

ROD CHRISTENSEN, P.E.

Owner & Principal – Adams & Christensen Engineering, Inc.

PROFESSIONAL ENGINEERING LICENSES

California, Illinois, Iowa, Michigan, North Carolina, Ohio, Oregon, and South Carolina. Current NCEES Record.

PROJECTS EXPERIENCE

RENEWABLE ENERGY (INCLUDING BIOGAS AND LANDFILL GAS)

Landfill Gas-to-Energy Design

Waste Management Renewable Energy (WMRE)

Project Manager responsible for preparation of civil, process and mechanical construction drawings of multiple landfill gas-to-energy (LFGTE) facilities. Facility designs generally consisted of a CMU building with engine bay, high voltage and low voltage rooms, fuel compressor room, shop, office, and restroom. Scope of work included site layout and development, sanitary and potable water piping, HVAC, process piping (LFG, compressed air, condensate, oil and coolant), and LFG compression system. Designs included development of LFG system energy and mass balance process models to evaluate probable flow rates, temperatures, dew points, energy demands (compressor horse power, cooling energy, etc.), and gas constituent concentrations at each stage of the system. Sites included:

- **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.

Biogas Compression and Conditioning Skid

Waste Management Renewable Energy – Surprise, AZ

Project Manager for design and manufacture of a biogas compression and conditioning skid to compress landfill gas and feed it to Caterpillar 3520 engine-generators. Skid included positive displacement compressor, coarse and fine moisture particulate filters, chiller, and ambient air cooler.

Wastewater Biogas System Modifications

American Crystal Sugar – East Grand Forks

Project Engineer for evaluation and preliminary design of biogas handling system modifications for an existing wastewater treatment and biogas handling system. Objectives of modifications were remove condensate and foam from biogas piping and components and increase biogas handling capacity for a covered pond and anaerobic digester.

Biogas Usage Evaluation

Linden WWTP Digester – Genesee Co., Michigan

Project Engineer for evaluation potential options for beneficial reuse of biogas generated from a municipal anaerobic digester.

Renewable Natural Gas Project

Waste Management Renewable Energy – Skyline Landfill, Ferris, Texas

Engineer for design process room ventilation system for a landfill gas to renewable natural gas (RNG) facility.

Dovetail Energy Capital Improvement Project

Reenergy, Inc. – Fairborn, Ohio

Completed biogas utilization evaluation and modeling for digester facility expansion. Evaluation identified expected biogas demands for operation of multiple process boilers, a CAT 3516 engine generator, and a PSA-based bag conditioning skid for RNG production as well as emergency flare and tail gas emissions.

Biogas Flare Replacement

Confidential Brewery - Wisconsin

Completed flare performance evaluation to calculate expected emissions velocity, constituents, and temperature at the exit of an approximately 70-foot tall enclosed flare stack extension.

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

WATER/WASTEWATER TREATMENT AND MANAGEMENT

Emerald Bioenergy Capital Improvement Project

Renergy, Inc. – Cardington, Ohio

Reviewed design documentation and Permit to Install application.

P&ID Development for Cooling Water System

Steel Mill - Ghent, Kentucky

Conducted field inspection and data gathering of a non-contact cooling water system for a steel mill and developed current P&IDs of the system.

Steel Coil Quench Water Cooling System Upgrade

Steel Mill, East Chicago, IN.

Performed an evaluation of cooling water upgrades for a 25,000 gpm quench water system at a steel coil Continuous Annealing Line (CAL). The existing system required the input of approximately 5,000 gpm of recycled industrial water for cooling resulting in the deposition of oil and grease (O&G) in the system. The evaluation included a review of system flows and temperatures (a water and heat balance); calculation of the design heat load based on current and potential future production levels; comparison of cooling options and recommendation for a closed-loop cooling system, including process flow diagrams, technical advantages/disadvantages, operation and maintenance requirements, personnel requirements, and cost estimate for each option; and preparation of design drawings, specifications, and bid documents.

Steel Coil Laminar Cooling Water (LCW) System Evaluation

Steel Mill, Ghent, KY.

Performed an evaluation of cooling water upgrades for an 18,000 gpm laminar cooling water system at a CSP steel mill. Under existing production levels, the LCW cooling towers were unable to provide sufficient cooling during the summer months, resulting in the need to restrict production rates to reduce the heat load to the LCW system. Additionally, modifications to production facilities upstream of the LCW system were expected to provide a 20% increase in production levels. The evaluation included a review of system flows and temperatures (a water and heat balance), review of system performance, calculation of the design heat load for current and proposed production levels, and recommendations for system modifications to improve performance. Recommendations included the installation of additional pumps and control valves to balance system flows, reconfiguration of hotwell and coldwell to prevent the bleed-over of hot water to the coldwell and improve efficiency of cooling towers, and the installation of additional cooling tower capacity.

Industrial Water (IW) Usage Reduction Evaluation

Steel Mill, Fairfield, AL.

Conducted an evaluation of selected water usage reduction opportunities within a Hot Strip Mill (HSM), Pickling Line, Cold Reduction Mill, Dualine, and Galvanizing Line. The evaluation was conducted to provide plant personnel with an identification of system inefficiencies and opportunities for water reuse. Identified reduction opportunities included potential IW usage reductions of 1.73 MGD out of a total IW usage of 6.8 MGD (or an approximately 25% reduction); including the replacement of selected single-pass IW cooling systems with closed-loop cooling water systems, substitution of recycled water for IW in selected processes, and the reconfiguration of selection water systems to prevent unnecessary system overflows.

**Hot Strip Mill Non-Contact Cooling Water System Evaluation
Steel Mill, East Chicago, IN.**

Performed an evaluation of the feasibility and costs of installing a closed-loop cooling water system for eighty-seven non-contact cooling components located throughout an 80-Inch Hot Strip Mill (HSM) to include heat exchangers for oil cooling, heat exchangers for a chiller system, heat exchangers for the cooling of air circulated through roughing and finishing mill motor rooms, and numerous production control and monitoring instruments. These components were currently cooled using recycled industrial water; however, high concentrations of oil and grease (O&G), suspended solids and other contaminants reduced the capability of the cooling equipment to provide adequate cooling resulting in component failures. The evaluation considered the installation of a closed-loop cooling water system that would tie all components into a single recirculation loop. Based on the review of system components, the calculated design flow for the system was 8,850 gpm with an associated heat load of 43 MMBtu/hr.

**Boiler Feed Water Treatment System
Citgo Refinery – Lemont, Illinois**

Project engineer for the preparation of construction drawings and specifications for a 400 gpm boiler feed water system. System included strainers, steam heat exchanger, three ceramic membrane filter skids, four water softener units, four reverse osmosis skids, compressed air system, chemical treatment pumps and storage tanks, water and brine storage tanks, required piping/mechanical systems, and building with HVAC system.

**Dirty Industrial Wastewater Treatment System
ArcelorMittal – East Chicago, Indiana**

Project engineer for design of a wastewater treatment system to remove solids and fats, oils, and grease (FOG) from recycled process water for steel manufacturing operations. System consisted of a circular clarifier, equalization tank with rope skimmer, flash mix tank, dissolved air flotation units, pumping systems, chemical feed systems, FOG and solids handling systems, instrumentation and control, and HVAC.

**#3 & #4 Blast Furnace Recycle System Evaluation
ArcelorMittal – East Chicago, Indiana**

Project engineer for evaluation of a process water recycle system for blast furnace scrubber water and Sinter Plant operations. Scope consisted of confirming the accuracy of existing flow meters, identifying sources of influent water to the recycle system loop, evaluation of discharges from the recycle system loop, and developing a preliminary water balance.

**Oil & Grease Removal Evaluation, No. 3 Hot Strip Mill WWTP
ArcelorMittal – East Chicago, Indiana**

Project engineer for evaluating methods to improve oil & grease removal and collection at an existing wastewater treatment plant. Recommendation included a multi-stage approach for modifying an existing 75-foot diameter clarifier and its oil & grease handling systems.

**Wastewater Treatment and Fuel Management System Upgrades
Rail Yard, Memphis, TN.**

Provided construction oversight for the upgrade the wastewater treatment system at a rail yard facility. Wastewater treatment upgrades included modifications to sewer piping and retention ponds and the installation of a biocide system within the wastewater treatment plant.

Waste Water Treatment Plant Design

Food Processing Plant, Tupelo, MS

Project Engineer for the preparation of construction drawings and specifications for a \$1.1 million WWTP to treat industrial waste water from a food processing facility. Design included equalization tank, rotary screen, dissolved air floatation (DAF) and pH adjustment. Principal removal constituents included FOG and BOD.

Waste Water Evaluation

Food Processing Plant, New London, WI

Project manager for assessment of the impacts of industrial process modifications to wastewater chloride effluent concentrations for a food processing facility. Prepared summary report of impacts and potential chloride reduction strategies towards compliance with future NPDES permit requirements.

Storm Water Treatment System Upgrades

Rail Yard/Dock Facility, Conneaut, OH

Project Engineer for the design of a \$3 million, storm water retention and treatment system upgrade at a rail yard facility. Upgrades included modifications to sewer piping, retention ponds, pumping stations, and the installation of a pH adjustment system within the wastewater treatment plant.

Waste Water Evaluation

Agricultural Facility, Ames, IA

Project Manager for an assessment of Total Suspended Solids (TSS) treatment technologies for waste water discharged from a USDA animal confinement facility. Waste water flow and TSS loading were evaluated. Solids removal technologies reviewed included a clarifier and dissolved air floatation (DAF). Prepared summary report of estimated waste water TSS loading, solids removal alternatives and associated costs, and recommendations.

REMEDICATION

Illinois Site Remediation Program

Planned and supervised environmental investigations for numerous commercial-industrial and residential properties enrolled within the Illinois Environmental Protection Agency's (IEPA's) Site Remediation Program (SRP). Prepared and submitted all necessary reporting (Site Investigation, Remedial Objectives, Remedial Action and Remedial Action Completion Reports) towards achieving a "No Further Remediation (NFR)" status for the sites.

Remediation of Proposed Home Depot Development

Home Depot, Chicago, IL

Planned and supervised the subsurface investigation and remediation of a five (5) acre former manufacturing facility. The site was redeveloped as a Home Depot retail outlet. Issues identified at the site included PNA and chlorinated solvent contaminated soils. A Tier II analysis was prepared for site specific soil saturation limits, soil inhalation remedial objectives and migration to groundwater remedial objectives. Remediation included the demolition of existing site structures, removal of free product soils and the emplacement of engineered barriers. Engineered barriers consisted of three (3) feet of clean fill, asphalt parking areas and the building foundations. Prepared and submitted Site Investigation, Remedial Objectives Report, Remedial Action Plan and Remedial Action Completion Report to the Illinois Environmental Protection Agency.

Soil COC Risk Assessment

Homewood, GA

Calculated risk based cleanup objectives for identified soil COCs at a former wood treatment facility. COCs consisted of arsenic, chromium, and copper. Remedial objectives were determined utilizing USEPA's Soil Screening Equations and Risk Based Corrective Action Equations. Evaluated off-site impact of COCs to adjacent wetlands.

Remediation and Closure of Former MGP Site

Chicago, IL

Planned and supervised the subsurface investigation of a one (1) acre former manufactured gas plant (MGP) site. Prepared and submitted Site Characterization Report, Remedial Objectives Report, Remedial Action Plan and Remedial Action Completion Report to the Illinois Environmental Protection Agency. The RAP called for the emplacement of engineered barriers to include: three (3) feet of clean fill, asphalt parking areas and the building foundations. Supervised the removal of 7,500 tons of impacted soils and the emplacement of 5,500 tons of clean fill. Site development consisted of residential multi-family homes.

Environmental Assessment of Brownfields Site

Chicago Rail Link, L.L.C., Chicago, IL

Project Engineer responsible for evaluation of remedial options and associated costs for the former Wisconsin Steel Works site in Chicago. Work included review of USEPA, IEPA and USEDPA documents related to historical use of the site, remedial action performed to date, and the regulatory status. Information developed was utilized to evaluate the feasibility of future development of the site as an intermodal facility

SRP Closure of Rail & Truck Distribution Facility

Aurora, IL

Prepared and submitted Site Investigation Report, Remedial Objectives Report and Remedial Action Plan to Illinois Environmental Protection Agency (IEPA) for a 15-acre rail and truck distribution facility for wood products. Contaminants of Concern (COCs) identified in soil and groundwater consisted of volatile organic compounds (VOCs) associated chlorinated solvents. A review of environmental reports submitted to the IEPA for the northern-abutting property indicated that their facility had historically used and stored chlorinated solvents and that they were the likely source of the soil and groundwater contamination. Based upon STS's findings, the IEPA approved the use of an "area background" concentration as the remedial objective for groundwater contamination. Substantial cost savings were achieved for the client by eliminating any requirement to remediate the Site; the client's liability associated with the off-site migration of chlorinated solvents was also substantially reduced.

Indiana Voluntary Action Program

Southbend, IN

Prepared and submitted Remedial Action Workplan (RAW) to Indiana Department of Environmental Management (IDEM) for 8 – 9 acres sealants and adhesives manufacturing facility in South Bend, Indiana. Contaminants of Concern (COCs) identified in soil and groundwater consisted of volatile organic compounds (VOCs) associated with petroleum-based paint solvents; specific compounds that had been identified included toluene, xylenes, ethylbenzene, naphthalene, methyl ethyl ketone (MEK), and methyl isobutyl ketone (MIBK). Primary source areas that had been identified as contributing to groundwater contamination were a former AST farm, former underground product tanks, and former underground petroleum storage tanks. The groundwater COCs consist of both dissolved and free-phase product. The site was enrolled in the Voluntary Action Program by previous consultants and remediation at the site had included an air sparging/soil vapor extraction system. The RAW proposed a Bioslurp system within the source areas and limited dual-phase vacuum extraction within off-site wells.

**Plating Facility Remediation
Rockford, IL**

Planned and supervised the subsurface investigation and proposed remediation of a three (3) acre plating facility. Soil COCs included polynuclear aromatic hydrocarbons (PNAs), chlorinated solvents and Resource Conservation and Recovery Act (RCRA) metals. Groundwater COCs consisted of trichloroethane (TCA), tetrachlorethene (PCE), cadmium and hexavalent chromium. The site was adjacent to a creek and groundwater contamination was present within shallow fractured limestone bedrock. Proposals for remediation included the excavation and removal of hazardous cadmium soils and chromium source soils, installation of engineered barriers, and in-situ treatment of groundwater to remove/reduce hexavalent chromium. Prepared and submitted Site Investigation Workplan and Site Investigation Report to the IEPA.

**Remediation and SRP Closure of Industrial Property
Addison, IL**

Planned and supervised the subsurface investigation and remediation of a three (3) acre aerosol spray can filling operations facility. Soil and groundwater COCs identified during Phase II subsurface assessments included chlorinated solvent and PNAs. The site was enrolled in the IEPA's Site Remediation Program as part of the property transaction. Remediation at the site included the excavation and thermal treatment (steam stripping) of approximately 1,400 cubic yards of hazardous (land-ban) soil; excavation and off-site disposal of 400 cubic yards of special waste soils; installation of a soil vapor extraction (SVE) system to address residual contaminants in soil; installation of a groundwater recovery trench with an associated air stripper. Reports prepared and submitted to the IEPA included site investigation workplans, Site Investigation Report, Remedial Action Plan, and Remedial Action Completion Report.

**Remediation and SRP Closure of Former Industrial Property
Chicago, IL**

Planned and supervised the subsurface investigation of a two (2) acre parcel in downtown Chicago, south of the loop. Former property uses had included a printing facility and bus repair facility. Issues identified at the site include USTs, elevated lead and PNAs in soil and groundwater. Site development consisted primarily of residential housing. Final remediation consisted of the installation of engineered barriers (foundations and parking surfaces), limited soil removal (within landscaping areas), and groundwater modeling (with associated notifications to downgradient property owners). Reports prepared and submitted to the IEPA included site investigation workplans, Site Investigation Report

**Litigation Support
Honeywell, Inc., Waltham, MA**

Provided litigation support services to defendant company alleged to have contributed to groundwater contamination at a former semi-conductor manufacturing facility. Responsible for the reconstruction and evaluation of historical operations. Evaluated the potential for historical operations to have contributed to VOC contamination in groundwater and soil. Prepared interrogatories and assisted in the development of expert statements used in the defense of the client.

LUST CLOSURES

Illinois LUST Closures - Chicago Area

Obtained IEPA regulatory closure for multiple LUST sites in the Chicago area. Supervised the excavation of petroleum contaminated soils, post excavation sampling, and the installation of groundwater monitoring wells as necessary. Provided data analysis and reporting to include: Tier 1 and Tier 2 analysis of soil contaminant concentrations; groundwater (fate and transport modeling); and preparation and submittal of 20-Day, 45-Day and Corrective Action Completion Reports.

Upgrade of Jet-A USTs

City of Chicago DOA, Midway Airport, IL

Supervised a \$360,000 upgrade of seventeen (17) 30,000-gallon Jet-A USTs located within five (5) separate fuel farms at Midway Airport. USTs were upgraded to meet the 1998 OSFM regulations. Upgrades included the installation of cathodic protection, inventory/leak detection probes, pipe leak detection systems, and overfill & spill protection devices.

UST Removals & AST Installations

City of Chicago DOA, Midway Airport & Meigs Field, IL

Prepared construction drawings and specifications for the removal of twenty-five (25) USTs from a total of ten (10) sites and the installation of three (3) ASTs at Chicago Midway Airport and Meigs Field. Provided construction and environmental oversight. Prepared associated 45-Day reports and Workplans for five (5) UST removal sites. Total cost of project was \$310,000.

Excavation of Petroleum Contaminated Soil

Northern Trust, Hinsdale, IL

Supervised the excavation of 6,500 tons of TPH contaminated soil from a LUST site. Approximately 60-70% of the 107' x 70' site was excavated to a depth of 15 feet. Site soils were removed as special waste. The site was redeveloped for commercial use.

MISCELLANEOUS

Design of Aboveground Storage Tank System

City of Chicago DOA, O'Hare Airport, IL

Designed a \$2.1 million Runway Deicing Fluid Storage Facility consisting of four (4) 100,000 gal. ASTs, six (6) unloading and delivery pumps, associated valves and piping, automated pump and valve control system, and automated inventory management system. Prepared construction drawings and specifications for the installation of the planned facility and the removal of the existing UST system.

Truck Loading Dock Upgrade

Pepsi – Toledo, OH

Project Engineer responsible for preparation of construction drawings and specifications for installation of overhead doors and associated loading docks for Pepsi bottling facility.

EMPLOYMENT HISTORY

Owner & Principal; Adams & Christensen Engineering, Inc. – Batavia, IL
Senior Project Engineer - Aether DBS/Hard Hat Services – Naperville, IL
Senior Project Engineer; STS Consultants, Ltd. – Vernon Hills, IL
Senior Staff Engineer; GaiaTech, Inc., Chicago, IL
Staff Engineer; Environmental Science & Engineering, Chicago, IL
Staff Engineer; GEI Consultants, Inc., Chicago, IL
Commissioned Officer, US Army

EDUCATION

Bachelor of Science in Industrial Engineering – Iowa State University, Ames, IA
Masters of Science in Environmental Engineering – University of Iowa, Iowa City, IA