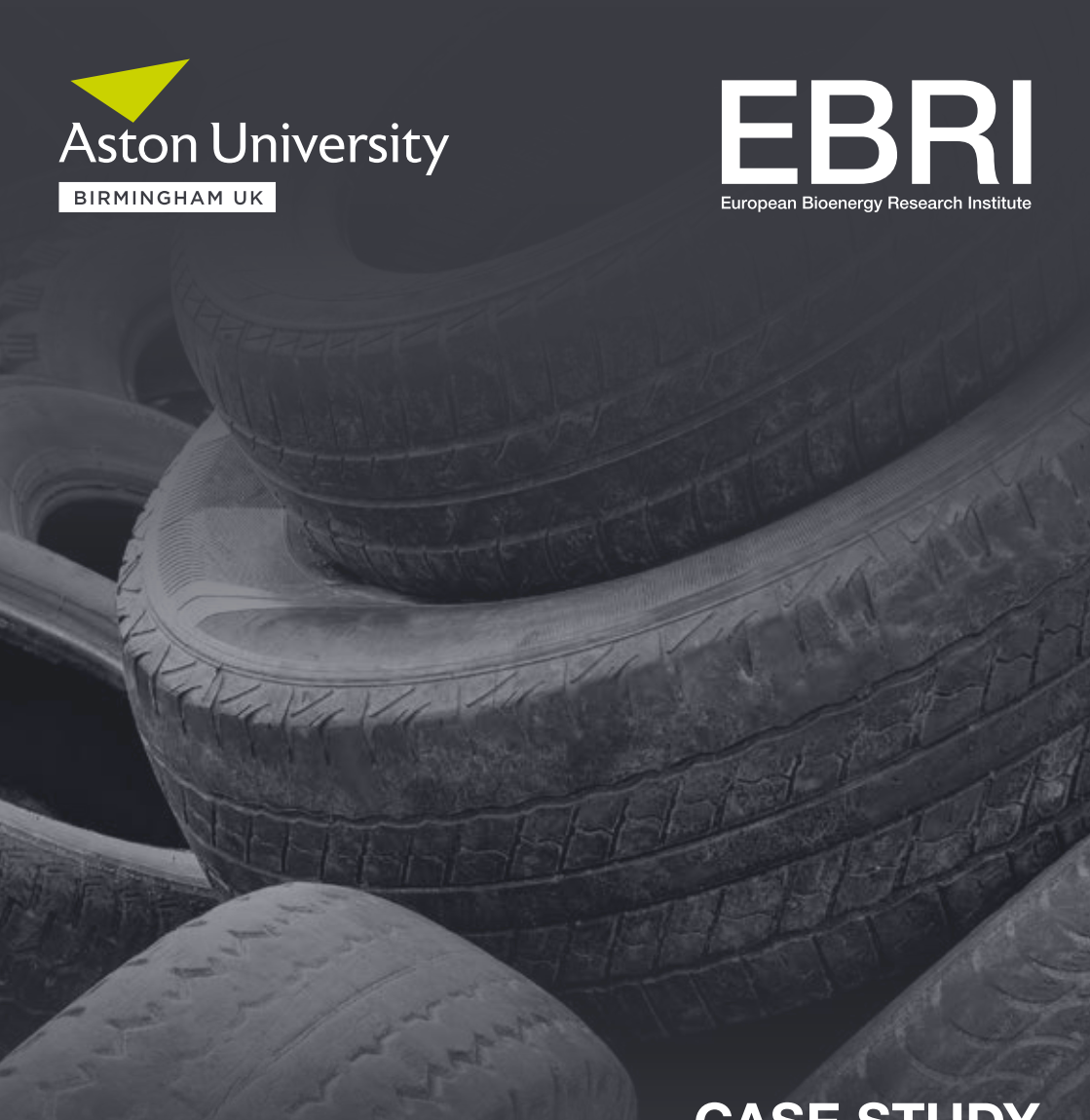
Aston University
BIRMINGHAM UK

EBRI
European Bioenergy Research Institute



CASE STUDY

Practical help for businesses

FuturEnergy

European Union
European Regional Development Fund

EVERY DAY IN THE UK, OVER 100,000 WORN TYRES ARE TAKEN OFF CARS, VANS AND TRUCKS

THIS ACCOUNTS FOR 46 MILLION TYRES PER YEAR (440,000 tonnes)[1]

The 2006 EU Landfill Directive means that scrap tyres are no longer accepted at landfill sites and virtually all end-of-life tyres are recycled or re-used in some way

One such use of waste tyres is for the generation of Tyre-Derived Fuel (TDF)

Tyres have a natural rubber content, which is a form of biomass and potentially a renewable form of energy

A thermal conversion process known as pyrolysis, which heats biomass in a reactor vessel containing an oxygen-free atmosphere, can be used to reprocess shredded scrap tyres into fuel gas, oils, solid residue (char), and a carbon black.

Shredded waste tyres, when mixed with chemical wastes, wood or coal, can be burned in power plants, paper mills and concrete kilns.

Case study

FuturEnergy Ltd based in Warwickshire in the West Midlands specialises in the design, production and distribution of clean technology and renewable energy, delivering a diverse range of own and contract design products and process solutions to industry and domestic users—specialising in wind turbines and waste-to-energy systems.

Tyres have a calorific value equivalent to a high quality coal

The burning of scrap tyres can help replace the burning of fossil fuels

Company background

FuturEnergy was founded in 2005 and is recognised as a leading UK wind turbine manufacturer. Its product range includes two innovative horizontal-axis upwind turbines: AirForce® 1 (1kW turbine) and AirForce® 10 (10 kW turbine), plus AirForce® control; a sophisticated control system that provides performance monitoring and automatic system protection for turbine installations.

8,000 FuturEnergy wind turbines have been installed around the world at a variety of locations including farms, private boats, off-grid telecoms sites and Arctic exploration sites.

FuturEnergy designed and manufactures the AirForce® control, which enables the remote monitoring, control and automatic system protection of the 1kW AirForce® turbine installation.

In recent years FuturEnergy has diversified into other renewable energy sectors, including the Energy-from-Waste sector, acting as a contracted design house specialising in mechanical engineering—developing equipment and processes that evolve ideas into actual products. FuturEnergy was approached in 2015 by Waste to Energy Technology Ltd to prepare a feasibility study in line with their ideas and plans to build a Hybrid Energy-from-Waste (EfW) process using “End of Life Tyres”.

Help from EBRI

New product applications. Warwickshire, West Midlands

Despite being highly-skilled mechanical engineers, FuturEnergy’s diversification into energy-from-waste systems required additional expertise in chemical engineering including thermal conversion processes such as pyrolysis.

The company’s Business Development Director, Steve Harrison, looked for guidance in this area from the European Bioenergy Research Institute (EBRI) at Aston University by attending one of its Value from Waste Master Classes. During the two-day course, Steve was able to enhance his knowledge of technologies and feedstock, supply chains and how new market opportunities can be developed from a whole host of unwanted materials including food waste, plastic, manufacturing and agricultural waste.

This event is part of an EU European Regional Development Fund (ERDF) initiative which provides practical help to small and medium sized enterprises in the West Midlands to develop new products and services.

Steve Harrison of FuturEnergy *(pictured in left photo on far left, and in right photo on the far right-hand side)* at EBRI’s Value from Waste Master Class held at EBRI on the Aston University campus in central Birmingham.

Bespoke support from EBRI

EBRI worked with FuturEnergy to shape a collaborative project to enable the company to provide technical guidance to one of its key clients, WET (Waste to Energy Technology Ltd) based in Warwickshire.

The EBRI team conducted a technical review of WET's and FuturEnergy's process design for the pyrolysis of tyres. The operational WET installation, based near Stratford-upon-Avon, uses a combination of proprietary techniques and equipment.

A detailed report was provided which included recommendations on how the design could be enhanced to improve both the operation process and the end fuel composition. Further support was given with the analysis of samples of waste tyre feedstock material, as well as the oil, charcoal and gas obtained from primary tests of the pyrolysis process being used at the plant.

Findings and recommendations

Waste tyres have a very low moisture content that is very favourable for thermal treatment like pyrolysis, combined with a high calorific value which is comparable to that of coal and diesel.

Photos showing the Hybrid WET plant in Warwickshire.

The oil, gas and charcoal produced from the pyrolysis of tyres has a number of potential uses and markets. For instance, the liquid produced can be used as binding material for bitumen. It also contains high value chemicals, such as limonene which can be used in the production of industrial solvents, resins and adhesives, as well as a fragrance for cleaning products. Other chemicals identified in the oil can be used for the production of synthetic rubber or gasoline fuel production, as well as for fuel applications.

The charcoal, known as 'char' has the potential to be used as a filler for waste water treatment, or as a binder for coke manufacturing. Pyrolysis can also convert tyres into a synthesis gas, known as 'syngas', which depending on its composition and heating value, has the potential to be used to produce heat and electricity, as well as for production of hydrogen, ammonia, methanol and synthetic fuels.

Outcome

The bespoke EBRI report concluded that further tests be conducted at the WET plant in order to enhance the quality of the products produced, and WET and FuturEnergy have since taken this on board and entered a new period of development.

EBRI's recommended process design enhancements, general advice and scientific analysis is helping the business explore how its process can be used not only for tyres, but for other waste streams including plastics.

"EBRI's research is at the forefront of the area that we have chosen to be in. The unparalleled support that they have given us with the evaluation of projects has been excellent."

Steve Harrison
Business Development Director
FuturEnergy Ltd

Aston University
BIRMINGHAM UK

EBRI
European Bioenergy Research Institute

The European Bioenergy Research Institute (EBRI) at Aston University provides practical solutions for businesses to explore the growing 'Energy-from-Waste' market, and the opportunities it offers. Companies can benefit from specialist support, cutting-edge technologies and bespoke events, e.g. workshops to help stimulate business start-up and growth, plus the development of new products and services.

To discover more email:
bioenergy@aston.ac.uk
or call 0121 204 3383
www.bioenergy-for-business.org

[1] WRAP: Tyres Re-use and Recycling

Published January 2019

European Union
European Regional Development Fund