

Making power from waste

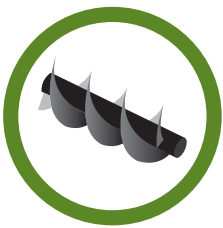
The European Bioenergy
Research Institute Pyroformer™

Background

The UK Government has established aggressive targets for CO₂ levels with reductions of 34% by 2020 and 80% by 2050. Regions across the UK have programmes to reduce CO₂ accordingly, and in some cases have been more aggressive e.g. Birmingham City Council has committed a target of a 60% reduction of CO₂ by 2026.

With this in mind, researchers at the European Bioenergy Research Institute (EBRI) at Aston University have developed an innovative bioenergy solution – a Pyroformer™ – unique in its use of multiple waste feedstocks to generate cost-effective heat and power and reduce the world's reliance on fossil fuels.

How it works



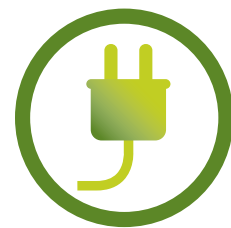
EBRI's patented Pyroformer™ technology uses intermediate pyrolysis to pyrolyse and chemically process waste material in a single step using a dual Archimedes screw system and an externally heated jacket. The reaction temperature for this process is around 450-500°C. The controlled thermal treatment and chemical reforming process produces a vapour stream that is free from particulates and tars and eliminates the need for expensive filtrations systems.



The Pyroformer™ is able to transform organic wastes and residues (biomass) into heat, power and other marketable products. It is able to handle a wide range of feedstocks, including traditionally 'hard to treat' materials such as residues with high water content (up to 40%). The process does not require expensive pre-processing as the technology is able to process pellets and briquettes.



The Pyroformer™ can be directly coupled with a gasifier to produce consistent and high quality gases that increase the efficiency of combined heat and power production. It can be used with a Bio Activated Fuels (BAF) Reactor (an Aston University patented system) to reclaim the oils in plastics to add to the fuel mix. Other by-products can be hydrogen gas, synthetic natural gas, biodiesel and (bio)char.



Uncontaminated char (biochar) has significant market value for use in soil enhancement and carbon sequestration. The char can also be used for co-firing in power stations. The Pyroformer™ offers the potential for carbon negative heat and power generation.

Environmental benefits

- a completely new approach to pyrolysis which increases the efficiency of the process
- a sealed process that has no emissions
- a wide range of waste and residues can be processed such as sewage sludge, husk from rice, wheat, barley, oil pressing cake from rape, soy bean, cocoa butter, olive, sunflower, straw from rape, wheat, rice, miscanthus, wood, algae, corn residue, dried anaerobic residues, meat and bone meal, residues from composting, grass and green clippings, and spent brewers grain and tyres. This means the process is not vulnerable to fluctuations in biomass feedstock prices
- no need for feedstocks to be pre-processed – they can be in any form and size ranging from powder to chips
- the overall process is not just carbon neutral, it is actually carbon negative as up to 25% of carbon can be saved as biochar and sequesters and returned to the soil in the form of fertilizer.

Social benefits

- higher efficiency in the form of more compact energy plants with lower running costs – a 5MW plant can be contained within a 12m² four story high building. This means that the technology could be housed almost anywhere (including city centres)
- the Pyroformer™ is a means of decentralising the generation of electricity
- a dramatic reduction in the amount of material sent to landfill
- reduced waste management costs.

Economic benefits

- in 2009 BIS estimated that the global market for low carbon goods and services was worth around £3 trillion a year and would be worth £4.5 trillion by 2015. The Pyroformer™ has patents in place to place this technology in this global marketplace
- it is anticipated that within the West Midlands alone, 35 jobs will be directly safeguarded or created and over 1,000 indirect jobs created by 2022 as a result. This would see an increase in the turnover of the West Midlands' regional bioenergy industry and will result in an increase in Net Regional GVA of £105 million by the same date
- high quality char outputs and low tar vapour streams which can be linked to other processes such as gasification much more effectively than previous technologies
- the biochar produced can be sold for up to £1000 per tonne.

**Watch the
Pyroformer™
in operation at:**
www.bit.ly/PvRDGw



For further information:

The European Bioenergy
Research Institute

T: 0121 204 4303

E: bioenergy@aston.ac.uk

www.ebri.org.uk

Aston University
Birmingham
B4 7ET