

CONTACT: Ginger Pinholster/John Toon
(404) 894-3444

**DEVELOPED IN THE UNITED STATES,
RENEWABLE FUEL PROCESS SEEMS BOUND
FOR EUROPE, ENERGY EXPERT CAUTIONS**

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After investing \$4.5 million to make biomass oil from unused wood scraps, the United States may be forced to sell the technology abroad, Dr. Daniel J. O'Neil warns.

As director of the Energy and Materials Sciences Laboratory at the Georgia Institute of Technology, O'Neil encouraged the development of a patented biomass conversion process known as "entrained flow pyrolysis."

Non-polluting and economically practical, the process is believed to be the world's most efficient biomass conversion system, yielding up to 60 percent oil on a dry basis (72 percent on a wet basis), from wood scraps or other agricultural refuse. Further, the process is simple and operates at relatively low temperatures. (Existing biomass technology, also developed at Georgia Tech, produces roughly 30 percent oil.)

And yet, O'Neil reports, U.S. manufacturers have expressed little interest in the technology -- despite rising domestic oil prices which make the Georgia Tech process commercially attractive. Since they pay about \$42 per barrel (twice the U.S. price) for oil, he notes, Europeans are more highly motivated to perfect new energy technologies. O'Neil says Georgia Tech has discussed a technology transfer arrangement with several European organizations in Belgium, Denmark, Germany, and Spain.

"This technology will probably be commercialized by a foreign entity," O'Neil says. "Five years from now, we'll end up buying U.S. technology back from a foreign-owned company. That's the real Catch-22."

O'Neil fears that U.S. companies could pay a high price later if renewable energy research falls by the wayside today. Domestic crude oil prices are expected to hit \$25 per barrel within the next five years, he cautions, and the going rate could jump to \$35 per barrel by the year 2010. O'Neil says a commercial version of the Georgia Tech pyrolysis system would be profitable at \$21 per barrel, the current price of crude oil.

"We've crippled the alternative energy industry in this country," says O'Neil, who has testified before a Senate subcommittee studying energy issues. "The Japanese and the Europeans have made the commitment."

Invented by Drs. James A. Knight and Charles W. Gorton, the patented Georgia Tech process was first conceived in the late 1970s, during the oil shortage. Transportation oil reserves were hardest hit, O'Neil remembers, but residential and commercial heating supplies also felt the pinch. Research money seemed to fall from the sky, he says. Since then, the energy crisis has become a hazy memory for most Americans. Today, O'Neil says, government roll-backs supporting alternative fuel research discourage industrial investment.

What makes the Georgia Tech process so efficient? In a conventional biomass conversion system, O'Neil explains, wood scraps move slowly through a large, cross-sectional reactor, producing large quantities of charcoal. To harvest more oil and less charcoal, Georgia Tech researchers modified the process by pushing finely-ground wood particles very rapidly through a high-temperature reactor.

Since the wood produces oil as a primary product and the oil has little time to degrade into gases or char, O'Neil says, roughly 60 percent has been converted into biomass oil, which is suitable for use in industrial heaters, boilers or kilns. The technique also generates lesser quantities of valuable charcoal and low-BTU gas. A theoretical model suggests the process could produce even higher yields. In the future, O'Neil predicts the process will be improved to produce gasoline and specialty chemicals. It may also be possible to convert municipal waste into biomass oil, he says.

Cost-analysis studies of a typical 200-ton-per-day plant indicate a relatively low initial investment of \$2.28 million, with sales estimated at \$4.4 million per year and a two-year pay-back, O'Neil claims. Such a plant would operate at 73 percent net efficiency, he noted. In other words, most of the energy input would be recovered in useful fuel products.

If half of the unused wood residues produced annually in the U.S. were converted in a Georgia Tech system operating at just 40 percent oil yield (lower than the maximum potential efficiency), O'Neil says, about 98 million tons of biomass oil -- the equivalent of 412 million barrels of crude petroleum -- could be produced.

Unlike crude oil, biomass oil is oxygenated, but it has been used successfully in many industrial heating applications and for firing industrial kilns, O'Neil says. Tests on oil produced at Georgia Tech's one-ton-per-day prototype conversion plant have produced excellent heating values, he adds.

Despite a reemerging awareness of the rising cost of oil and increasing imports, he says, U.S. firms still are not aggressively seeking investment in alternative fuels. We've reverted to a "pre-energy shortage mentality," O'Neil says, and that's not a good sign for the future energy security of the U.S. However, he adds, "The Europeans have come to realize the danger of this single-fuel dependence, and they're looking for options."

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