



## FACTSHEET 8: Introduction to Anaerobic Digestion

### Introduction

Anaerobic Digestion is a natural process whereby organic material can be reduced in the absence of oxygen to a natural gas composed mainly of methane and to a lesser extent carbon dioxide. AD is a value adding flexible multi-purpose process, that yields both energy and organic fertiliser from the same raw material.

### 1. The Fuel

Anaerobic Digestion systems can have a variety of feedstocks including crops and natural vegetation (grass, maize, wood, etc), raw products before harvesting ( Fruit, grains, vegetables, straw, leaves ,forest residues, etc), processed and manufactured products (Dairy and meat production, canning etc.), and farm slurries. AD could be vital for local authorities who are responsible for the disposal of household waste, 60% of which is organic and could be used as a feedstock. The anaerobic digestion process creates gas, which can be used to create heat, electricity and vehicle fuel. The bi-products of the process are organic fertiliser, fibre board materials, a form of CO<sub>2</sub> with a variety of commercial uses, and heat which can be used in local buildings.



### 2. The Technology

Anaerobic Digestion technologies exist on all scales: for small, medium and large scale operations. Whether this be a wheelbarrow sized digester to a large community power plant the technology exists and in some instances is well established with over 25 years of research and development.

Inorganic material such as plastics, glass and metals are removed from the feedstock, as are large particles and objects such as stones etc, through a screening process. The organic material is placed in

a sealed tank, in an oxygen free environment at an elevated temperature of between 20 and 60 degrees centigrade. The organic material is then broken down and digested by naturally occurring bacteria. This process releases bio-gas; a methane rich gas which can be used for onsite energy production, to power machinery or for heating.



### 3. Transport Fuel

The anaerobic digestion process can be used to produce vehicle fuel, as demonstrated by Organic Power's Mercedes EcoVitos. The car's exhaust emissions have been previously measured and found to be 0.02% carbon monoxide (3.5% is allowed) and 123 ppm particulates (against 1,200 ppm allowed) The car is a demonstration of how organic waste can be used to power clean, quiet and renewable vehicles. Capturing the methane which would otherwise be emitted from decomposing organic materials and preventing this from becoming a greenhouse gas which is 21 times worse than carbon dioxide in terms of climate change is actually improving the environment. Currently gas is already being captured from the Anaerobic Digestion process at some land-fill sites and sewage works where it is used to power machinery and produce electricity for the national grid. Energy is more than electricity. Over one third of the world's energy requirement is for transport, and natural gas is quietly establishing itself as the cleanest fuel.

In a recently presented report from the Swedish Committee of Alternative Fuel; biogas was acknowledged as the best alternative fuel today, as regards climate change, environment and health – low emis-



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sions and no net contribution to the greenhouse effect.

### 4. Environmental Issues

As Anaerobic Digestion is considered as a waste treatment process the Environment Agency must be consulted at all times as it could require a waste management licence or an Integrated Pollution Prevention and Control permit. The site may also require water for cooling which may well require an abstraction licence, and if water is returned to the environment then consent to discharge may also be required. Off site disposal such as returning residual material to land will require either a Waste Management Licence or an Exemption (usually para 7).

Most sites considering anaerobic digestion will fall under Integrated Pollution Prevention and Control (IPPC). Section 1 Thermal treatment. A1(b) processes are those with a thermal **input** of more than 3MW, smaller sites will be regulated by the Local Authority. Integrated Pollution Prevention and Control (IPPC) is designed to wrap up all our regulatory inputs into one permit. It relies on the applicant showing the Environment Agency they are using the best available techniques to reduce their environmental impacts. And the EA will follow risk-based conditions so that the EA can reduce the regulatory burden on those sites that are fully compliant with the regulatory framework.

The responsibility for correctly completing the application form is with the applicant. The application is determined by the national Strategic Permitting Group to try and ensure consistency.

Once the application is determined there may be a number of conditions including Emission Limit Values (ELV'S), Self Monitoring / Reporting and Improvement conditions with timescales. Off-site issues of waste regulations, feed stock storage, transport, effluent storage, and land spreading will also be assessed.

For help and advice call the Environment Agency on 08708 506 506 or visit

[www.environment-agency.gov.uk/business/ippc/general](http://www.environment-agency.gov.uk/business/ippc/general)

### 5. Anaerobic Digestion Impacts

Currently we exist within an oil based economy which relies on finite resources. Environmentally we are releasing in a few decades, the quantities of carbon, that took millions of years to be deposited and sealed

underground. Using renewable energy, such as AD, reduces the use of fossil fuels and thus mitigates climate change.

Currently we have an unsustainable waste disposal strategy with huge greenhouse gas emissions. Farming is currently dependant on fossil fuels for transportation, heating and is reliant on nitrogen fertilisers, both of which can be supplied by the AD process. Waste from one source becomes the raw material and energy for others.

Anaerobic Digestion is gaining renewed interest due to the impacts of Landfill Allowances and Trading Schemes and the rise in Landfill taxes and fines for failure to meet targets. European directives are restricting the amount of waste that can be land-filled and organic wastes are eventually to be banned altogether. Planning permission for landfill sites or to build incinerators are becoming extremely difficult, if not impossible, to obtain. The Biomass Task Force recommends a strategic plan for waste as a resource to optimise CO2 savings and renewable energy generation.



Using the Anaerobic Digestion process to produce electricity, heat, vehicle fuel and fertilisers will all help mitigate climate change. It will also provide sustainable income from virtually infinite resources, bringing jobs and income to local and often rural communities. Anaerobic Digestion could be part of a sustainable waste management strategy and provide renewable energy resource.