ANAEROBIC DIGESTION

Concept to completion, renewable bio-energy expertise

Anaerobic digestion (AD) is one of Black & Veatch's key strengths: whether mesophilic, thermophilic, wet or dry, high-rate or traditional, batch or continuous process, stepped or separated (hydrolysis, fermentation, methanogenesis) or in-one-vessel digestion, we have done it all.

For further information please contact:

ANNELLE BUCHANAN  
PROCESS & PROPOSALS ENGINEER  
Grosvenor House, 69 London Road, Redhill, Surrey, RH1 1LQ  
+44 (0) 1737-856-574  
BuchananA@bv.com

RICHARD BOUD  
RENEWABLE ENERGY BUSINESS DEVELOPMENT MANAGER  
Grosvenor House, 69 London Road, Redhill, Surrey, RH1 1LQ  
+44 (0) 1737-856-277  
BoudR@bv.com
DAVYHULME WWTW SEWAGE SLUDGE PROCESS PLANT IMPROVEMENTS AND ADDITIONS | United Utilities

United Utilities sludge treatment scheme at Davyhulme Wastewater Treatment Works (WwTW) in Manchester is a 121,000 tonnes dry solids / annum (tDS/a) enhanced sludge treatment plant—one of the largest design-and-build thermal heat and power projects completed in the world.

The five 2.4MWe biogas fired CHP engines with heat recovery, enable the boilers system to generate 26 tonnes of steam per hour.

The purpose of the project was to increase the capacity and improve the quality of treated sludge by providing a central sludge processing facility comprising a pre-treatment process upstream of the existing mesophilic anaerobic digesters.

Black and Veatch provided Engineer, Procure and Construct services for the project, as well as Project Management expertise, process design, MEICA design, civil design, asset optimisation, operational efficiency, operator training, HAZOP and HAZCON services.

Our scope of works included:
- New Thermal Hydrolysis Streams
- New imported cake facility
- Modifications to existing AD tanks
- New biogas holders and biogas clean-up plant
- New steam plant
- New CHP plant (12MWe)
- New digested sludge storage
- Existing HV electrical infrastructure modifications

During construction the existing digesters were retained in service to ensure the Clients overall ROC and energy generation targets were met. The HpH is AWS’ patented biological pre-treatment process, to ensure the sludge product meets the enhance treated standard (Class A) and to increase gas production in the downstream digesters.

Black & Veatch, working with partners under AMP5 special Projects biosolids framework, developed the process from concept, through procurement, to commissioning, training and handover to operations.

The design was done using 3D modelling and intelligent P&ID’s, allowing the transfer of information at the end of the project to the Client’s Asset Management Database.
PROJECT DEVELOPMENT

CHP AT FOOD MANUFACTURING SITE | InSource Energy (CTEL) |
Black & Veatch was appointed to undertake the design development of a biogas plant to treat the food waste arising at a ready meal factory site using anaerobic digestion technology. The plan design involved the segregation of food waste from packaging, pasteurisation and anaerobic digestion of the organic fraction and dewatering of the digestate to allow it to be used as a fertiliser.

The biogas was to be used in a CHP engine and the generated heat and power was supplied to the main factory. Black & Veatch was responsible for the development of the scheme, up to the preparation of enquiry documentation for the EPC contract, for the design and construction of the project.

ANAEROBIC DIGESTION CHP | Carbon Trust Enterprises (CTEL) |
InSource Energy was created to develop, deliver and operate onsite integrated waste disposal and energy supply projects for medium and large sized food manufacturers. Typical projects involve anaerobic digestion (AD) plant linked to gas-engine CHP plant, or combustion plant using waste biomass to provide steam.

Black & Veatch provided all the technical input to support the development of the business.

Our tasks included:
- Review of organic waste availability in the UK
- Review the current and emerging technology options for AD of food waste
- Development of a generic techno-economic model for a range of food wastes that calculates the potential biogas yields for any composition of waste flows
- Provide technical support in securing funding from private investors

Black & Veatch assisted in the initial screening to evaluate the site potential; more than 20 food manufacturing sites were screened. Prefeasibility studies were carried out on selected sites and, for approved projects, a full feasibility study was completed.

TESTIMONIAL

“Black & Veatch has consistently demonstrated a sound knowledge of the engineering and programme issues and a thorough understanding of the areas of health, safety and the environment. Black & Veatch has proven to be an effective and committed technical partner who has helped InSource Energy deliver value to our clients”

Justin Strutt | InSource Energy Limited

TECHNICAL DUE DILIGENCE

MSW/FOOD WASTE AUTOCLAVING PRIOR TO ANAEROBIC DIGESTION | Bridges Venture |
The aim of the project was to assess the improvement in the waste properties and biogas yield for autoclaved MSW and/or food waste; study the technical and economic viability of implementing an autoclave system; as a pre-treatment to AD plants; and review the market potential for the autoclave system and the potential scaling-up risks.

Black & Veatch’s scope of work included:
- Auditing the laboratory work performed by the autoclave company for both autoclaved and un-autoclaved material
- Reviewing the technical performance of each step and the assumptions and calculations involved
- Cost benefit analysis
- Reviewing the potential technical and commercial risks and benefits of scaling up from the existing demonstration plant
- Bridges Ventures and the Carbon Trust invested in AeroThermal. The money will be used to build a full-scale advanced anaerobic digestion system

TROWBRIDGE STW | GAS TO GRID |

Thames Water |
Black & Veatch’s role in the UK’s first biogas upgrading plant for grid injection was to verify the design and to represent the Client’s interests.

Our scope of work included:
- Verifying the sub-contractor’s design
- Project managing the project’s progress
- Managing the commissioning phase

The project comprised upgrading 100 m³/hr of biogas generated from sewage sludge AD, to produce approximately 60 m³/hr of biomethane for injecting into the gas grid.

Our scope of work included:
- Outline biomethane gas specification
- Overview of contaminants and problems these may cause
- Budgetary Capex and Opex for biogas upgrading and BTG plants
- Liaise with local gas operators to study grid capacity
- Identification and assessment of further treatment required of the out of specification gas

BIOGAS UPGRADING | DIDCOT STW |

Wessex Water Services |
Black & Veatch was appointed to provide technical consultancy for a 420 m³/hr biogas upgrading plant at Trowbridge STW. 120 m³/hr of the biogas produced from sewage sludge AD is to be diverted to a new biogas boiler for digestion heat, with the remainder (300 m³/hr) to be upgraded for injection into the gas grid.

Our scope of work included:
- Further treatment required of the out of specification gas

Davyhulme | Under Construction
FEASIBILITY STUDIES
ENERGY RECOVERY FROM ORGANIC RESIDUALS - TENDER REVIEW & FEASIBILITY STUDY | Confidential Client | UK |
The client gathered proposals from technology providers for energy recovery solutions to process mixed organic waste arising at their premises with the goal of diverting waste from landfill and generating energy for local usage.

Black & Veatch’s scope included:
- Review client’s data and propose a suitable solution and strategy to maximise the energy recovery from the organic residuals
- Review tenders received, assess the potential of the technology providers, their track record and capabilities.
- Review capital and operational costs and revenues for each tender
- Proposed estimate of the potential capital and operational costs, revenues, financial and carbon savings for the project
- Provide position statements on planning and permitting plus recommendations for project development and implementation

Black & Veatch found that the optimal solution was the preparation and conditioning of the waste stream in order to extract the organic fraction to be treated in an anaerobic digestion process.

FEEDSTOCK STUDIES
RESEARCH & ASSESSMENT OF FEEDSTOCKS USED BY AD | Ofgem |
Black & Veatch was commissioned by the Office of Gas and Electricity Markets (Ofgem) to carry out Research and assessment of feedstock used by anaerobic digestion (AD) and gasification/pyrolysis (ACT) electricity generating stations.

The scope of work included:
- To define default moisture content values of common feedstock or group of feedstocks, to be used by operators of AD and ACT generating stations, as part of their fuel measurement and sampling (FMS) reporting procedures, to meet the incoming reporting changes with respect to biomass sustainability
- Provide information on typical AD operations with respect to the use of crops as feedstock

TECHNICAL ASSISTANCE
TROUBLE-SHOOTING - 5 AD FACILITIES | JFS & Associates |
JFS & Associates contracted Black & Veatch to assist with independent engineering advice to investigate and recommend solutions for operational problems in five of their digestion facilities in the UK.

The recommendations from the assessment enabled JFS to take action to improve their plants’ gas production and operational stability.

SUPPLY CHAIN ASSESSMENT
ANAEROBIC DIGESTION FOR THE UK | National Non-Food Crops Centre |
Black & Veatch was commissioned by the National Non-Food Crops Centre to carry out a UK-wide assessment of the potential of anaerobic digestion with the aim of seeking optimal ways to develop the AD sector in the UK.

The feasibility study included a review of:
- Current AD activity
- Feedstock suitability and availability
- Digestion technology processes
- Upgrading technology processes and biogas uses
- Optimal AD technology, given feedstock and biogas usage
- Optimal locations for AD plants in the UK

Black & Veatch presented their findings to stakeholders to understand their willingness to implement biogas plants, the constraints they face in their corresponding sectors and recommendations they might make for the promotion of AD plants.

BUILDING A WORLD OF DIFFERENCE®
Black & Veatch is an employee-owned, global leader in building critical human infrastructure in Energy, Water, Telecommunications and Government Services. Since 1915, we have helped our clients improve the lives of people in over 100 countries through consulting, engineering, construction, operations and program management. Our revenues in 2015 were US $3 billion. Follow us on www.bv.com and in social media.

BLACK & VEATCH
For further information please contact:

ANNELLE BUCHANAN | PROCESS & PROPOSALS ENGINEER
Grosvenor House, 69 London Road, Redhill, Surrey, RH1 1LQ
T +44 (0) 1737-856-574 | E BuchananA@bv.com

RICHARD BOUD | RENEWABLE ENERGY BUSINESS DEVELOPMENT MANAGER
Grosvenor House, 69 London Road, Redhill, Surrey, RH1 1LQ
T +44 (0) 1737-856-277 | E BoudR@bv.com

© Black & Veatch Corporation, 2016. All Rights Reserved. The Black & Veatch name and logo are registered trademarks of Black & Veatch Holding Company. REV 2016-4-1.0.1