



ENERGY

# Ethanol history being ignored at our cost

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*A recent report for the Joint Venture Agroforestry Program (JVAP) acts as the latest manifestation of the recurrent 'amnesia' suffered by Australian researchers, consultants, writers, government officials, politicians and ministers, on the subject of ethanol. The report Wood for Alcohol Fuels is previewed in this edition of Forest Grower.*

'Amnesia' should be treated as the acceptable word; otherwise, far more incriminating terms would have to be used. 'Amnesia' is also an appropriate word because it helps to explain the propensity for 'reinventing the wheel'. It helps to explain why each new wave of researchers, consultants, bureaucrats, and politicians want to spend (or receive) new and greater amounts of public money, ostensibly in pursuit of answers that have already been provided by previously funded projects and reports.

Here are some historical points for readers to consider:

- Leading edge technologies were developed in the 1980s and 1990s in Australia and the US that have the potential to produce ethanol from wood and other 'lignocellulosic' material for around 30 cents per litre - a production cost comparable to petrol - while requiring no external energy and creating no noxious effluent;
- 'Diesohol' E15 emulsion was successfully demonstrated during the 1990s, and is attracting serious attention in Australia and overseas;
- Remaining technical problems with the use of ethanol/petrol blends were largely resolved as part of the Federal Government's Ethanol R&D Program between 1994 and 1998.



*A Volvo FM10 heavy duty truck operated by Croydens, a CSR sub-contractor, which is running on diesohol E15 as a trial begun last year.*

## ECONOMICAL ETHANOL IS WITHIN REACH

Two major criticisms of ethanol production by conventional steam distillation are first, the very poor energy input/output (and thus greenhouse) balance because of steam generation from fossil fuels, and second, the noxious effluent remaining after the ethanol is extracted. Both were identified by the National Energy Research, Development and Demonstration Program (NERDDP) in 1985 as the most important problems to be solved before there could be a large-scale biomass fuels industry in Australia.

By 1986, Australia's Apace Research Ltd had developed an 'induced phase separation' process that simultaneously recovers ethanol from the

fermentation broth, re-uses the solids for process heat and power, and re-uses any remaining benign effluent - thus eliminating both the steam distillation and noxious effluent problems. The process requires no external energy input, and is applicable to ethanol recovery from starchy as well as woody feedstocks.

Apace Research integrated this technology into the design of the proposed pilot plant to demonstrate the commercial potential of several leading-edge ethanol-from-lignocellulosics (EXL) technologies - namely, concentrated acid hydrolysis with acid recovery and recycle, developed by Tennessee Valley Authority and University of Southern Mississippi; simultaneous fermentation of C5 and C6 sugars, developed by University of NSW and the US National Renewable Energy Laboratory; and the Apace Research ethanol recovery/waste treatment process itself. The pilot plant is still (since 1994) awaiting adequate government and industry support, even though the estimated project cost is approximately half that of comparable pilot plants existing and proposed in the US and Sweden.

RKAI Inc is a US process engineering company internationally recognised as expert in ethanol production, including the design and construction of ethanol plants. For a decade, RKAI Inc has sustained its public view that the integrated conversion process in the proposed Australian EXL pilot plant is the most advanced in the world. It has a higher ethanol yield and a lower energy requirement than any available or emerging EXL technologies, and would cost the same as or less than other proposed EXL conversion processes.

One must ask why less experienced Australian researchers, consultants and government officials have over the same decade shown a determination to direct Australia's attention and resources to other more expensive and less promising technologies.

## ETHANOL USAGE QUESTIONS ALREADY ANSWERED

Conducted by the Gorton Timber Company, the feasibility study for the pilot plant in 1994 was, and remains, the most comprehensive Australian analysis of the practical capacity to convert whole lignocellulosic feedstocks, and of the estimated costs of production. Using conservative assumptions, the study estimated a cost of production of 44 cents per litre. Subsequent analysis, based on less conservative assumptions and on further work done under the Federal Government's 1994 Ethanol R&D Program, brought the estimated production cost to below 30 cents per litre - somewhat less than the 41 cents per litre in 15 years time chosen by the JVAP report.

The JVAP report did not use the Australian feasibility study as another (and local) source of cost estimates to compare with the report's US source. Nor did it properly address energy balance and noxious effluent, which will remain as problems for all the other technologies covered in the report so long as they rely, as they do, on conventional steam distillation for their ethanol recovery stage. Such omissions mean that the JVAP report is not as useful as it might have been. They are especially regrettable in a report that will enjoy considerable prominence and a perception of being an authoritative reference.

Bureaucratic and political manoeuvrings bedevilled the EXL pilot plant project from the 1992 announcement of federal funding until the search for additional funds in Australia stalled in 2001. Industry players, researchers and consultants with competing interests were involved, as well as the various federal and state government agencies and their ministers. The sorry saga will one day make an instructive and fascinating case study. Meanwhile, years have been wasted, and 'amnesia' has had a chance to take hold.

Although it makes little of the successful demonstrations of the diesohol E15 emulsion during the 1990s, the JVAP report, to its credit, acknowledges the several studies conducted under the Federal



*At its Sarina Queensland sugar refinery, CSR is producing 30,000 litre batches of diesel E15 on a monthly basis for use in its own road transport vehicles, and those of sub-contractors.*

Government's two-year \$4 million Ethanol R&D Program, managed by the since-abolished Energy R&D Corporation in 1994-95.

The R&D Program was part of a Budget package that included a three-year ethanol bounty to stimulate production and demand. The bounty was quickly abolished by the incoming 'Minister for Fossil Fuels' (Senator Warwick Parer) in the new Howard Government in 1996. The irony of the same Government's recent attempts to stimulate ethanol production should not be lost on anyone with a sense of humour.

The R&D program was designed very specifically to address the remaining technical problems and criticisms about fuel ethanol usage - such as ethanol concentration in petrol blends, vehicle emissions,

vehicle driveability and performance, materials compatibility, fuel safety and storage, and so on.

Automotive and petroleum industry groups, NRMA, NSW EPA, and others involved in the extended intensive field trial of ethanol/petrol blend in vehicles between 1995 and 1998 have made statements during the recent public debate confirming the suitability of E10 for the existing vehicle fleet.

By contrast, it is frustrating that the Federal Government appears not to be acknowledging the findings of those studies (reflected in its recent \$2.5 million grant to Orbital Engine Co to investigate E20); or the decade of private oil company experience marketing E10 (reflected in its \$8.8 million grant to BP to conduct an E10 marketing trial in Queensland, which was suspended last month).

Given that questions about blends and marketing have already been answered, it can be argued that these public funds could have been, and could still be better, directed towards the proposed EXL pilot plant project. The greenhouse benefits of replacing steam distillation would alone seem to justify such an investment. But more generally, the emphasis must now be on commercialising the technologies to produce ethanol at a scale that will economically and sustainably contribute to meeting national fuel demand.

Forestry, and private forestry in particular, as well as other rural industries, regional communities and the environment, all stand to gain far more from the latter option.



**From 1991-93, Alan Cummine was the greenhouse, energy and transport policy adviser to the Federal Minister for Environment. He was instrumental in developing the Federal Government's ethanol initiatives of that period, as described in the above article.**



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