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Pure potential

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It shouldn't be hard to build a new business if you're providing a new way to do something everybody wants and needs – right?

Well, maybe not.

"Everybody wants clean water, but not for the same reasons and not in the same way. It can be a real puzzle," said David Bertoni, head of Marketing & Sales at Zanaqua Technologies.

Zanaqua has spent years working on purifying water using high-tech versions of old-fashioned distillation, to create a marketable product. With a roughly \$20,000 device that purifies 500 gallons of water a day at what they say is a fraction of the energy use and water waste of reverse osmosis, they're ready to turn all that R&D, prototype development and market research into profits.

"There are lots and lots of uses for this. It's time for us to monetize it," said company president James Dean.

Zanaqua was known as Ovation Products when based on East Dunstable Road in Nashua; inventor and founder Bill Zebuhr had visions of cleaning up household septic systems, a vast market.

Septic waste eventually proved too messy to handle at reasonable cost, said Bertoni. The company is now in a south Hudson industrial park with a different name and funding from the private investment firm Andlinger & Co. Zebuhr is no longer involved, although his technical approach is still a basis of the company. That technology involves distillation, which is as straightforward as it gets: You boil dirty water, collect the steam and condense it back into pure liquid, leaving all the nasty stuff behind.

Done properly, it produces the cleanest water imaginable, free of bacteria, endotoxins and the like. The problem is that distillation requires lots and lots of energy. Largely for that reason, most water purification these days uses various forms of mechanical or chemical filtration, including reverse



osmosis.

Zanaqua says its units, which are about the size of a small refrigerator, solve that problem by recapturing 98 percent of the heat, slashing the amount of energy needed for distillation. It claims "1,000 times the purity at half the cost per gallon" of reverse osmosis.

The devices use heat exchangers that Zanaqua makes itself, because commercial ones didn't fit the bill, and a patented spinning device that sends water through scores of tiny tubes to improve evaporation and condensation.

It sounds straightforward, but the complexities of thin film behavior and fluid dynamics make it anything but, helping explain why many in the company, including the president, are mechanical engineers. During a reporter's recent visit, for example, the whiteboard in the conference room was covered with calculus equations concerning turbulence, a topic that can occupy an entire engineering career all by itself.

As is known by many tech-oriented startups, however, generating profits and sales can be as complicated as calculus.

The difficulty for Zanaqua is that there's no established channel to market, in marketing lingo, for purified water in medium-sized amounts – more than needed by an individual but less than needed by a "big pharma" drug production facility.

"One of the problems is that there are no trade shows," Bertoni said.

It's easy to think of potential customers, including the exotic (NASA would love a low-energy method to purify water from urine), the dangerous (clean water is always needed at disaster sites, particularly when they involve flooding) and the high tech (electronics firms need very pure water to clean its microscopic components during assembly).

But chasing all of them at once would be fatal for so small a company, so Zanaqua has to choose.

Among those that Zanaqua is emphasizing at the moment are research laboratories, which need dozens of gallons of purified water each day for various reasons such as laboratory rats used to measure the effect of drugs.

"At the end of the process when they try to figure out what happened, they need to know very precisely what went into their bodies," Bertoni said. Using water free of contaminants is part of that process.

A notable success is at Harvard, which has bought units for a new biophysics lab.

Another target market is dialysis centers, which need pure water as part of the process of drawing toxins from the blood.

And then there's what might be called the reverse market: Firms that are interested in the stuff removed from dirty water, rather than the pure water which results.

Zanaqua says its systems can be used to "de-water" industrial cleaning residue, allowing valuable compounds to be reclaimed from the rinse water, or to reduce the cost of disposing of the residue. For example, a carbonated drink company shipping waste sugars to a landfill wants to reduce its per-pound costs by getting rid of as much water as possible, without sending energy bills sky high by

drying.

One obvious market that is not viable, however, is turning seawater into drinking water: The salts foul the system, Bertoni said.

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