

New technologies for faster, cheaper ethanol production

Production time and the cost of fuel ethanol could be slashed using new patented technologies that are undergoing commercial development trials in Australia.

Australia's Ethtec Technologies Limited (Ethtec), a Willmott Forests Limited company, has commenced work on a three-year \$20 million project designed to commercialise the patented fuel ethanol production process.

International patents protecting the US and Australian developed technologies are held by the Tennessee Valley Authority, the University of Southern Mississippi and Australia's Apace Research Limited.

Ethtec holds an exclusive worldwide licence to these patents.

Ethtec director and chief scientist Dr Russell Reeves says phase one of the four phase project at Harwood in the northern rivers region of New South Wales is attracting significant international interest (see graphic below).

Russell says that, if the commercialisation program is successful, production time could be slashed from 'days to minutes' and fuel ethanol production costs dramatically reduced.

He says feasibility studies have concluded that fuel ethanol produced by the Ethtec process will have a crude oil equivalent cost in the range of US\$36–50 per barrel (at exchange rate A\$=US\$0.88) when the ethanol is used in blends with petroleum fuels (see feasibility studies).

This cost of ethanol, without govern-



New technologies to turn waste fibre into fuel ethanol – Ethtec director and chief scientist Dr Russell Reeves and his mountain of wood and sugar mill residue in northern NSW.

ment subsidies, is highly competitive with the current cost of crude oil in excess of US\$100 per barrel.

"Economically viable conversion of woody or fibrous materials to 'cellulosic' ethanol is internationally recognised as being the basis of an environmentally sustainable industry that is able to deliver this liquid fuel in the volume required to meet projected demand," Russell says.

"Quite apart from what's happening in Australia, Sir Richard Branson has launched 'Virgin Fuel' which has announced plans to build or acquire plants to develop cellulosic ethanol.

"And, Microsoft chair, Bill Gates, has

committed approximately US\$80 million to the biomass ethanol industry."

Willmott Forests Limited CEO Marcus Derham describes the value-adding potential for the plantation forest industry sector as 'very exciting'.

"While we are pursuing this project conservatively with our sugarcane industry partners, the opportunity to add serious value to what has almost universally been treated as waste, is very, very compelling," he says.

FOOD VERSUS FUEL

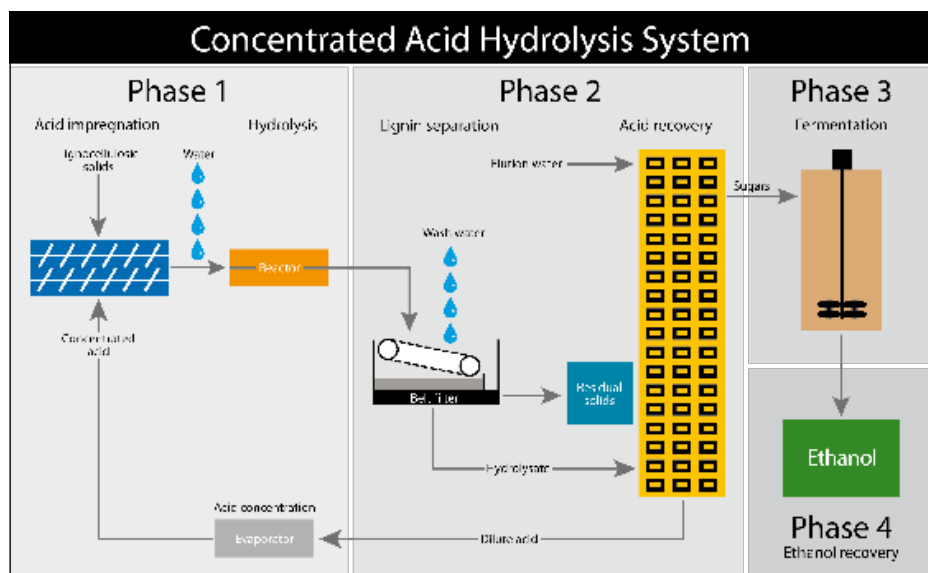
Russell says the production of ethanol from major food crops such as corn is distorting international markets and tying up vast areas of farm land in the US and Europe, while delivering no significant reduction in greenhouse gas emissions.

"Studies have shown that all of Australia's liquid fuel demand could be met by ethanol produced from fibrous biomass without interfering with food production or causing land or other environmental degradation," he says.

"The Ethtec process brings distinct environmental and production advantages over other ethanol production processes."

Major advantages of the new process technologies, which are attracting Australian federal and state government interest, include:

- Greenhouse gas reduction. The UN's Intergovernmental Panel on Climate Change has concluded that use of fuel ethanol properly produced from woody



or fibrous biomass results in almost no carbon dioxide emission.

- Positive energy balance for ethanol production. The Ethtec process converts fibrous biomass to ethanol and generates surplus electricity from combustion of the lignin co-product.
- Closed loop water cycle. The process captures production water and other liquids and treats and recycles them.
- Use of waste fibre as feedstock. The process enables the use of abundant supplies of waste fibre from existing industries, particularly sawmill wood residue and sugar production waste known as bagasse.

"Phase one of the pilot plant project involves a new hydrolysis process that converts components of the fibre to low cost pentose and hexose sugars in minutes compared to days for enzymatic hydrolysis processes," according to Russell.

"These sugars can be used for the production of ethanol, bio-plastics and other renewable chemicals and as alternative sugars in some traditional sucrose markets."

THE NEW PILOT PLANT

The new Ethtec pilot plant is being constructed alongside the historic Harwood Sugar Mill on the Clarence River in northern NSW, Australia.

The individual new technology processes to be brought online at the new plant during the next three years include:

- Phase one – hydrolysis of lignocellulosic biomass;
- Phase two – production of sugars and lignin;
- Phase three – fermentation of sugars to ethanol; and,
- Phase four – ethanol recovery and process water recycling

"Our aim is to commercialise production of highly cost competitive fuel ethanol from lignocellulosic materials without using steam distillation and without generating large volumes of noxious effluent," says Russell.

FEASIBILITY STUDIES

Feasibility studies show that with an assumed initial capital investment of AU\$70 million for a 50 ML/annum commercial scale plant, a 30 year plant life, 10 per cent IRR and a lignocellulosic feedstock cost of AU\$50/dry tonne, the ethanol production cost using the proposed new process would be in the range of A\$0.34-0.44/L. This corresponds to a crude oil equivalent cost of around US\$36-50 per barrel (at exchange rate A\$=US\$0.88) when the ethanol is used in blends with petroleum fuels.

"Results from the critical first two phases of the project are expected to be available within 18 months and commercialisation can follow quickly thereafter."

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Ethtec Limited analytical chemist Dr Tony Banks of Grafton – planning to turn sugarcane trash – on one hand – and woody biomass – on the other – into fuel ethanol.

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- > Tyne spacing 200, 250 & 333mm – depending on wheel centres
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