

Incubator for Progress

CSU hatches spin-offs to tackle global issues with business plan

Slimy bluish-green algae floats in the frothing water tank, clinging to the sides. The idea is that the scum could satiate the world's growing energy hunger.

Solix Biofuels plans to squeeze oil out of the protein-rich algae and sell it as biodiesel, a motor fuel.

The company is just one of several Colorado State University spinoffs that seek to solve some pressing global issue, such as energy demand or air pollution, by transferring research work to the marketplace.



Blake Sherman, a research assistant for CSU spinoff Solix Biofuels, tends flasks of algae being tested for oil-conversion properties. Solix harvests the algae and crushes it into a type of vegetable oil that can be refined into biodiesel. CSU is shaping up as a supercluster school with several spinoffs that one day could become corporate giants.

"Education is the primary driver of economic prosperity," said CSU President Larry Edward Penley, often credited with turning around the philosophy of the university since he came on board in August 2003.

"A university like Colorado State can and should be organized to promote higher quality of life, and the product of scientific and engineering research must be made commercial if it has to matter to society."

It's an odd place for CSU, which isn't exactly on the radar of venture capitalists or angel investors as an incubator. Plus, there's competition from the Stanfords and Berkeleys of the world, and

the perception of a learning institution focused on commercial success.

"The biggest pitfall is that a university with incubator concept, in some way or another, is accountable to the business community that oftentimes has an agenda different than education," said Stephen Haag, associate professor at the University of Denver's Daniels College of Business.

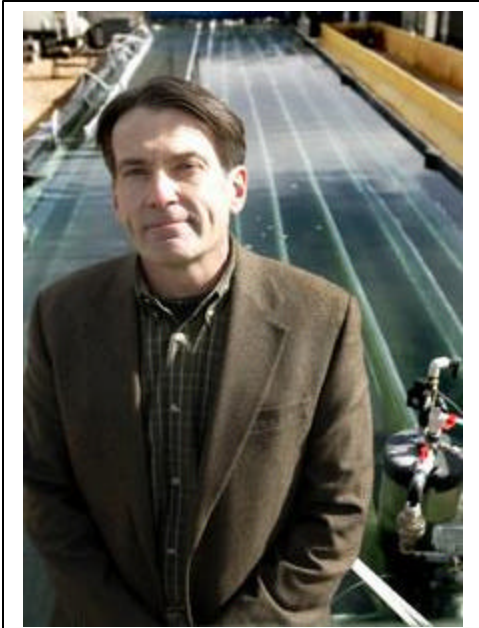
"I don't know of any school that has fallen into that trap, but that's certainly possible."

But CSU has a different game plan, professor Bryan Willson said.

"It's about the social return on investment, not the capital return," said Willson, a co-founder of several CSU spinoffs.

Penley - a former business dean at Arizona State - and supporters at CSU have worked hard to realize the vision.

CSU Provost Tony Frank led a team in summer 2004 to study how technology transfer works at universities in Wisconsin, Illinois and California, especially at Stanford in Palo Alto and at Caltech in Pasadena. Stanford's famous spinoff is Google Inc. of Mountain View, Calif., the search engine giant started by two students in a garage.



Brian Wilson is co-founder of several spinoffs at CSU.

That CSU's board of governors is largely composed of Denver business leaders further shaped the vision.

Board members include Doug Jones, former chairman of the Denver Metro Chamber of Commerce; Joe Blake, the chamber's CEO; Patrick Grant, CEO of the National Western Stock Show; and Marguerite Salazar, CEO of Valley- Wide Health

Systems.

Solix Biofuels was born last year.

It was joined by AVA Solar, which owns a patented technology that could slash the cost of solar panels. Envirofit International, another CSU spinoff, is making inroads in Asian and African markets.

The university spawned two so- called superclusters to speed up research into infectious diseases and cancer by putting students, professors and investors together to brainstorm commercial plans. A new supercluster to promote clean energy will be

announced this spring.

Also, CSU traded land with Fort Collins to build an incubator park and spent nearly \$300 million last year on research.

The challenge is to keep up the momentum and lure venture capitalists, angel investors, entrepreneurs and eventually Wall Street into convergence on the Fort Collins campus.

"We don't have an existing large cluster of industry in the area. We are not like Boston or Silicon Valley yet," said Mark Wdowik, CEO of nonprofit CSU Ventures, which manages the business side of superclusters.

"But in the long term, we can attract money and create Route 128 here. Maybe it'll be Interstate 25 without the sinkhole."

An auto rickshaw in the Philippines emits 90 percent less pollution.

A three-wheel tempo in Nepal is 35 percent more fuel-efficient.

A cookstove in sub-Saharan Africa makes more heat and belches less smoke.

Envirofit International makes these products to clean up indoor and outdoor air pollution in poorer nations.

The company, at a defunct coal-fired power plant in Fort Collins, has offices in the Philippines and Bangalore, India, and is about to open one in Africa.



Herb Warren examines a solar panel cutout at AVA Solar in Fort Collins. The CSU spinoff hopes to meet high demand by cutting production costs.

Like AVA Solar, Envirofit is a CSU spinoff. Unlike the solar company, it is a nonprofit whose customers are poverty-stricken people of developing nations.

"The challenges of selling to the bottom of the pyramid is that venture capitalists won't get a return on investment; they will get a social return," said Bryan Willson, a veteran professor of mechanical engineering.

Willson founded the company in 2003 with Paul Hudnut, a former business professor; and students Tim Bauer and Nathan Lorenz.

The prior year, the team had begun looking into two-stroke engines when snowmobiles were polluting Yellowstone National Park. Soon, they developed one of the cleanest snowmobiles.

They took the research results to Third World nations, demonstrating that a \$300 kit fitted onto two-stroke engines common on auto rickshaws could drastically cut emissions and improve mileage.

Envirofit now has a thriving business in the Philippines, and the Environmental Protection Agency has asked it to work on a kit for India.

Envirofit also is developing a line of clean stoves. Nearly half the world cooks with wood, dung or crop waste, and lethal flames or indoor pollution are leading causes of death among children and women.

Last year, Envirofit received \$25 million from the Shell Foundation to design and develop 10 million clean stoves.

"Envirofit is an example of how universities can develop and disseminate solutions on a big scale," Willson added.

Corn is passe. Switchgrass is years away.

So, how about algae?

The green slimy feedstock is being touted as a stable and affordable source of motor fuel, and leading that bandwagon is Solix Biofuels.

Solix was born of CSU's biofuels research, drawing heavily from two decades of work done at the National Renewable Energy Laboratory in Golden.

The technology depends on a type of algae that produces oil. The algae is cultured in plastic bags, which allows enough light for the organisms to grow but reduces infestation by other species.



Brian Wilson holds an African cookstove. Envirofit is developing cleaner, safer stoves that burn hotter with less smoke. Flames and fumes are leading causes of death among children and women in developing nations.

The company is collaborating with Fat Tire beer maker Belgium Brewing Co. to pipe carbon dioxide from its nearby brewery into plastic bags to nourish the algae. The brewery produces 5,000 metric tons of CO₂ a year.

Once the algae is harvested, it's crushed into a type of vegetable oil. The oil later is refined into biodiesel, a fuel mostly blended with diesel and sold at gas stations. The algae oil also can be refined into ethanol and jet fuel.

Co-founder Bryan Willson, a mechanical engineering professor, said the algae is well-suited for dry Western states dotted with small bodies of water, or in land adjacent to power plants where waste heat is available.

Algae-based biodiesel could meet the diesel demand by using only 0.5 percent of the nation's land, supporters say.

"Our goal is to produce 8,000 gallons of biodiesel per year from growing algae in one acre of land," Willson said.

Business plan brought AVA Solar to life, with prospect of meeting high demand with low-cost panels.

W.S. Sampath figured he could make solar energy panels for \$1 a watt if he applied the beer-can logic.

That was 1987, and Sampath, then a rookie professor of engineering at CSU, was studying aluminum use at beer maker Anheuser-Busch's plant in Fort Collins.

Sampath imagined that if, like the can plant, he used low-cost labor, cheaper material and an efficient process, he could make solar panels at one-third the cost of competing technologies.

Over two decades, he translated his theory into reality, using cadmium telluride, which is commonly found in copper zinc mines, to make panels. But there was one hitch.

Nobody outside CSU had heard of Sampath's success.

That changed on the morning of Nov. 1, 2006, when Hunt Lambert walked into Sampath's lab.

Lambert had been appointed by CSU President Larry Edward Penley to push technology transfer. He seemed impressed with the research work, then turned around and asked, "Where's your business plan?"

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"I didn't know what he meant," Sampath, 51, recalled.

AVA Solar was born soon after Lambert's visit, on Jan. 1, 2007. Newly hired CEO Pascal Noronha, Sampath, and former students Kurt Barth and Al Enzenroth, set about charting the company's path.

"We'd want to be the Google of clean energy," Sampath said. "That'd be a vision, yes."

AVA Solar plans to break ground this year on a manufacturing plant to produce 2 million solar panels, each producing 60 watts of electricity, beginning in 2009. It will employ up to 500 workers. AVA Solar pocketed \$3 million in federal research grants last year to perfect its panel design.

"The nice thing about the solar market is that there's an over-demand situation, and supply is racing to catch up," said Russ Kanjorski, AVA's director of strategic planning.

"We could scale up the plant to meet market conditions.