ANAEROBIC DIGESTION AND BIOGAS
CAPABILITY STATEMENT
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ANAEROBIC DIGESTION AND BIOGAS

Anaerobic Digestion (AD) of organic waste to produce biogas has many environmental benefits. With AD a flexible, renewable and storable fuel is generated, and greenhouse gas emissions are reduced. Also, nutrients from waste material can be reused as an agricultural fertiliser.

AD is a process that is suitable for utilisation of many different types of residues such as agricultural, municipal and industrial organic waste and WWTP sludge.

Ramboll offers a multi-disciplinary approach to dealing with all aspects of biogas production. We provide services to a wide range of clients, including biogas producers, sewage treatment companies, waste management companies, regional/local governments, central government, project developers, investors and banks.

**AD technology**
Ramboll has extensive experience in the field of biogas. We have a large technical resource consisting of dedicated engineers combining considerable experience in AD processes as well as biogas treatment.

Our experience covers many types of AD processes; mesophilic and thermophilic, wet and dry, various types of digesters and retention time. We also have experience within minimisation of ventilation requirements and zero discharge of waste water.

Within biogas utilisation we are highly experienced in many types of solutions including CHP, upgrading and injection into gas grids, CNG, LNG and filling stations applications.

**Substrates**
Ramboll has experience in a great variety of biomass and substrates in AD plants: Manure (cattle, pig, poultry, fur animals etc.), agricultural waste, energy crops, straw, industrial waste from slaughterhouse and dairies, fish-, potato-, pharmaceutical- and vegetable industry, waste water sludge, household waste (bio-pulp), green garden waste, sea weed and other similar types of organic material.

**Project development**
Based on factors such as appropriate biomass availability, end use of digestate, biogas yield and the most favourable use of the biogas, the feasibility of a project is assessed. We assess the area required for the

**SELECTED PROJECT REFERENCES**

- **Nature Energy (4 projects), Denmark,**
  Total: 1.2 million tonnes/year of manure and various biomass, 40 MNm³ bio-methane/year
- **Energigjenvinningsetaten, Norway,**
  50,000 tonnes/year of food waste, 4.0Mm³ biogas/year
- **Deep Tunnel Sewage System, Singapore,**
  73,000 tonnes/year of food waste, 7.3Mm³ biogas/year
- **Maabjerg Bioenergy, Denmark,**
  650,000 tonnes/year of manure and various biomass, 20.0MNm³ biogas/year
- **Novozymes, Denmark,**
  4.3Mm³/year industrial waste water, 7.9Mm³ biogas/year
- **Stockholm Vatten och Avfall, Sweden,**
  150,000 tonnes/year of household waste, 75,000 tonnes of food and restaurant waste, 8.0MNm³ biogas/year
- **Brocklesby, United Kingdom,**
  Technical Due Diligence of facility processing 55,000 tpa food waste producing 1000 Nm³/h of biogas.
WHY CHOOSE RAMBOLL FOR YOUR PROJECT?

Ramboll has broad knowledge and employees with more than 30 years’ experience within biogas.

Ramboll has been deeply involved in the implementation of most of the recent large-scale plants in Scandinavia and in development of plants in the UK and in the Netherlands. In Denmark Ramboll’s references include some of the largest biogas plants in the world. These AD projects alone utilise a total of 1.9 million tonnes of biomass per annum and produce 40 million Nm$^3$/yr of upgraded biomethane utilised e.g. as fuel for transport and 28 million Nm$^3$/yr biogas utilised for CHP.

Our references furthermore includes various biogas projects in Southeast Asia and North America.

Ramboll has acted as EPC Manager for the establishment of one of the largest manure based AD facilities in the world.

OUTLINE DESIGN/FEASIBILITY
- R&D contribution
- Feasibility studies
- Due diligence
- Risk assessment
- Environmental Impact Assessment (EIA)
- Budgeting and time scheduling
- Permitting

BASIC DESIGN
- Conceptual and tender design for anaerobic digestion process and gas utilisation, including CHP and biogas upgrading
- Civil and structural design for tanks, access, buildings etc.

POST CONSTRUCTION
- Follow-up on operations and maintenance (O&M)
- Trouble shooting
- Optimisation

TEST & COMMISSIONING
- Acting on behalf of the client/developer during testing, commissioning and handing over of the project

MANUFACTURING & CONSTRUCTION
- Design review
- Construction management and supervision
- Installation supervision

OUTLINE DESIGN/FEASIBILITY
Ramboll can provide our clients with a full range of services for AD throughout all phases of the project – from idea to reality and from planning and project development to design, implementation and follow-up on operation and maintenance - based on our comprehensive experience from AD projects all over the world. Our services include:

SUPPORT AND CONSULTANCY SERVICES
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