

Cleaning up liquid biofuels

This project has developed a new process for turning low-grade waste materials into new types of fuel for heating and transport.

The need

Traditional energy resources such as oil, coal and gas are becoming increasingly costly. More importantly, the need to reduce carbon emissions to mitigate the effects of climate change means there is increasing focus on developing alternative fuels. This project aimed to find a way of extracting harmful free fatty acids (FFAs) from oils found naturally in organic matter (bio-oils) so they can be purified and used in combined heat and power (CHP) systems. It also supports emerging alternative bio-oil fuel sources such as algae and those produced through heated decomposition of organic material (pyrolysis).

The results

There is huge demand for alternative fuel sources for road transport and generating energy in CHP markets. But transforming bio-oils into a useable form can be expensive. Reducing the cost of upgrading low-quality bio-oils can bring fast payback periods by improving profit margins on existing materials and by bringing into the supply chain highly degraded material that was otherwise too costly to process, thus helping to create a more sustainable future.

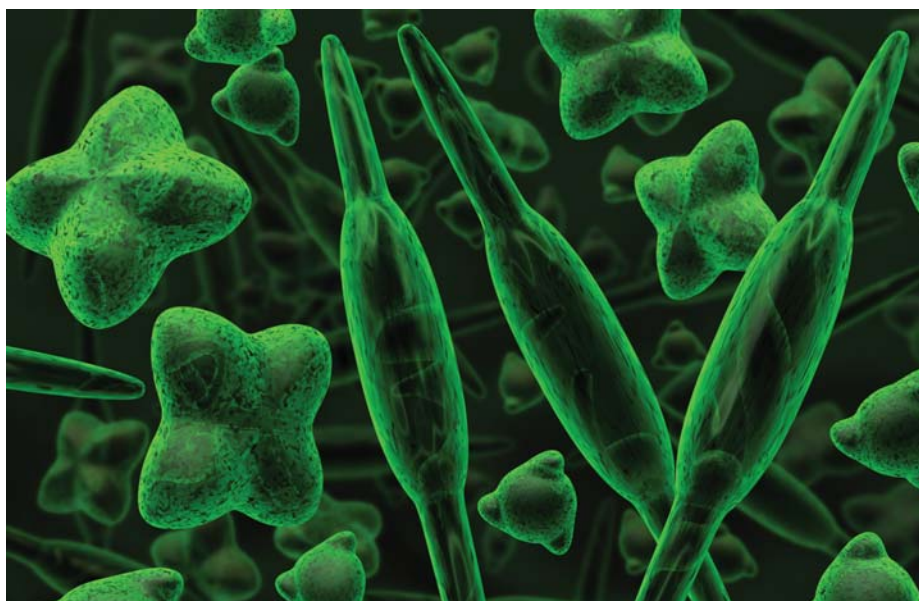
In an innovative approach to the problem, Longma Clean Energy Limited led a consortium that used microwaves to enhance a solvent separation process that cleans the bio-oil and produces purified FFAs that can be used as a chemical feedstock or for energy generation. This extraction process can also be used to separate a wide variety of

potential chemicals. In many such applications, extraction processes are not effective at low temperatures, which can be a problem for chemicals that are temperature sensitive. However, the microwave energy in this new process is highly targeted and results in a lower overall heating effect, thus addressing this problem.

In the future, a suitable application of this process could be in extracting nutraceuticals – products that combine health and medical benefits – from bio-oils in different types of algae. The use of microwaves also enhances the efficiency of solvent separation, resulting in higher yields and less carry-over of the solvent in the oil. The technology is, therefore, even more suited to these high value-added processes and represents a huge market opportunity over the next decade.

Implementation

Longma Clean Energy is now working with leading CHP provider, Green Frog, to develop the processing system for a specific waste to CHP fuel supply chain. CHP must compete for material with the more heavily subsidised road transport biofuel industry, even though, for certain applications, bio CHP will directly displace fossil diesel. Tight control of fuel costs is therefore vital.



‘Technology Strategy Board support has been critical in enabling an SME to take this complex research project from concept through to demonstration.’

**DR MARC THOMAS,
LONGMA CLEAN ENERGY**

Next steps

There are a number of future major markets for algae including basic food and fuel production. These are not currently economically viable, but there are significant opportunities in producing high-value chemicals from algae. A new consortium has been

formed to pursue R&D opportunities in the algal oils field. The research is focusing on the extraction of nutraceuticals from algae and the synergies that can be gained through coupling CHP with algal production.

Technology Strategy Board Driving Innovation

Collaborative research and development projects are one of the tools that the Technology Strategy Board uses to drive innovation in the UK. The Technology Strategy Board is a business-led executive non-departmental public

body, established by the Government. Its role is to promote and support research into, and development and exploitation of, technology and innovation for the benefit of UK business, in order to increase economic growth and improve the quality of life. It is sponsored by the Department for Business, Innovation and Skills (BIS).

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Project partners

Longma Clean Energy Ltd
(lead partner)
Liverpool John Moores
University
XpertRule Software Ltd
Feldec Ltd
Catering Waste Solutions Ltd

**Technology Strategy Board
investment**
£344,000

Total project investment
£644,000

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