, zero landfill solutions
- Carbon neutral to negative
- Reduces hauling, which lowers costs and reduces CO2 emissions
- Technology produces clean, renewable distributed energy
- Systems can produce producer gas, thermal energy and/or electricity
- Systems produce beneficial biochar
- 10+ years of product development and operating history
- Fully patented systems
- Full-scale commercial downdraft facility constructed and operating
- Fluidized bed 18 months of commercial operation
- Linden Gasification facility in construction with start-up scheduled for Q4 2021
- Feedstocks include forestry, industrial and urban wood waste, sludge, biosolids, agricultural waste, waste paper, tire crumb and energy crops
- Distributed systems reduce on-road transport
- Experienced team with an average of 35 years in clean technology and energy
2. Aries Gasification
Aries Gasification

Liquid Bioprocessing Center – Linden, NJ

- Decomposition of biosolids into producer gas and biochar in an oxygen limited environment
  - Bed temperature 1,250°F
  - Producer gas is primarily H2, CO, CH4, N and CO2
  - Self-sustaining; no external heat needed
  - Co-product biochar (~5% of wet biosolids processed)

Lebanon Bioenergy Center – Lebanon, TN

- Decomposition of biomass into producer gas and biochar in an oxygen limited environment
  - Bed temperature 1,800°F
  - Producer gas is primarily H2, CO, CH4, N and CO2
  - Self-sustaining; no external heat needed
  - Co-product biochar (~10% - 20% of biomass processed)
Aries Fluidized Bed Gasification Facility

FBG Sizes: 150 or 500 wet biosolid tons per day (100% Renewable Thermal & Partial Renewable Electricity)
Aries Fluidized Bed & Downdraft Gasification Facility

FBG Sizes: 150 or 500 wet biosolids tpd and DDG: 65 tpd woodchips (100% Renewable Thermal & Electricity)
Aries Gasification Facilities - Emission Control Systems

1. Precombustion - Cyclone
   - Following both the Aries DD and FB Gasifiers, the fuel gas is directed to cyclones to remove particulate matter
   - Unconverted carbon and residual material that elutriates through the gasifier in the syngas is captured in the cyclone and recovered as biochar.

2. Combustion - Thermal Oxidizer
   - The thermal oxidizer is a refractory lined steel vessel which blends producer gas with air creating hot exhaust gas from which heat can be recovered.
   - Producer gas is exposed to flame temperatures in the thermal oxidizer in excess of 1800 F for over 1 second residence time destroying volatile organic compounds including PFAS/PFOS compounds.

3. Post Combustion – Tri-Mer UltrCat
   - Catalytic Ceramic Filter System with dry sorbent injection
     - Minimum removal efficiencies:
       - > 90% NOx Removal
       - > 90% SOx Removal
       - > 99% PM Removal
       - > 98% HAPs Removal
3. Benefits of Gasification
Benefits of Gasification - Bioenergy

Aries revolutionary gasification technologies decompose biosolids and biomass into beneficial fuel gas and biochar products volumetrically reducing them by approximately 95%.

Project Benefits

- Can divert 50,000 - 150,000 tons of biosolids/biomass per facility from incinerators, landfills and non-compliant SB1383 land applications each year depending upon gasifier size
- Creates 25 new full-time jobs plus 100-150 construction jobs
- Generates renewable energy onsite, accounting for 60% of total energy requirements from renewable sources in FB gasifier configuration and >100% in FB & DD gasifier configuration
- Reduces truck traffic and associated emissions by up to 75%, and eliminates transportation emissions if using self charged EV trucks to haul
- Minor air source - Aries uses Best Available Control Technologies (BACT) and enhanced odor control
- Negative greenhouse gas footprint when utilizing self charged EV trucks for hauling
- Federal Environmental Protection Agency (EPA) has determined Aries gasification is not incineration
- High PFAS/PFOS Destruction Removal Efficiency; 99.99%
- Cost competitive with other compliant SB1383 biosolid management alternatives [WWTP Design-Build, P3, or Aries Design-Build-Own-Operate-Maintain proposals available upon request.]

Carbon Cycle

Freightliner E-Cascadia

GCW: 82,000 lb; Range: 250 Miles on a full charge; Pre-Orders: Being Accepted; Commercial Delivery Year: 2023
Benefits of Gasification - Biochar

Aries proprietary process is a highly efficient assembly of drying and thermal heating technology that converts roughly 5% of wet biosolid input into a final biochar material.

What is Biochar?

- Biochar is a manufactured product that is formed in a low oxygen environment.
- During the gasification process a small fraction of the carbon and ash in the biomass resist thermal degradation forming biochar.
- Bio-Fly-Ash™ is an Aries trademark biochar product from its FB gasifier, which is used as a base material in the green manufacturing of asphalt, concrete, and other building products.
- Aries Green Biochar™ is an Aries trademark biochar product from its DD gasifier, which is used as base material in the green manufacturing of textiles, building products, catalysts, remediation/filtration medias, graphite, graphene, soil amendments and fertilizer.
- Bio-Fly-Ash™ & Aries Green Biochar are inert and non-hazardous, and best of all offer useful and permanent carbon sequestration.

Biochar Uses
4. Current Biosolid Gasification Projects
Aries Linden, LLC

Aries successfully completed the permitting/financing process for the Linden Gasification Facility in 2019 and promptly began construction thereafter and is due for completion in Q4 2021

System Description
- 430 TPD biosolids throughput
- Approximately 30 TPD of Sludge to be dewatered on site
- 2 x 215 TPD Baker Rullman Drum Dryers
- 85 TPD (dry basis) Aries Patented Fluidized Bed Gasifier
- 22 TPD of Bio-Fly-Ash™ produced

Status
- Achieved financial close
- Currently under construction
- Received all required operating permits through NJDEP
- Financed thru Union County Improvement Authority
  - Tax Exempt Private Activity Bonds (PABs) - $50 million Sold

Counterparties
- Feedstock fully contracted
- 2 sources of sludge (22% solids) supply:
  - R&B debris: 350 - 400 TPD
  - LRSA to provide 125 tons/day 4-6% dry sludge
- Bio-Fly-Ash™ – LOI to sell to local concrete company as a fly ash substitute
- Class A Biosolids – LOI in place to sell Class A biosolids produced to a soils remediation company

Milestones
- Mechanical Completion – October 2021
- Placed in Service – December 2021
Aries Linden Construction Photos
Other East Cost Projects in Development

Newark Bioprocessing Center
- Technology: Fluidized Bed Gasifier
- Location: Newark, New Jersey
- Throughput: 470 wet tons / day biosolids

Kearny Bioprocessing Center
- Technology: Fluidized Bed Gasifier
- Location: Kearny, New Jersey
- Throughput: 470 wet tons / day biosolids

Taunton Bioprocessing Center
- Technology: Fluidized Bed Gasifier
- Location: Taunton, Massachusetts
- Throughput: 470 wet tons / day biosolids

Middlesex Bioprocessing Center (Pending Bid)
- Technology: Fluidized Bed Gasifier
- Location: Sayerville, New Jersey
- Throughput: 470 wet tons / day biosolids
West Coast Projects in Development:

Fairfield-Suisun Bioprocessing Center

- **Technology:** Fluidized Bed Gasifier & Downdraft Gasifier
- **Location:** Fairfield, CA
- **Size:** 25 Class A biosolid tons & 65 woodchip tons
- **Throughput:** 150 wet tons / day biosolids and 65 woodchip tons
- **Contracts:**
  - Biosolid & Woodchip contracts being negotiated with local haulers
  - Export thermal supply contract being negotiated with neighboring tenant
  - Export power supply contract being negotiated with landlord
- **Milestones:**
  - Fairfield-Suisun Sewer District Site Lease Option & Project MOU executed
  - Preliminary design complete
  - Preparing permit applications for 4Q21 submittal
  - Target financial close of December 2022

### Project Specifications

#### Configuration
- 1 - 65 tpd DDG & 1 25 tpd FBG
- Biosolid Dryer, Cyclone, TO, Heat Recovery, ORC
- Emission Control

#### Feedstock
- 65 tpd wood residue 7 non-recyclable paper
- 150 tpd wet biosolids

#### Output
- 100% internal thermal & electrical loads
- Net export 250 kW, 2.5 MMBtus/h, 6.5 t/d
- Aries Green BioChar™, 7.5 t/d Bio-Fly-Ash™

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[Map image of the Fairfield-Suisun Bioprocessing Center]
Thank you!

Joseph Regnery  
Director, Business Development West Region  
Aries Clean Technologies  
4037 Rural Plains Circle, Suite 290  
Franklin, TN 37064  
(720) 548-0580  
joseph.regnery@ariescleantech.com

Questions?