

WISCONSIN-BASED COMPANY VIRENT ENERGY SYSTEMS HAS FOUND A WAY TO MAKE GAS, DIESEL AND JET FUEL out of agricultural waste, and is creating excitement around the world.

Virent, based in Madison, Wis., has become a green energy superstar of late. In December, it was the only biofuels company in the world to be named a Technology Pioneer 2009 by the World Economic Forum, which honors companies for innovative technologies that it believes will have a deep impact on business and society. Virent was one of just 34 companies globally to be honored by the forum. "During these difficult times, we are certain that the technologies driven by these visionary companies will contribute to the next wave of growth, with the innovative and entrepreneurial spirit that characterizes them," said André Schneider, Managing Director and Chief Operating Officer of the World Economic Forum.



BioForming turns plant material into biogasoline, with the same chemical composition as gasoline

A recent turning point for Virent took place in January, when Lee Edwards joined the company as president and chief executive officer. Edwards had been the head of the solar technology division of BP, the world's third-largest oil company. As Virent's founder and chief technology officer, Randy Cortright, sees it, "We're getting the worldwide recognition that we have unique technology, that what we are doing is technically and

economically viable, and that we can produce a renewable fuel that would be useful around the world, not just in the U.S."

What makes Virent so different from its biofuel competitors is that it doesn't produce ethanol or use a food crop in the production process as most ethanol producers do. Instead, with a technology called BioForming, it uses a catalyst to convert plant sugars found in sources that would often be discarded, such as wood waste, switch grass, sugar cane stalks and cornstalks, into gasoline. It does this by producing the same range of hydrocarbon molecules now refined from petroleum. The molecules also can be used to make diesel or jet fuel.

Unlike ethanol, Virent's biogasoline has the same chemical composition as regular gas. Biogasoline can be used on its own, be blended with regular gasoline or ethanol, and it can share the same pipelines and gas pumps, which makes distribution economical. It's exciting from an environmental perspective too, because Virent says, its fuels have twice the net energy yield per acre of traditional biofuels and produce virtually no carbon dioxide emissions.

A NEW SCIENTIFIC BREAKTHROUGH

When he founded the company in 2002, Cortright had planned to commercialize a process that turns plant sugars into hydrogen; he had developed the process along with his colleague, James Dumesic, while working as a scientist at the University of Wisconsin-Madison. They hoped that the hydrogen could be used to produce fuel cells, but in 2006, Virent discovered that its BioForming technology could be expanded to convert plant sugars into hydrocarbon molecules much like those produced at petroleum refineries. So it started producing its own gasoline, as well as diesel and jet fuel.

Since then, the company has attracted a lot of outside interest, receiving over \$30 million in equity financing and \$11 million in federal funds. Just last September, the company received a \$500,000 grant and a \$500,000 loan from the Wisconsin Energy Independence Fund, a \$150 million 10-year grant and loan program set up by Governor Jim Doyle to make Wisconsin a leader in renewable energy. Cargill and Honda are two of its main investors and it is collaborating with Royal Dutch Shell to commercialize biogasoline. Expansion has been so rapid that the company employs 75 people at its catalytic biorefining development facility in Madison.

Actual gasoline production is still on a very small scale. Cortright explains that right now, Virent generates about half a gallon of gasoline components a day from cane sugar. "Now we're scaling up to the next level to generate about 25 gallons a day," he says. "We're going to be able to provide samples to interested parties for engine testing or blending."

The long-term plan is to build a commercial plant, but as Cortright points out, that could cost between \$200 million and \$400 million. "Before investors are going to commit that sort of money, we're going to have to scale up the technology and the production a couple of times," he says. "You need to show you can crawl and walk before you can run."

Cortright is committed to Madison, not just because he developed the patented research at the university, but because it has a great pool of talent as well. "I think Madison is a great place to live, but also we've been able to recruit a number of good young engineers out of the university here," he says, adding that the U.S. Department of Energy-funded Great Lakes Bioenergy Science Center is also on the University of Wisconsin-Madison campus. "That means that there's a lot of foreign expertise around here as well."

Cortright adds that Midwestern agriculture was the inspiration behind his scientific breakthrough. "I actually grew up in a farm in Michigan, which is where I got the idea of growing biomass and producing fuel from it, so this is all really an extension of that," he says. After all, the Midwest is the most productive agricultural region in the world. Virent's technology could eventually produce benefits all over the world, but not before it has created jobs and driven growth a lot closer to home.