



TDP: The Next Big Thing

Posted by [Robert Rapier](#) on April 11, 2007 - 11:30am

Topic: [Alternative energy](#)

Tags: [cellulosic ethanol](#), [changing world technologies](#), [thermal depolymerization](#)
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If you are a layperson, it may not be clear to you just how much of the current infatuation with cellulosic ethanol is hype, and how much is based on realistic assessments. So, I thought I would take you down memory lane and revisit another technology that was going to reduce our dependence on foreign oil.

The Hype: TDP Will Save the World

In May of 2003, [Discover Magazine](#) published [Anything Into Oil](#). It was a look at a technology called [thermal depolymerization](#) (TDP), which could take any organic material and turn it into oil. This was a high profile write-up with a lot of hype, and the technology of [Brian Appel](#) and his company [Changing World Technologies](#) (CWT) was really going to change the world.

I remember the first time I read the article, and I thought to myself "Wow, this is really something special." However, the hype of the technology didn't quite match up with reality. Let's take a look back at that original article, and see if we can draw some parallels with some of our current biofuels delusions.

The article starts off:

"This is a solution to three of the biggest problems facing mankind," says Brian Appel, chairman and CEO of Changing World Technologies, the company that built this pilot plant and has just completed its first industrial-size installation in Missouri. "This process can deal with the world's waste. It can supplement our dwindling supplies of oil. And it can slow down global warming."

Pardon me, says a reporter, shivering in the frigid dawn, but that sounds too good to be true. "Everybody says that," says Appel. He is a tall, affable entrepreneur who has assembled a team of scientists, former government leaders, and deep-pocketed investors to develop and sell what he calls the thermal depolymerization process, or TDP.

So far, so good. An entrepreneur (like Vinod Khosla), former government leaders (like Tom Daschle), and lots of deep-pocketed investors. The article opens with a little bit of hype, and follows with another liberal dose:

"The potential is unbelievable," says Michael Roberts, a senior chemical engineer for the Gas Technology Institute, an energy research group. "You're not only cleaning up waste; you're talking about distributed generation of oil all over the world."

"This is not an incremental change. This is a big, new step," agrees Alf Andreassen, a venture capitalist with the Paladin Capital Group and a former Bell Laboratories director.

Yeah, but it's got to be expensive, right? Not so:

Private investors, who have chipped in \$40 million to develop the process, aren't the only ones who are impressed. The federal government has granted more than \$12 million to push the work along.

"We will be able to make oil for \$8 to \$12 a barrel," says Paul Baskis, the inventor of the process. "We are going to be able to switch to a carbohydrate economy."

The article goes on to explain that the technology originated back in the 1980's:

Usually, the Btu content in the resulting oil or gas barely exceeds the amount needed to make the stuff. That's the challenge that Baskis, a microbiologist and inventor who lives in Rantoul, Illinois, confronted in the late 1980s. He says he "had a flash" of insight about how to improve the basic ideas behind another inventor's waste-reforming process.

"The prototype I saw produced a heavy, burned oil," recalls Baskis. "I drew up an improvement and filed the first patents." He spent the early 1990s wooing investors and, in 1996, met Appel, a former commodities trader. "I saw what this could be and took over the patents," says Appel, who formed a partnership with the Gas Technology Institute and had a demonstration plant up and running by 1999.

And they were on the verge of printing money, planning to make oil for \$15 a barrel (I thought it was \$8-\$12?):

And it will be profitable, promises Appel. "We've done so much testing in Philadelphia, we already know the costs," he says. "This is our first-out plant, and we estimate we'll make oil at \$15 a barrel. **In three to five years, we'll drop that to \$10**, the same as a medium-size oil exploration and production company. And it will get cheaper from there."

The Hype Begins to Unravel

Well, it's been 3 to 5 years, and things have not worked out as planned. Costs were much, much

higher than forecast. Unforeseen complications appeared. Small technical problems turned out to be big technical problems after the process was scaled up.

Let's look at some of the issues. A Newsday article in 2004, while also full of hype, foretold of some potential problems:

[Turning Garbage into Oil—and Cash](#)

Appel and his financial backers have bet more than \$66 million that the modern-day alchemy practiced by Changing World Technologies Inc. will revolutionize the way the world deals with its waste, reduce dependence on foreign oil, fight the spread of mad cow disease and even ease global warming.

Not bad for a 25-person company that Appel, who has no scientific training, runs from the top floor of a Hempstead Avenue china shop owned by his wife, Doreen.

No scientific training? Hmm. Where else have I seen amateurs jumping into an alternative fuel technology with both feet? Oh, yeah. [Here](#) and [here](#). (I don't mean to sound elitist, because amateurs have made valuable contributions in many fields. However, they are more likely to make mistakes/miscalculations than a professional).

The article continues with one more bit of hype that eventually turned out to be unfounded. More on this later:

Incredibly, the only "waste" that's left behind is distilled water. There are no smokestacks bellowing chemical-laden smoke, and no pipes discharging fetid wastewater.

The article continues by indicating that despite the hype, there really isn't that much that is known about the process:

Although Discover, Money and Scientific American magazines have all written wildly enthusiastic stories about the company recently -- Money called it "The Next Big Thing" -- competitors and independent researchers point out that Changing World Technologies has released very little information about the details of its patented process.

So the skeptics (AKA, naysayers) weigh in:

"You have to remember that people have been pressure-cooking different types of biomass for a long time now, and we really haven't seen these kinds of breakthroughs," said Ralph Overend, a leading authority in the bio-energy field and a research fellow at the National Renewable Energy Laboratory in Golden, Colo.

"People always stay skeptical until they can see the real data," added Overend, editor of the academic journal Biomass & Bioenergy.

Appel said the company's focus has been on building the Missouri plant, not on publishing scientific papers that he worries could tip off potential competitors.

And then there were those nagging cost issues:

Skeptics also wonder about the project's profitability, and whether it can truly compete with traditional oil drillers and refiners.

Appel acknowledges that producing a barrel of oil through thermal conversion costs about 50 percent more than doing it by conventional refining.

Only 50% more?

And then he makes the mistake that so many others repeatedly make:

If the price of oil keeps rising, he said, so will profits.

This is the same mistake that proponents of tar sands, GTL, oil shale, cellulosic ethanol, and many others have run into. They believe that oil prices will rise, and yet their costs will magically remain where they were. In fact, what happens is that as oil prices rise, all the costs associated with these various projects rise. That's why [oil shale has been imminent for 100 years](#). That's why [ExxonMobil is scrapping GTL plans](#). And that's why [tar sands costs have skyrocketed](#). A poster has referred to this trend as [The Law of Receding Horizons](#).

The Bloom Comes off the Rose

So, where does the technology stand today? How far off were those \$8 or \$15/bbl costs estimates? After all they had run the pilot plants. They had "*done so much testing in Philadelphia*", they "*already know the costs*." [Turns out they didn't](#):

Reports from 2005 summarized some economic setbacks which the Carthage plant encountered since its planning stages. It was thought that concern over mad cow disease would prevent the use of turkey waste and other animal products as cattle feed, and thus this waste would be free. As it turns out, turkey waste may still be used as feed in the United States, so that the facility must purchase that feed stock at a cost of \$30 to \$40 per ton, adding \$15 to \$20 per barrel to the cost of the oil. **Final cost, as of January 2005, was \$80/barrel (\$1.90/gal).**

\$80 a barrel! That is an **order of magnitude** higher than their early estimates. (Incidentally, if

their process really worked as they claimed, they could just feed it corn and turn it into oil at a very high EROEI). Not only that, they obviously made more errors in their estimates than just presuming the feedstock would be free. Subtract that \$20/bbl and you are still at \$60 a barrel - 300% over their highest prior estimate of \$15/bbl. Cellulosic ethanol hypesters, take note.

And there was more bad news:

[Turkey-oil plant closed due to foul odors](#)

SPRINGFIELD, Mo. - A foul-smelling plant that turns turkey byproducts into fuel oil was ordered closed by the governor Wednesday until the company finds a way to clear the air.

Renewable Environmental Solutions Inc. in the southwest Missouri community of Carthage had agreed in May to improve its odor-control systems after state and city officials sued, alleging the smell posed a public nuisance.

The company also was cited six times by state environmental officials this year, Gov. Matt Blunt said, but the smell continued.

Well, at least there were "*no smokestacks bellowing chemical-laden smoke.*"

The Lesson Here

CWT still exists as a company today. Like cellulosic ethanol, TDP is a technology that actually works. But the technology was hyped beyond reason. People did not apply enough skepticism before embracing the promise of the technology. It was really going to be "the next big thing."

But costs and complications were grossly underestimated. They fell victim to The Law of Receding Horizons. They learned that the public doesn't like smelly plants in their community. Discover ran an [updated article in 2006](#) in which Appel admitted "*We have made mistakes. We were too aggressive in our earlier projections.*" The hype just ultimately did not match the reality. And while TDP may make some small contribution to our energy needs, it isn't going to make any measurable dent in our fossil fuel usage.

But at least we have cellulosic ethanol, which I have heard really is "the next big thing."



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