

How algae could change your world (or at least your car)

July 13 2011, By Jim Motavalli

Will we soon be fueling our cars, applying cosmetics and eating food - all made from algae? That's the rather science-fiction-y premise of the new cluster of companies (many of them based in San Diego, home of the San Diego Center for Algae Biotechnology) that are growing strains of algae far more useful than that residue that forms on your swimming pool.

Steve Mayfield, the University of California at San Diego professor who runs the center, told me that algae production is finally reaching the commercial scale. He was a founder of the locally based Sapphire Energy, which is building a large [pilot plant](#) in New Mexico that will start pumping [diesel fuel](#) from algae in the summer of 2013. "This is first-generation technology, a Model A," he said. "The technology will only get more efficient as it ramps up."

Sapphire raised \$100 million through investors that included Bill Gates and the Rockefeller-connected Venrock. Its algae technology was hailed by the Wall Street Journal as the "next big thing" back in March. People are getting excited. The New Mexico project also received more than \$104 million in federal funding, from the Departments of Energy and Agriculture.

According to Jason Pyle, Sapphire's CEO, the New Mexico algae ponds will be built on unproductive salt-saturated former [agricultural land](#). "The land grew cotton 15 years ago, but the growing salt content gradually made that impossible." Pyle said that "green crude oil" from

algae looks very similar to petroleum, and is low in sulfur and heavy metals. He thinks that algae can replace up to 10 percent of our current transportation needs. The company's goal is to produce fuel for \$70 to \$80 a barrel, which is of course cheaper than petroleum oil right now.

"By 2020, we could see heavy military usage of our products," he said. We will probably see [algae fuel](#) in buses and trains before it's in passenger cars.

Mayfield likes the idea of producing algae on dried-up parts of the Salton Sea, an artificial and highly toxic body of water in California's economically depressed Imperial Valley. As it evaporates, it makes the toxins (including [heavy metals](#)) airborne and dangerous. Algae production ponds could cover that waste and keep it contained. "We're talking about hundreds of thousands of acres," Mayfield said. "It's an ideal place to grow algae fuel, as much as 600 million gallons per year, and it could employ thousands in a place with 27 percent unemployment.

State and federal regulations that "protect" the toxic Salton Sea could kill that idea, though. Algae can be grown in open ponds, where it is fed fertilizer and carefully monitored. Or it can be cultivated indoors in fermentation tanks using synthetic biology. That's the approach taken by Solazyme, one of the industry leaders.

According to Andrew Chung, a principal at Lightspeed Venture Partners, one of Solazyme's investors, "What's produced is a renewable crude oil that can be made into a wide variety of products, from animal feed and cosmo-ceuticals to fuel." Food, too - Chung has eaten brownies made from algae. Chung, interviewed at a Wharton School Alumni Forum in San Francisco, contends Solazyme's algae approach works best, because it can use commercially available fermentation tanks - no re-inventing of the wheel is necessary. And that's another major advantage of algae when it's made into fuels that are chemically

indistinguishable from gasoline and diesel: Unlike ethanol (which is corrosive), it can be pumped through our existing network of 160,000 gas stations.

Solazyme, which is partnered with Chevron and the U.S. Navy, isn't just talking about algae fuel. The company, which went public last month, is already producing it for the aviation industry and for naval ships. It can only expand from there. "The market is in the hundreds of billions of gallons," Chung said.

Kent Bio Energy advances the concept of producing algae from waste sources such as raw leachate from landfills and cow manure sourced from intensive animal agriculture factories (which usually pay to make the stuff go away). "We can put any waste into algae ponds and it will eat the effluent," says Barry Toyonaga, Kent's chief business officer. "Pollution is huge."

Kent has gotten EPA grants for waste-based algae pilot plants, but it hasn't commercialized that technology yet. It's a great idea, with the only caveat that it's not easy to pull off on a large scale.

What's not to like about algae fuel? It's sustainable, domestically produced, and it can use our current infrastructure. The biggest challenges for algae, said Bernard David, a partner at Energy Management International, are coming up with a process that works the same way every time, and is cost-effective.

At Solazyme, I saw an agitating platform covered with bright green algae samples, part of ongoing experiments. There are millions of different species of algae, and they all have unique properties with advantages and disadvantages. Scientists can perhaps be forgiven for not finalizing the fuel. [Algae](#) is alive, after all, and not always predictable.

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