

Glycerol power

Professor Patricia Harvey, of the University of Greenwich, is mobilising science and engineering resources across the globe to produce glycerol from algae as a new clean green energy source, as Dr Martin Davies explains

The University of Greenwich is poised to become the first university in the world to generate its own power and heat from a new biofuel; glycerol. Rising to the low carbon challenge, the story began when the university led a team of energy specialists, engineers, chemists and farmers in Kent to develop biofuels and supply chain strategies for combined heat and power (CHP) applications. One of these companies, Aquafuel, defying conventional engine combustion technology, developed an ingenious way to burn glycerol in conventional diesel engines.

Glycerol is a water-soluble biodegradable, non-toxic, odourless liquid and naturally occurring compound with an energy density equivalent to that of ethanol on a volumetric basis. It is also non-volatile, produces virtually no combustion particulates and has the best emission profile of any engine fuel. It is also a by-product in the manufacture of biodiesel from plant oil. The Bioenergy Research Team headed by Professor Patricia Harvey at the university was quick to seize the opportunity. Since most sources of biodiesel utilise edible plant oils, they began to search for new sources of glycerol. With concerns over land use and water reserves and with awareness of the food-fuel debate, they unearthed early research by Israeli scientists which showed that there were salt-loving algae that could produce up to 80% of their dry mass as glycerol. They made a case to the University of Greenwich's Research and Enterprise Office (GRE) for support to establish a new algae-glycerol laboratory. GRE recognised the importance and global impact that this might lead to and committed the necessary resource.

With this backing, a new EU-ACP funded project was secured for capacity building in Namibia, Ghana and South Africa to establish new business ventures and develop non-food biofuel supply chains, including glycerol from algae for use in CHP. At the same time, the team secured an Interreg IV project ECOTEC21, to demonstrate the utility of biofuels such as glycerol in CHP to reduce the carbon footprint in decentralised energy generation and serve as a demonstration as clean fuel for the shipping industry.

ECOTEC21 brings together universities in the UK and France, as well as research institutions, government-funded organisations, energy and facility managers, designers and architects and aims to find cost-effective and environmentally efficient ways of producing glycerol, including the future possibility of using algae as a source of the fuel. Professor Harvey will research the carbon footprint of glycerol – expected to be much lower than gas – as well as its risks. The university's School of Engineering will review



the design of the plant and its systems, which will be commissioned, installed and operated by the facilities management team. The School of Architecture, Design & Construction will study the retro-fitting and performance of this new technology, along with the training needed, and the Business School will assess economic issues, while university researchers in psychology will consider how best to encourage use of biofuels.

As Professor Harvey states: "This ambitious project puts us at the forefront of technological development in sustainable fuels. We believe that we will be the first university in the world to install a glycerol engine and the findings of this research will have an important contribution to make to the global search for the biofuels of the future. It is also unusual to see academics and the university's facilities management team working together this way"

She adds: "All this, of course, would not have been possible without the support and forward thinking of GRE who were instrumental in facilitating the necessary multi-disciplinary whole-systems approach."



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