WASTE AS AN ENERGY RESOURCE

Every time the price of oil peaks, the issue of waste as an energy resource becomes a major preoccupation with governments, businesses and individuals. The pressing need is to escape the impact of potentially crippling increased costs.

There is no doubt that waste biomass streams are commercially attractive. This is, in fact, the case in many situations where the price of oil has already been sufficient to make consideration of alternative fuels a commercially attractive proposition.

Waste can come in many forms suitable for energy recovery. The processing of agricultural products, such as tapioca, palm oil, rice and coconuts leaves significant quantities of solid and liquid effluent which can be processed to produce energy.

Organics offers a broad range of energy-harnessing technologies including anaerobic digestion systems, gasification and pyrolysis.

PRODUCT RANGE

R01 Gasification systems

R02 Anaerobic digester

R03 Waste to energy

R04 GALFAD

R05 Cassava Root AD

R06 Clean Pyrolysis

R07 Clean Pyrolysis K Range

R08 Clean Pyrolysis T Range

R09 Air Free Drying

R10 Palm Oil Mill Effluent AD

R11 Pine Kernell Shells

R12 Coconut Shells

R13 Plastic to Oil

R14 Coal Bed Methane

R15 Coal Mine Methane

ISO 9001 REGISTERED FIRM

PROJECT ROUTE

All projects follow a similar administrative route from initial specification through to handover. Organics has developed a project delivery structure over many years that ensures reliable completion and quality control whilst maintaining specification requirements, and time-schedules.

SPECIFICATION

Establishing a clear statement of the design parameters is the first step in administration of an order. The Order Confirmation provides this statement and is drafted by the engineers of the Operations Department who will be responsible for the build.

DESIGN

Each manufacturing project is designed as a one-off project ensuring that details are fully addressed. Detailed manufacturing drawings are produced for all projects.

PROCUREMENT

The Procurement function takes full responsibility for maintaining delivery schedules. Their remit is from drawings and component specification through to all parts ready for final fit-out and commissioning.

MANUFACTURE

Manufacture may either be completed to “good engineering practice” or, where specifically requested, under the supervision of a Third Party Inspector, such as Lloyds. All welders are coded and manufacturing quality is high.

FIT-OUT AND INSTALLATION

Fit-out may occur in our factory or on site, for larger installations. Fit-out work is completed by suitably qualified personnel, under the supervision of an Operations Department engineer.

COMMISSION AND HANDOVER

Commissioning is undertaken on site by the Technical Manager or a member of his staff. Established procedures are followed to ensure that equipment is fully operational at the point of handover.

SERVICE SUPPORT

Following handover, responsibility for equipment support passes to the Service Manager. This support can range from supply of spare parts and advice to regular servicing or complete operational management.

CLEAN PYROLYSIS

Power can be derived from heat in many different ways. Heat travels in many forms. Flames are the most visible form of heat production but heat can be found where flames do not exist. Pyrolysis is the use of heat to break down biomass into its constituent gaseous components in the absence of combustion.

The pyrolysis technology offered by Organics involves the use of heat in the complete absence of air. Without air combustion is not possible. The resultant reactions are therefore clean and complete, leading to a maximisation of power production in the form of Volatile Organic Carbons. These are the re-formed biomass constituent components now present as a gas.

The overall objective of the biomass application is to convert biomass materials, such as waste wood products, woodchips, forestry residues, short rotation coppice, miscanthus and other energy crops and agricultural wastes such as bagasse, coconut husks, waste from palm oil plantations, and organic sludges (sewage and animal slurries), into renewable power (as electricity) and heat. The Clean Pyrolysis system will do this in a highly efficient and environmentally sound manner and, in so doing, will displace a significant fossil fuel requirement.

Using local biomass as a source of fuel for CHP applications provides a sustainable source of energy and is carbon neutral in terms of the recycling of CO2 emissions through the natural biomass growth cycle.

The use of mixed municipal solid waste as a feedstock introduces issues of pyrogas consistency which can best be addressed by use of a steam cycle for power production. This is, however, a very robust technological approach which is tolerant to contaminated/ dirty material feedstocks.

ANAEROBIC DIGESTION

Anaerobic digestion involves the breakdown of organic waste by bacteria in an oxygen-free environment. It is commonly used as a waste treatment process but also produces a methane-rich biogas which can be used to generate heat and/or electricity.

Anaerobic digestion equipment consists, in simple terms, of a anaerobic reactor volume, a gas holder to store the biogas, and a gas-burning engine/generator set, if electricity is to be produced. The organic waste is broken down in the reactor with up to 60% of this waste being converted into biogas; the rate of breakdown depends on the nature of the waste, the reactor design and the operating temperature. Biogas has a calorific value of typically between 50% and 70% that of natural gas and can be combusted directly in modified natural gas boilers or used to run internal combustion engines.

Organics offers a number of anaerobic digestion systems suitable for varying feedstocks and specific operating conditions.

The process of anaerobic digestion (AD) consists of three steps:

The first step is the decomposition (hydrolysis) of plant or animal matter. This step breaks down the organic material to usable-sized molecules such as sugar.

The second step is the conversion of decomposed matter to organic acids.

Finally, the acids are converted to methane gas.

Process temperature affects the rate of digestion and should be maintained in the mesophillic range (30°C to 35°C - 86°F to 95°F). It is possible to operate in the thermophillic range (approx. 55°C - 131°F) but the digestion process at this temperature is subject to relatively easy upset if not closely monitored.

GALFAD

GALFAD™ is an integrated waste disposal system designed to maximise energy recovery from unsorted municipal solid waste. The simple objective is to use appropriate conversion technology for each type of waste.

The system for the commercial implementation of a waste-to-energy strategy is based upon the following process stages:

- Front-end waste separation in wet and dry organics, recyclates and rejects
- Pyrolysis/gasification of the dry waste
- Anaerobic digestion of the wet waste
- Energy generation from product syngas and biogas
- Optional compost production from digestate sludges

The technology involved has been developed and demonstrated in Europe. In each location it will be implemented within the context of the local economy to ensure it remains commercially viable. It is supported by methane-offset Carbon Credits, making it especially commercially attractive in Annex 1 countries of the Kyoto Protocol.

There are many types of organic waste stream produced by both industry and society in general. Such waste may be broadly categorised as both dry and wet waste. Where moisture content is high the energy required to dry the waste may be excessive. In such cases the use of gasification would be inappropriate. Organics offers a range of anaerobic digestion systems for wet wastes. (See datasheet 0DSR02).

The Organics Clean Pyrolysis system (See datasheet 0DSR06) is designed to accept a broad range of organic waste types.This is an essential pre-requisite for systems designed to dispose of Municipal Solid Waste whilst producing energy.

PLASTIC TO OIL

The production of gasoline, kerosene and diesel from waste plastics is an emerging technological solution to the vast amount of plastics that cannot be economically recovered by conventional mechanical recycling operations. Pyrolysis is one established method of reducing plastics and other hydrocarbon waste. If applied correctly, it should allow the recycling of some of the stored energy with the waste plastics.

During pyrolysis the polymeric materials are heated to high temperatures, such that their macro-molecular structures are broken down into smaller molecules, resulting in a wide range of hydrocarbons being formed. These pyrolytic products can be divided into a non-condensable gas fraction, a liquid fraction (consisting of paraffins, olefins, napthenes and aromatics) and solid residues (ie char).

General advantages of pyrolysis include:

- Very low energy consumption
- It can handle plastic wastes, which cannot be efficiently recycled
- It operates without the need of air and at low pressures
- The HCL produced from the pyrolysis of PVC plastics can be recovered and utilised as a raw material
- Since pyrolysis is conducted in a closed system, there are no pollutants
- It permits the recycling of unwashed and soiled plastics
- It enables the recycling of plastics laminates, coextrusions and multilayer packaging films, particularly those with aluminium foil layers that are difficult to recycle using traditional reprocessing technologies

With unsorted, “dirty” plastics forming an increasingly large percentage of waste disposed to landfill, the use of pyrolysis to oil technologies will be of increasing importance.

KEY FEATURES

TURNKEY DESIGN, MANUFACTURE AND INSTALLATION SERVICES AVAILABLE OR COMPONENT SUPPLY ONLY

FINANCE AVAILABLE THROUGH AFFILIATED COMPANIES FOR FINANCE AND OPERATE PROJECTS

OPERATION AND MAINTENANCE SERVICES PROVIDED

A ONE-STOP SOLUTION FOR A COMPLETE SERVICE RELATING TO THE COMBUSTION OF WASTE AND SURPLUS GASES

PROJECT TYPES

GALFAD™
This acronym stands for **GA**sification **L**and**F**ill gas and **A**nerobic **D**igestion. It is a trademarked waste disposal methodolgy, approved by the UNFCCC under the terms of the Kyoto protocol to generate Certified Emission Reductions.

Palm Oil Mill Effluent (POME)
POME is produced by all palm oil mills. It is rich in organic carbon suitable for the production of biogas.

Cassava Root
Similarly, cassava processing facilities produce a liquid effluent which can be used to produce biogas.

Coconut shell
By means of pyrolysis, coconut shell produces an excellent carbon for activation, as well as by-product gases which can be used for energy production.

Pine Kernel Shell (PKS)
Pine kernel shell is often used to produce clean power at palm oil mills. Where this is not possible or not necessary, PKS can also be used to produce activated carbon and energy for power production.

Empty Fruit Bunch (EFB)
After the fruit is removed from a palm fruit bunch, the residual fibre can be used to produce power in a number of ways. Simple burning produces a very dirty plume and is generally not permitted for environmental reasons. Gasification/pyrolysis can take the EFB and produce clean energy.

Organics Group plc
The Barclay Centre
University of Warwick Science Park
Coventry CV4 7EZ,
United Kingdom
T: +44 (0) 24 7669 2141
F: +44 (0) 24 7669 2238
E: comms@organics.com
W: www.organics.com

LIQUID EFFLUENTS

Palm Oil Mill Effluent

At an average, about 0.6 tonne of raw Palm Oil Mill Effluent (POME) is generated for every tonne of fresh fruit bunch (FFB) processed. POME consists of water soluble components of palm fruits as well as suspended materials like palm fibre and oil. Despite its biodegradability, POME cannot be discharged without first being treated because POME is acidic and has a very high biochemical oxygen demand (BOD).

A typical mill rated at 40 tonne per hour of FFB can produce between 1 and 2 MW of electricity from the biogas that can be generated in an anaerobic digester. In certain countries such facilities will also qualify for Certified Emission Reductions (CERs), adding to the overall project viability.

Organics offers a number of anaerobic systems suitable for POME.

Casava Mill Effluent

Cassava processing presents an ideal opportunity for distributed generation, coupling an excellent renewable resource with large heat and electricity loads. Significant energy is required to dry the starch, reducing its moisture content from 70%-80% to 15%-17% for bagging and shipment. Cassava processing produces significant quantities of nutrient-rich waste water. In the absence of a treatment facility, such waste streams are normally treated in an extensive facultative lagoon system occupying many hectares.

The waste water is ideal for the production of biogas. As the initial ponds in a typically vast lagooning system are normally anaerobic, there is also the possibility of generating CERs.

Organics offers technologies for the anaerobic digestion of cassava processing liquid effluent.

SOLID EFFLUENTS

Coconut Shell

Coconut is a majestic perennial palm. It is grown extensively in numerous islands and also in the humid coastal tracts of tropical countries. The coconut-palm, rightly known as the Kalpa vriksha or the `tree of heaven', provides many necessities of life, including food and shelter. One important opportunity is to use the coconut shell as a fuel. With the Organics Clean Pyrolysis this may be achieved without polluting paradise.

Pine kernel shell

As another opportunity for energy production, the kernel shell from the palm oil fruit is available for conversion into energy and activated carbon. Carbonisation and energy recovery may be combined to maximise the

commercial benefit in a clean and environmentally sound manner. With the application of Organics' gasification and pyrolysis technology such processes may be taylored to the specific requirements of each situation.