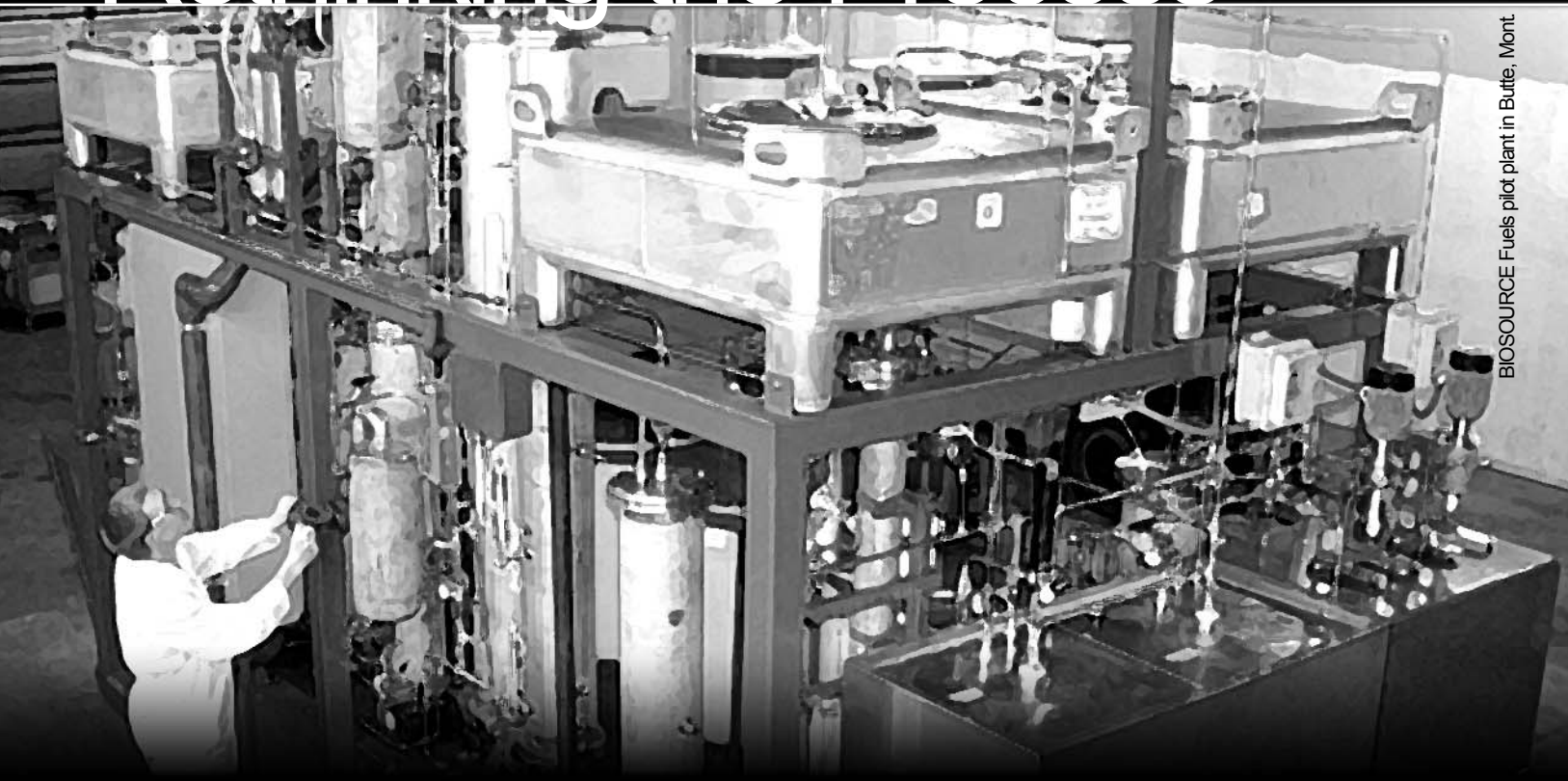


Rethinking the Process



BIOSOURCE Fuels pilot plant in Butte, Mont.

A Montana-based industrial technology company has partnered with a Wisconsin-based beef manufacturer to form BIOSOURCE Fuels LLC. Find out why this young company checked preconceived notions of production at the door.

By Tom Bryan, Editorial Director

On the surface, Kenosha Beef International and Resodyn Corporation are rather unlikely partners. One being a 65-year-old Wisconsin beef processor, and the other a forward-thinking Montana technology firm, the connection is not obvious.

And that's what makes the partnership work.

Where some businesses might have failed to see the potential for innovation, these companies took a chance, uniting complimentary corporate cultures and forming an exciting new biodiesel venture called BIOSOURCE Fuels LLC.

Combining Kenosha Beef's experience, resources and traditional bottom-line focus with Resodyn's proven ability to develop cutting-edge technology, BIOSOURCE Fuels is primed to become a leading biodiesel technology provider.

Mike Marquardt, marketing director of BIOSOURCE Fuels and a longtime Kenosha Beef employee, told *Biodiesel Magazine* he was initially impressed by Resodyn's trademarked "ResonantSonics" mixing technology, which provides an apparatus and associated method for mixing materials.

"We came across Resodyn and were immediately impressed

with the company's sonic mixing technology," Marquardt said. "Soon, however, we discovered that they had much more to offer—these were scientists and chemical engineers with a whole lot of talent. We pitched our biodiesel idea and they were on board from the start."

According to BIOSOURCE Fuels Program Manager Dick Talley, a member of Resodyn's Butte, Mont., team, the sonic mixing technology that impressed Marquardt affords exquisite control over mixing in a wide range of applications.

"The operating principle behind this method of introducing acoustic vibrations into liquids and slurries involves the concept of 'resonant vibration of an elastic medium,'" Talley explained. "The entire system vibrates in resonance, allowing efficient energy transport to the fluid."

But the mixing technology wasn't the only factor that attracted Kenosha Beef to Resodyn and the possibility of producing biodiesel.

Kenosha, a renderer with the ability to supply feedstock for biodiesel and glycerin production, had its eye on pending EPA regulations pertaining to low-sulfur diesel requirements.

"Given biodiesel's excellent lubricity characteristics and low

sulfur content, it becomes an excellent blend additive to help meet low-sulfur standards while providing a high-quality lubricity additive," Marquardt said, adding that biodiesel does not cause subsequent air quality emission concerns typical of some additives.

With indications of a favorable market around the corner, Kenosha Beef and Resodyn created BIOSOURCE Fuels in 2002, strategically aligning the new limited liability corporation with The Dupps Company. Dupps is an international construction firm with the ability to design, build and install high-quality process equipment and systems.

"They are the world's largest manufacturer of rendering equipment used to recycle animal protein byproducts," Talley said. "With the addition of Dupps, we are completely capable of designing, fabricating, installing, starting up and commissioning multiple biodiesel facilities throughout the world."

Multi-feedstock utilization

According to Talley, BIOSOURCE Fuels has a number of enabling features which, in his own words, "differentiate it from the current technologies on the market." The most critical discriminator, he said, is the company's proprietary ability for multi-feedstock utilization.

"Our proprietary process technology is insensitive to the free fatty acid content of feedstocks," he told *Biodiesel Magazine*. "This insensitivity allows the biodiesel producer to manage his production with the most cost-effective feedstock inventory—whether it's low-fatty acid virgin feedstock or high-fatty acid recycled and reclaimed oils."

BIOSOURCE Fuels' multi-feedstock approach has been developed to maximize the yield of each feedstock and, according to Talley, will result in some of the "lowest production costs in the industry."

Another factor that Talley believes gives the company a competitive edge is the elimination of the water wash requirement that is typical of some contemporary biodiesel production technologies. BIOSOURCE Fuels is also a strong advocate of recovering biodiesel's high-value, high-quality glycerin coproduct.

"Some contemporary technologies only recover a crude glycerin stream that is nominally 80 to 85 percent pure—and sometimes laden with salts, methanol, and materials other than glycerin and water."

Moreover, Talley said, many technology providers believe that glycerin recovery is not economical until large-scale production is achieved. While he admits this is true for conventional technologies, he said the BIOSOURCE Fuels technology development focused on high-quality glycerin recovery from its inception and has resulted in a cost-effective and integrated process that yields clear—97 percent pure—glycerin with nondetectable levels of salt and methanol.

"Our glycerin recovery is very economical and can provide an additional 20 percent or more revenue to biodiesel plant operations," Talley said, adding that the company utilizes a continuous process that results in low utility demands, highly consistent product quality, low risk of conditions that would result in off-spec materials, relatively few personnel and infrequent maintenance.

Armed with that technology, BIOSOURCE Fuels has set out as a full-service international biodiesel plant design/build company. The company has projects pending but, due to client confidentiality agreements, is unable to discuss them, Talley said.

Montana pilot plant serves as testing ground

At the company's Butte, Mont., testing facility, BIOSOURCE Fuels has built a biodiesel pilot plant that is helping the company reach its mark.

Initially, the pilot plant was built to demonstrate a fully integrated and continuous biodiesel production process technology developed by BIOSOURCE Fuels, Talley explained. However, as the technology matured, the pilot plant's role changed somewhat from a research plant to what the company calls a "technology viability tool."

"Clients will often ship their proposed feedstock to our pilot facility, and we can produce biodiesel through the process, allowing each client to customize their business model with actual process conditions, requirements, feedstock yield, finished-product quality, energy and mass-balance values unique to their feedstock," Talley said. "As commercial scale facilities come on line with our technology, the role of the pilot plant will again evolve into a training mechanism whereby our clients can send operators to the facility to develop a first-hand understanding of the process reactions and requirements, process

conditions and final product recovery and quality."

Talley told *Biodiesel Magazine* that the scale of the plant is ideal for training and providing hands-on experience without the impact on commercial facility.

Feedstocks utilized at the pilot plant are assayed for moisture, insoluble impurities and unsaponifiable (MIU) content. BIOSOURCE Fuels determines the free fatty acid concentration in order to determine what portion of the feedstock is a glyceride and what portion is unbound fatty acids. Lastly, the company determines the composition of the free fatty acids and determines the amount and length of the various carbon chains. They also complete a glyceride assay to determine what fraction is mono-, di- or tri-glycerides, which plays a key role in the process and yield calculations.

"The pilot plant has been critical to our success," Talley said. "It has demonstrated the efficiency and validity of the process and has also provided our customers with a level of confidence in the process conditions, feedstock yield, product quality and variable feedstock evaluation."

An unconventional process

As BIOSOURCE Fuels was taking shape as a company, Talley, Marquardt and other company leaders did not limit themselves to preconceived notions of how biodiesel should be produced. The result is a company that tends to think differently about process technology.

"Conventional biodiesel production technology has not evolved since the 1940s and for the most part follows the patents for producing glycerin during World War II, back when methyl ester was just a coproduct," Talley said. "We were very aware of this fact three years ago when we started on a strategic path for research and development of a new process."

For a multitude of reasons, Talley explained, conventional biodiesel production technologies are well established and work very well—if the feedstocks are limited to clean and virgin materials such as soy oil, rapeseed, palm and tallow.

"However, these processes have shortcomings if they try to use the lower-cost feedstocks such as yellow and brown greases," he claimed. "The ability to use these lower-

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value feedstocks by employing our technology will allow a biodiesel producer to achieve a significant price advantage."

The economies of scale at work

With all process technologies, scale becomes a real cost issue.

"We often receive inquiries from producers who want to make 1 million gallons of biodiesel per year," Talley told *Biodiesel Magazine*. "If these producers must sell into the commercial market for biodiesel—which is currently about \$1.50 to \$1.60 per gallon—they are at a real disadvantage."

Labor, feedstock and energy costs all come into play and the economics become difficult to overcome at small scales of productivity.

"Each client's business plan is different but we encourage minimum plant sizes of at least 4 million gallons a year," Talley said.

'High risk, early stage' R&D

Resodyn has been awarded two competitive research grants from the USDA SBIR program over the past three years that

have, in part, led to the development of BIOSOURCE Fuels' process technology.

Over the past few years, the evolution of Resodyn from a technology/consulting firm to a viable commercial technology business has been aided significantly by participation in the Small Business Innovation Research (SBIR) programs, Talley told *Biodiesel Magazine*. Additionally, Resodyn entered into a Cooperative Research and Development Agreement (CRADA) with the USDA EERS program as part of its process research and development work.

As with the USDA program, the EPA also has its own SBIR program and Resodyn has won a competitively awarded grant from the EPA to research and develop another "high risk, early stage" biodiesel production process.

"The program is comprised of two phases, which are aligned in the first phase to answer technical feasibility questions and in the second phase to address commercial viability," Talley said. "Many new or emerging technologies begin with just an idea. To flush the idea out, resources are needed and some-

times the resource needs are great. More often than not, the outcome of the research cannot be predicted nor can the return on the investment. This early stage investing is often very high risk with the chance of failure high."

According to Talley, the SBIR program recognized this "high-risk" aspect of research and development and provides seed money to mitigate the possibility of technical failure. The program requires that commercial development and industrial acceptance be integrated as soon as major technical milestones are achieved.

"In this manner, high-risk, high-value research can be accomplished with a real impetus to engage the technology, or the development, with the commercial marketplace as soon as possible for all of society to benefit," Talley said. "The United States is the only country in the world with such a program, and it shows in our innovation and quality of life." ■

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