



STATEMENT OF QUALIFICATIONS

Renewable Energy



Adams & Christensen Engineering, Inc.
P.O. Box 481
Grayslake, Illinois 60030
Phone: (630) 337-0781

www.ac-engineering.com



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SUMMARY

Adams & Christensen Engineering, Inc. (**ACEng**) is an engineering firm specializing landfill gas, manure, and food waste based renewable energy assessment and system design for electricity generation or renewable natural gas (RNG) production. **ACEng** can provide complete system evaluation and design including system/technology evaluation, mass & energy balances, hazardous area classification, equipment and component specifications and selection, piping & instrumentation diagrams (P&IDs) piping design, electrical design, instrumentation and control design, control panel design, operating descriptions, and complete design packages for field construction or pre-fabricated skid manufacturing.

ACEng's principals bring over 60 years of water and wastewater experience in the following industries:

- Food & Beverage
- Renewable Energy – Landfill Gas
- Renewable Energy – Food Waste
- Renewable Energy – Dairy Manure
- Renewable Energy – Beef Lot Manure
- Construction Firms
- Engineering Firms
- Equipment Packagers

ACEng offers evaluation and consulting services along with process, mechanical, civil, structural, controls & instrumentation engineering and design services for field erected systems or modular skid-mounted components/systems.

Our Principals have Professional Engineering Licenses in 30 states, Certificates of Authorization in 21 states, and are an ISNet World registered and compliant contractor.

SELECT PROJECT EXPERIENCE

Landfill Gas to Energy Facility

Waste Management Renewable Energy – Multiple Sites

- Arlington, Oregon – 6.4 MW electrical generation facility (three Caterpillar 3520 engine-generators).
- Des Moines, IA - 6.4 MW electrical generation facility (four Caterpillar 3520 engine-generators).
- Geneva, OH – 4.0 MW electrical generation facility (five Caterpillar 3516 engine-generators).
- New Springfield, OH – 4.8 MW electrical generation facility (six Caterpillar 3516 engine-generators).
- East St. Louis, IL – 5.6 MW electrical generation facility (three Caterpillar 3520 and one Caterpillar 3516 engine-generators).
- Surprise, AZ – 3.2 MW electrical generation facility (two Caterpillar 3520 engine-generators).
- Herkimer, NY – 3.2 MW electrical generation facility (two Caterpillar 3520 engine-generators).
- Kernersville, NC - 2.4 MW electrical generation facility (three Caterpillar 3516 engine-generators).
- Lewisville, TX - 4.8 MW electrical generation facility (three Caterpillar 3520 engine-generators).
- Barre, MA – 1.6 MW electrical generation facility (one Caterpillar 3520 engine-generator).
- Freemont, CA – 4.8 MW electrical generation facility (three Caterpillar 3520 engine-generators).
- Novato, CA – 3.9 MW electrical generation facility (two Caterpillar 3520 1500 RPM engine-generators). The system included a Sulfatreat-based H₂S removal system, a regenerative siloxanes removal system, and emissions control systems.

Anaerobic Digester Project

Green Era Sustainability – Chicago, Illinois

Project Manager for design of an anaerobic digester facility to receive and process organic food wastes to Class A biosolids and RNG. The system consisted of liquid unloading stations, product de-packaging equipment, anaerobic digester, biosolids dewatering and disinfection system, biogas boilers for process and building heat, biogas conditioning skid for RNG, flares, associated mechanical systems. Work completed by Mr. Adams included the process mechanical design and building HVAC design as well as managing the structural, plumbing, fire protection, and electrical design.

Manure Mass and Energy Balance

Settje Agri-Services & Engineering, Inc. – Confidential, Nebraska

Developed a mass and energy balance for a proposed anaerobic digester system at beef feedlot. Utilized manure and owner operational data as well as climatic data to calculate manure and digester heating requirements, expected fuel consumption, and associated boiler sizing for the project. Monthly scenarios were evaluated as well as an annual average.

Operations Support and Systems Upgrade Design – Anaerobic Digester

Jerome Resources – Confidential Dairy, Idaho

Project manager to support operations of an existing dairy digester. Work has included development of a mass and energy balance for the operation, design of a centrifuge-based solids removal system from digestate, design and scope development for maintenance and improvement tasks.

**Preliminary Design and Engineering Support – Anaerobic Digester
Jerome Resources – Confidential Dairy, Kansas**

Developed basis of design, mass and energy balance, 30% design drawing set, structural design for temporary manure solids removal system.

**Preliminary Design and Engineering Support – Anaerobic Digester
Jerome Resources – Confidential Dairy, Idaho**

Developed basis of design, P&ID, mass and energy balance, 30% design drawing set for an anaerobic digestion and RNG system at a dairy.

**Feasibility Evaluation – Anaerobic Digester
Jerome Resources – Confidential Dairy, Idaho**

Performed expected manure and biogas generation evaluation and mass & energy balance for client to evaluate feasibility of an anaerobic digestion system at a dairy.

**Preliminary Design and Engineering Support – Anaerobic Digester
Confidential Client – Cactus, Texas**

Engineer for conceptual design of a digester and biogas conditioning system for a meat processor. Specific tasks included development of project drawings, design of feedstock handling systems, developing an opinion of probable cost for potential investors, and technical review of design documents completed by others.

**Opportunity Evaluation – Anaerobic Digesters
South Pointe Partners – Confidential Dairy, Idaho**

Performed expected manure and biogas generation evaluation and mass & energy balance for two anaerobic digestion systems serving two dairies with a common high BTU system for RNG pipeline injection.

**Dovetail Energy Capital Improvement Project
Renergy, Inc. – Fairborn, Ohio**

Provided technical review of Process Flow Diagram and Piping & Instrumentation Diagram and lead engineer for project civil and structural design. The expansion included increasing food waste handling and digestion capacity, improving biomass disinfection system to achieve Class A biosolids, upgraded biogas compression and conditioning system, and additional CAT 3516 generators.

**Emerald Bioenergy Capital Improvement Project
Renergy, Inc. – Cardington, Ohio**

Reviewed design documentation and Permit to Install application.

**Hydraulic Assessment – T&W RNG Generation Facility
SustainRNG – Eatonton, Georgia**

Hydraulically model manure pumping systems to aid in operations optimization at an existing dairy manure-to-RNG facility.

Conceptual Dairy Manure-to RNG System Design

SustainRNG – Multiple Dairies

Developed conceptual design documents for a Dairy Manure-to RNG. Documents consisted of seasonal heat and mass balance, project specifications, piping & instrumentation diagram (P&ID), process equipment and pump schedule, expected electrical load summary, pipe insulation schedule, hand valve schedule, actuated valve schedule, instrument schedule, vessel schedule, and line specialties schedule.

Dairies included:

- Pecan Grove Dairies, Baconton, Georgia
- Harmony Grove Dairies, Waynesboro, Georgia
- Barrington Dairies, Montezuma, Georgia

Dairy Manure Mass and Energy Balance

SustainRNG – Multiple Dairies

Developed a mass and energy balance for a proposed anaerobic digester system at a dairy farm. Utilized manure and owner operational data as well as climatic data to calculate manure and digester heating requirements, expected fuel consumption, and associated boiler sizing for the project. Monthly scenarios were evaluated as well as an annual average. Dairies included:

- Milco Dairy, Lewisville, Indiana
- County Line Dairy, Lewisville, Indiana
- Sun Mountain Dairy, New Bavaria, Ohio
- Mountain View Farms, Chathan, Virginia
- Beam Dairy, Cherryville, North Carolina

Opportunity Development – Anaerobic Digester

Jerome Resources – Multiple Dairies

Performed expected manure and biogas generation evaluation, mass & energy balance, and preliminary site layout for an anaerobic digestion system at a dairy. Locations included:

- Confidential Dairy, Idaho
- Confidential Dairy, Idaho
- Confidential Dairy, Iowa

Hydraulic Assessment and Modifications Design – Liberty RNG Generation Facility

SustainRNG – Liberty North Carolina

Hydraulically model manure pumping systems to aid in operations optimization at an existing dairy manure-to-RNG facility and developed design documents for system recommended and requested improvements.

Engineering and Inspection Services

ampCNG – Fair Oaks, Indiana

Evaluated an existing biogas compression and dehumidification system and provide recommendations to improve system performance.

Emerald Bioenergy Capital Improvement Project

Renergy, Inc. – Cardington, Ohio

Reviewed shop drawings for a PSA-based biogas conditioning system to treat 400 SCFM of biogas to local pipeline standards.

**Biogas Flare Evaluation Support
Confidential Brewery - Pennsylvania**

Project Manager to evaluate digester biogas generation and current enclosed flare performance. The flare's construction and design parameters were compared to actual biogas quality and quantity produced to identify solutions for improved flare performance and emissions compliance.

**Biogas Flare Replacement
Confidential Brewery - Wisconsin**

Project Manager to develop flare specifications, solicit request for quotations, evaluate quotes for compliance with the specifications and project emissions requirements. Developed a process diagram and mass and energy balance for the biogas compression and conditioning system.

**American Organic Energy
Green Arrow Engineering – Long Island, New York**

Provided technical of biogas compression and conditioning skid request for quotation and hazardous area classification memorandum.

**Landfill Gas to Energy Facility
SCS Energy – Multiple Sites**

Project Manager for Process HVAC design for a Landfill Gas to Energy Facility (RNG) at the following facilities:

- Skyline Landfill, Ferris, Texas
- Southside Landfill, Indianapolis, Indiana
- Outer Loop RDF, Louisville, Kentucky
- Wood Street Landfill, Lansing, Michigan
- Noble Road Landfill, Shiloh, Ohio
- Pine Bend, Inver Grove Heights, Minnesota
- Prairie View Landfill, Wilmington, Illinois
- New River, Raiford, Florida
- Eco-Vista Landfill, Springdale, Arkansas
- Carbon Limestone Sanitary Landfill, Lowellville, Ohio
- Lorain County Landfill, Oberlin, Ohio
- Prince William Landfill, Manassas, Virginia
- Arbor Hills Landfill, Northville, Michigan
- Fairless Landfill, Morrisville, Pennsylvania
- DFW Landfill, Lewisville, Texas
- Orchard Hills Landfill, Davis Junction, Illinois
- Sampson County Landfill (Sapphire RNG), Roseboro, North Carolina
- Ridge Landfill, Blenheim, Ontario, Canada
- Okeechobee Landfill, Okeechobee, Florida
- Security Landfill, Cleveland, Texas
- Temple Landfill, Temple, Texas
- Williamson County Landfill, Hutto, Texas
- Dekalb County Landfill, Dekalb, Illinois
- Medley Landfill, Medley, Florida
- Covell Gardens Landfill, San Antonio, Texas
- Polk County, Winter Haven, Florida
- Richland Landfill, Elgin, South Carolina

- Oakridge Landfill, Dorchester, South Carolina
- Columbia Ridge Landfill, Arlington, Oregon
- High Acres Landfill, Fairport, New York
- Ocean County Landfill, Manchester, New Jersey
- Salem Waste Disposal Center, Opelika, Alabama
- Atlantic County Utilities Authority Landfill, Egg Harbor Township, New Jersey
- Pheasant Point Landfill, Bennington, Nebraska
- Brevard Landfill, Cocoa, Florida
- Pecan Grove Landfill, Pass Christian, Mississippi
- Pine Bluff Landfill, Ball Ground, Georgia
- Elk River Landfill, Elk River, Minnesota
- Dry Creek Landfill, Eagle Point, Oregon
- Cottonwood Landfill, Marissa, Illinois
- American Avenue Landfill, Kerman, California
- Denver Arapahoe Disposal (DADs), Aurora, Colorado