

# Biodiesel

## SUCCESS STORIES



The many faces  
of biodiesel



“Innovators are at their very heart visionaries who also have determination, dedication, passion and motivation.”

Pearl Zhu

# Remembering Beth Jo Calabotta



**B**eth Jo Calabotta was a transforming force for improving the scientific understanding of the sustainability impacts of biodiesel. Beth lost her battle with metastatic breast cancer in 2017.

Beth was highly respected for her expertise in chemical engineering and especially for her knowledge of the ag industry. She became a true leader as a director of the *National Biodiesel Foundation* and inspired the foundation to coordinate industry and academic experts.

Beth was positive that biodiesel and agriculture could achieve powerful things. As a scientist, she knew that it was not enough to simply hope for better things. She knew that understanding the science would help businesses and policymakers avoid pitfalls.

She also knew that understanding the agricultural economy and potential environmental impacts would dispel myths created to hamper the advancement of biofuels.

The path to making our society and our economy more sustainable is to follow natural systems that are replenished and renewed continually. Biodiesel is a prime

example of using renewable energy to displace fossil fuels. The solar energy that powers agriculture can also provide a substitute for petroleum if we follow the examples in nature. Vegetable oils store solar energy in a liquid form that can be used without adding carbon to the atmosphere. The question that remained was how can we produce more of this renewable, carbon-neutral fuel?

Beth knew this was a critical question and she led others to use the best available science to find the answer. Beth encouraged experts from disparate disciplines to work together to quantify the land available to produce food and fuel. By understanding the increasing demand for food around the globe, she started by solving societies most critical need—the need for protein.

Farmers are steadily producing more protein and using fewer acres by increasing yields and planting more efficient crops. Seed-bearing plants are especially good at storing solar energy. When we harvest seeds for protein, we also get more fat than we can eat. This excess fat is a gift of stored solar energy that can fuel our economy as a feedstock for biodiesel.

It took the leadership of Beth Calabotta for this story to be uncovered in scientific literature drawing on decades of ag industry data. The National Biodiesel Foundation is following and building upon Beth's example to uncover data that illustrates the elegant power of natural systems.

*Don Scott*  
Director of Sustainability, NBB

## Leader, Scientist, Mentor & Friend

I first came to know Beth through National Biodiesel Board meetings where she represented Monsanto. I was instantly struck with her knowledge and, just as importantly, her strength of conviction and her ability to organize and motivate people.

It was through the National Biodiesel Foundation in 2008-2009 that Beth realized how answering the sustainability and indirect land use issues would be essential to the long-term success of biodiesel. She kick-started the work through coalition building and fundraising; bringing in strong partners like the National Corn Growers Association along with various state corn boards.

Through her vision and leadership, the California Air Resources Board would come to accept biodiesel's true score on carbon emissions. Her work also showed how the negative *food to fuel* argument against agricultural based biofuels did not apply to biodiesel.

Her passion was not limited to big policy issues. Beth could often be seen doing the little things, like working fundraising auctions or selling 50/50 tickets for a worthy industry cause.

I would often pass through her home city of St. Louis and we'd meet at the airport for an informal dinner where she would continue to share her passion for the industry. She would talk and I would listen, taking copious notes. Even when her cancer returned, I would visit her in the hospital, notebook in hand of course, and leave with even more notes. I never passed up a chance to learn something from her.

Beth is very much missed by the industry and those who worked with her. To honor her dedicated service, the NBB has established the *Beth Calabotta Sustainable Education Grant*.

*Tom Verry*  
Director of Outreach & Development, NBB

# Biodiesel

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*Information gathered from personal interviews.*







# Biodiesel:

## Bright things ahead

**W**hat modestly began as a patent application in 1937 Belgium by Georges Chavanne for a “*Procedure for the transformation of vegetable oils for their uses as fuels*” using a process now called transesterification, has since become a multi-billion industry that touches so many aspects of American life.

Biodiesel, the eventual result of that patent idea, serves in the on-road transportation, marine and home heating industries. With its advantages, instantly obvious to even the most recent acquaintance of biodiesel, it provides significant carbon reduction, improved operational characteristics, domestic jobs, and with its source of renewable agricultural products, long term sustainability unmatched by the fuel it naturally replaces.

This publication contains stories shining the light on individuals and organizations that have been instrumental in creating the biodiesel industry; in conducting research and development to ensure that it performs optimally and continues to improve; of entrepreneurs who have ventured forth into the unknown and continue to add to the production of

biodiesel. You’ll find stories of government servants who have championed its use and retailers and marketers who bring biodiesel to the public.

All of these stories have one thing in common: the embracing of biodiesel to solve specific problems, while at the same time marshalling in a new stewardship of our environment and our future.

We face a time when traditional petroleum diesel is too carbon intensive to be able to satisfy regulators, policy makers and the international community as they struggle to meet desired greenhouse gas levels. Biodiesel, with its carbon neutral long-term sustainability, is leading the way forward.

Of course, these stories are just snapshots as biodiesel’s influence continues to grow. There are multiple states with mandates requiring the use of biodiesel in on-road transportation or in home heating. Thousands of children are brought to and from school by biodiesel-powered buses. Tens of thousands of people go to work each day to biodiesel created jobs. Millions of homes are heated each winter with biodiesel blended into their fuel.

It seems as if Monsieur Chavanne was looking into our future...and saw bright things.

# It's Good for Jobs It's Good for the Environment It's Good for National Defense

**B**iodiesel producers and marketers can trace much of their success to the hard work of veteran U.S. Senator Chuck Grassley.

The Iowa Republican has made the biodiesel industry a chief concern for much of his 37-year tenure on Capitol Hill. He led the way in 2004 and 2005 when Congress passed two landmark measures that have helped spark the industry's growth to 2.9 billion annual gallons and beyond: the *Renewable Fuel Standard* (RFS) and the Biodiesel Tax Credit.

While there have been challenges with both measures through the years, the overall effects of both have been highly favorable. The RFS has created financial incentives for the blending of biodiesel with petroleum, while the biodiesel tax credit has reduced the market price of biodiesel and helped the fuel compete.

Grassley, a family farmer himself, has been proud to bring his legendary tenacity to bear for biodiesel. "There is an abundance of soybeans in my state, and the value added beyond exports is very important to our economy," he said. Biodiesel also helps reduce U.S. dependence on foreign sources of energy and improves national security. "The fuel is clean burning and low-carbon, so it's very good for the environment, and you create good paying jobs in rural America, where the small towns often don't have that," he said.

Since the RFS was established in 2005, Grassley has worked hard to make the law more effective for biodiesel by raising the required volume obligations (RVOs) for advanced biofuels and biomass-based biodiesel.

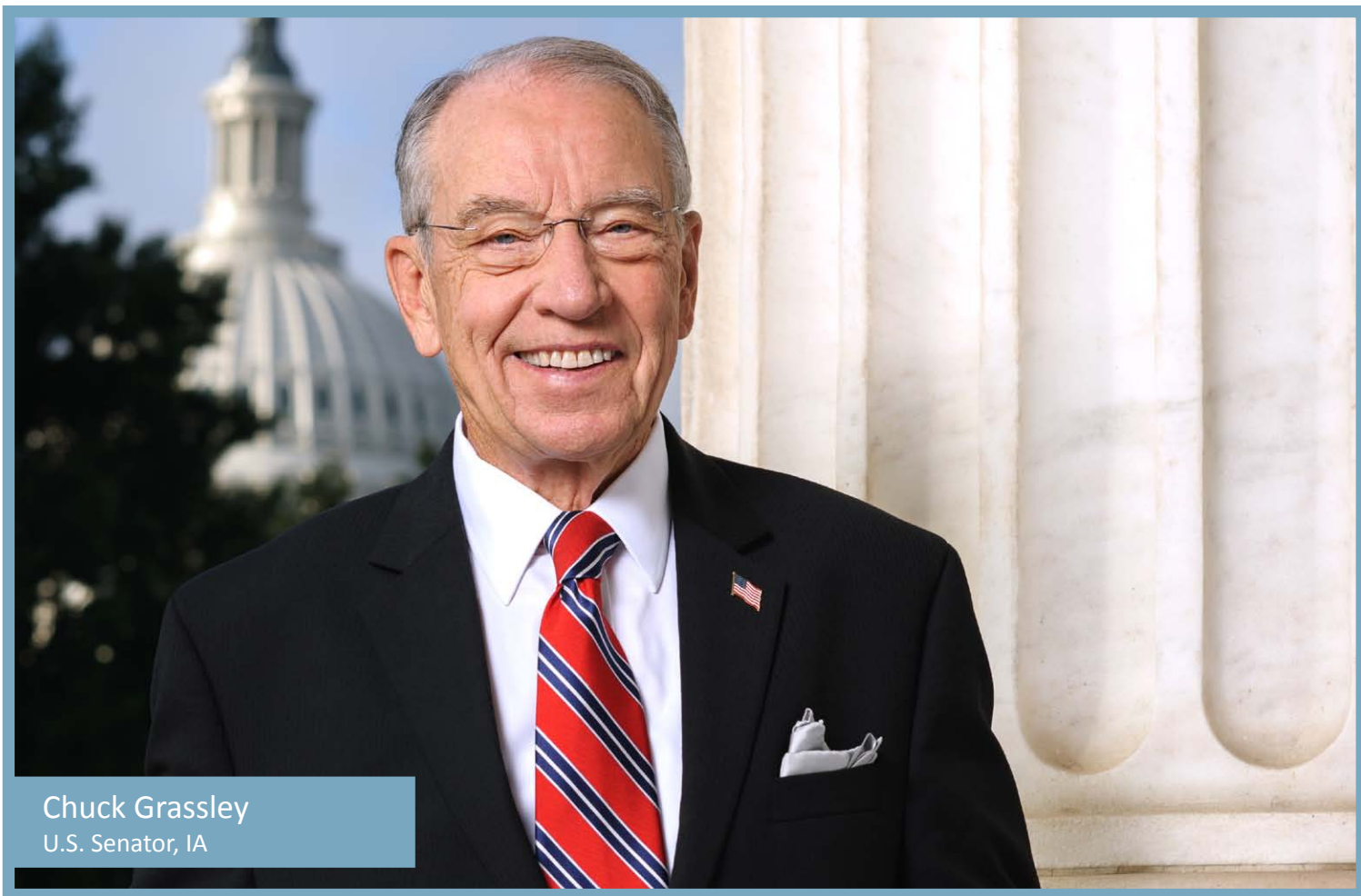
He has also worked to preserve the biodiesel tax credit and resuscitate it whenever it has lapsed. "We need

to have the tax credit for biodiesel to become a viable, mature industry, and every time it sunsets, we have to reauthorize it. It got reauthorized in this last deal we did, but only for 2017. Now here we are in 2018, and we ought to have had it authorized for two or three years so that the industry could depend on it. We need some certainty so that we can expand production."

Changes in U.S. petroleum production have only made his job harder. Since the Oil & Gas producers began using hydraulic fracturing, aka fracking, to increase yields, production has soared and the United States has regained its place as a global petroleum powerhouse. Concern about energy security was so diminished by late 2015 that Congress lifted a ban on crude oil exports that had been in place for 40 years.

"Back in the 1980s we thought we weren't going to have any more natural





Chuck Grassley  
U.S. Senator, IA

gas and petroleum in the United States, but fracking has really changed things,” Grassley said. “Five or six years ago we were building facilities to import liquefied natural gas, and now we’re using those same facilities to export it.”

The powerful petroleum lobby is constantly pushing back against the RFS and the tax credit, but the Iowa senator tirelessly defends biodiesel and carves out every advantage he can get. “Big Oil has always been a strong voice in Congress and they don’t want to market any products they don’t control, so they have been a big obstacle to tax credits and things of that nature,” he said. “It has just been a constant fight.”

The assault on biodiesel intensified in 2017 with the presidency of Donald Trump who placed Scott Pruitt in charge of the U.S. Environmental Protection Agency (EPA). The petroleum industry stalwart quickly moved to curtail renewable volume obligations (RVOs)

under the RFS. Grassley last year convened a meeting in his office between lawmakers and the new EPA chief that helped turn the tide and save the RFS. “I told Administrator Pruitt that supporting biofuels isn’t just good policy, it’s also what President Trump promised,” the senator told reporters after the meeting. “I reiterated what the President told me personally and what he told Iowans during the campaign, that he’s for biofuels and for a strong RFS.”

Grassley also works to combat misinformation about renewable fuels. When Philadelphia Energy Solutions (PES) and other refiners recently blamed the RFS for their financial struggles, Grassley took action. “After I heard that the *Renewable Fuel Standard* was being blamed for the financial troubles of some refineries, I wanted to know more,” Grassley said at the time. “So I asked my staff to get to the bottom of the situation. After reviewing the facts,

I’m confident that the Renewable Fuel Standard isn’t harming refineries, that other factors are at work, and that the RFS law is working as Congress intended. Once these facts are known, there ought to be an end to the misleading rhetoric blaming the RFS.”

Grassley sees a bright future for biodiesel. “It’s good for agriculture. It’s good for jobs in rural America. It’s good for the environment. It’s good for national defense. When it all adds up, everything about it is beneficial, and there are no known negatives. So like the 1930s tune that Campbell’s Soup used to sing, it’s mmm, mmm, good.”

**2007** the year the Renewable Fuel Standard was expanded to include biodiesel

# 20 percent in 2034, that will be like taking 175,000 cars off the road

**P**olicymakers in New York City are determined to reduce harmful emissions from energy sources, and they have made biodiesel a linchpin in that effort.

New York City Council Member Costa Constantinides, who represents a portion of the Borough of Queens,

has achieved tremendous success in his ongoing campaign to increase biodiesel usage in the nation's largest city.

The City Council's landmark achievement was the enactment in 2016 of Intro. 642, a local law he introduced that will eventually make B20 Bioheat® the city's standard for heating oil. Passed in 2016, the law increased the biodiesel

content of all heating oil sold within the city to 5% effective in 2017. Over the next 17 years, the standard will increase incrementally, reaching B20 in 2034.

Biodiesel is an apt solution for New York because heating oil provides winter warmth in many buildings and homes in a densely packed environment. Local policymakers have been quick to see the health and environmental benefits of incorporating clean-burning biodiesel in the fuel supply.

Constantinides is passionate in his support. "I look at biodiesel as one of the main solutions in New York City to reduce emissions," he said. "Going to a 5% biodiesel blend was the equivalent of taking about 40,000 cars off the road. When we go to 20% in 2034, that will be like taking 175,000 cars off the road. As we work to go green and fight climate change, this is a huge deal. We are burning less petroleum by replacing it with fuel that can emit up to 90% less greenhouse gas and 10% less particulate matter."

While climate change is the issue that gets the headlines, health is another critical issue for Constantinides and his allies in city government. "Particulate matter is what gets in your lungs and causes asthma. We have communities that have large power plants and





other environmental detriments,” he said. “Creating policy that reduces our reliance on traditional petroleum and makes us greener is a big win in our fight to make our communities healthier and less afflicted with asthma.”

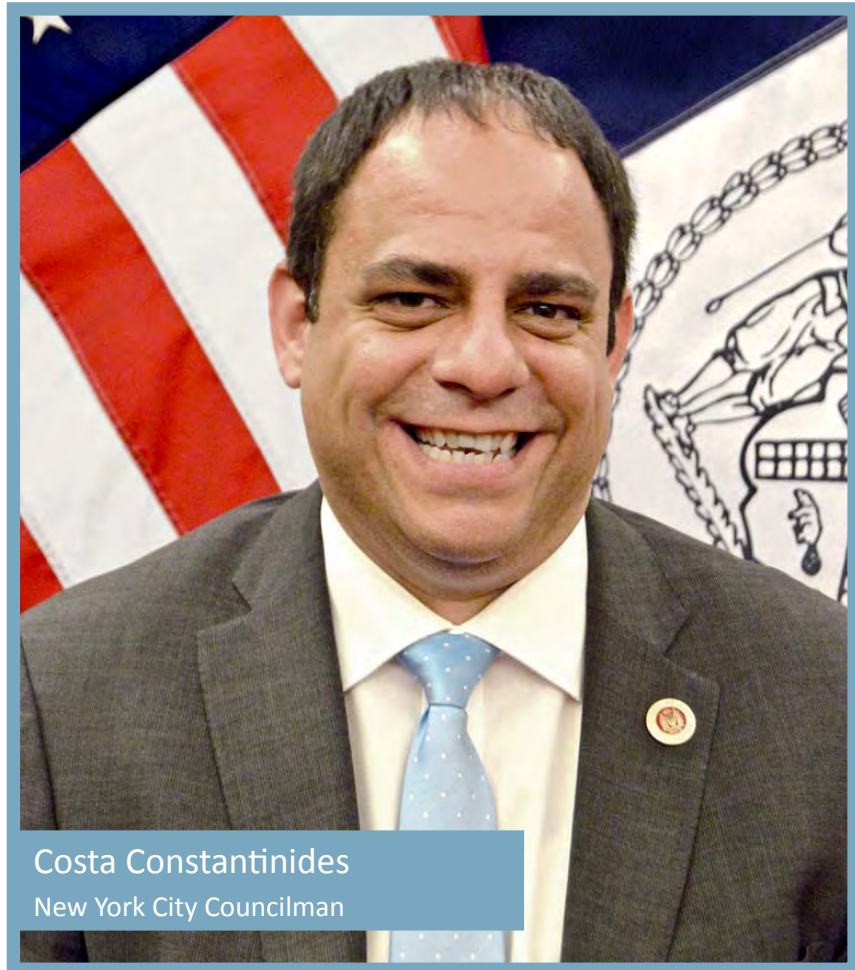
The benefits don’t stop there because biodiesel can also bring down the cost of indoor heating by expanding the market for fuels. “We can keep more money in people’s pockets from the purchase of biodiesel, which has been either competitively equivalent to traditional petroleum or less expensive over the last several years,” the council member said.

Biodiesel production also boosts the local and national economies. “We are creating jobs for recycling grease and building markets for waste product from soy crops,” Constantinides said. “We are building a green economy with biodiesel that will endure and improve New York City’s tax base. From all sides, whether from dollars and cents, job creation, emissions reduction, or health, biodiesel has been an important part of making our city greener.”

Support for biodiesel has been strong among New York City policymakers for years. The city had previously moved to B2 heating oil in 2012, and when Intro. 642 came up for final consideration in 2016, the City Council passed it by a 47-3 vote.

By contrast, only Long Island and the downstate counties of New York State have joined New York City in adopting a Bioheat® standard.

Constantinides believes it is important for the City Council to lead on the environment. “As a city, we’re setting standards for how much biodiesel is utilized,” he said. “In adopting these increasing blend levels, we are making sure that we are setting a good fuel standard for New York City in the long term. We are saying that if you are going to sell home heating oil, these are the standards that we expect. These



Costa Constantinides  
New York City Councilman

standards will maximize our emissions reduction and fight climate change.”

Environmental and health organizations such as League of Conservation Voters, the Environmental Defense Fund, and Empire Clean Cities have come out in favor of the city’s biodiesel fuel standards.

“The only entity that was really against us was the American Petroleum Institute,” said Constantinides. “They spent close to a quarter of a million dollars to kill my bill, and it didn’t work. We had environmental groups that were talking about the importance of emissions reduction and public health. We had the industry talking about how biodiesel helps build jobs.

The other side tried to spin their version of the story but we stayed focused on the truth and the facts, and the bill won on its merits.”

There have been no issues with supply but the city has built “circuit breakers” into the legislation to suspend the biodiesel requirements in the event of a supply crisis or a price blowout. There is also a seven-year gap before the switch to B10 to allow equipment manufacturers to prepare for the higher biodiesel blends.

Constantinides would like to see biodiesel powering vehicles of all kinds, including New York’s ferry fleet. “If there are opportunities for us to push the envelope a bit, to continue to be greener and make biodiesel part of that solution, we’re going to seize those,” he said.

86% reduction of lifecycle carbon emissions by advanced biodiesel

Research/Science

# Exceeding Expectations

Earl Christensen

Senior Scientist, National Renewable Energy Laboratory

**BQ-9000** NBB's quality  
assurance program for producers,  
marketers, retailers and labs



# Biodiesel has been put to the test and passed with flying colors

**E**arl Christensen, a Senior Scientist at the National Renewable Energy Laboratory (NREL), and his colleagues have done extensive testing on biodiesel over the last eight years, and the findings have impressed him. “As we did more and more long-term storage testing, I was a bit surprised at how stable all these recent samples were,” he said. “Today’s biodiesel can be very stable and can be stored for a long time, especially as a blend, so we have started looking at even longer storage times and more storage scenarios.”

The National Biodiesel Board (NBB) has honored Christensen twice for his achievements. At the Biodiesel Technical Workshop in November 2017, Christensen was named Biodiesel Researcher of the Year. Then at the 2018 Biodiesel convention, NBB honored him with the *Eye on Biodiesel Innovation* award.

Christensen’s research on relatively recent market samples of B20 biodiesel blends indicated B20 meeting today’s ASTM standards had a minimum simulated shelf life of over one year, with many of the samples having a simulated shelf life of over 3 years.

“The oxidation reserve of a biodiesel blend is dependent upon both the petrodiesel and the biodiesel. For the biodiesel component, the make-up of the oil or fat used to produce the biodiesel is one important factor. The more unsaturated a fuel is the lower the oxidation reserve in general, so biodiesel from unsaturated oils/fats like linseed oil and fish oil won’t have as long of an

unadditized shelf life as biodiesel from something more saturated like or animal fats or frying oils. However, some frying oils are solid at room temperature, so there is always this balance between cold flow and unadditized oxidation reserve,” Christensen explained.

“The secondary factor that really plays into this is antioxidant additives, and that’s how you get the really long shelf life with lower cloud biodiesel (which tends to be more unsaturated), by adding antioxidants. You tune that composition with the different types of feedstocks and additives you use.”

Producers of high-quality biodiesel are adept at adjusting fuel properties for the intended applications, and fuel buyers can generally specify the oxidation reserve they need. “As long as the B100 met spec, the ASTM specs were originally designed to provide a minimum shelf life of 6 months for B20 or lower blends. All the B20 samples we collected that met the 6 hour oxidation reserve spec had a minimum predicted shelf life of over one year—that’s some good news. In longer-term storage scenarios, that is where you monitor the fuel or use antioxidants proactively,” Christensen said.

“If you have fuel going into long-term storage, the ASTM specifications advise users that successful long term storage requires attention to fuel selection, storage conditions, handling and monitoring of properties during storage. That goes for either petroleum diesel or a biodiesel blend,” Christensen said. “One has to make sure to get good, in-spec fuel for long term storage and smart users utilize antioxidants and other fuel storage enhancing additives up front and monitor the fuel in storage periodically. Even petroleum diesel does not have an infinite shelf life.”

Christensen’s research helped prove the viability of long term storage options for biodiesel blends. Users can periodically test the fuel’s oxidation reserve, which naturally goes lower over time, and add more antioxidants to extend the fuel’s life, which mirrors common practices for many petroleum products. “Once you have a fuel that’s in storage for a while and you see the oxidation reserve start

to drop below target levels, you add a certain amount of additive and mix or churn it to disperse it and this extends the useful life of the fuel,” he said. “In our readditization study, we achieved over 4 years of simulated storage with B20, which was impressive.”

Christensen’s work is very important to fuel distributors and users. “The fuel users are very interested. I am a lab chemist, so it’s valuable to me when people share their experiences about what happens in the field.”

OEMs also pay close attention. “They have a huge vested interest in the quality of the fuels going through their vehicles. They don’t need to be having any problems based on fuels.”

“We want to be able to give people the tools they need” to trust biodiesel, he said. “It’s unfortunate that a lot of people have it in their minds that diesel fuel itself is good forever. That’s not necessarily the case, and there might even be some overlooked issues there that might be worth looking into as well.”

Most of his work has been on blends of up to B20, but that is changing. “You’re starting to see a lot of interest in blends up to B50 and even in applications of B100, particularly in home heating,” he said. “In theory, there really shouldn’t be a difficult transition. There might be considerations about materials compatibility for seals that weren’t designed for these fuels, but for actual combustion, I don’t see too much difficulty moving up.”

Christensen’s work at NREL has given him a strong appreciation of biodiesel. “I’m entirely neutral on how we reduce the amount of petroleum we use, but from what I’ve seen of biodiesel, I think it is a really great path for us to supplement our diesel usage in a way that reduces emissions and ultimately gets us all to where we want to be.”

He believes biodiesel should play a larger role in the energy mix going forward. “It doesn’t take a whole lot of energy to make and we’ve got quite a bit of oil to make it from,” he said. “It absolutely deserves to grow as far as it can go.”



# Strong support helps NBB open markets



**T**he National Biodiesel Board has enjoyed great support throughout its first 25 years as it has worked to establish a vital, new energy supply and create an important market for farmers and food producers.

"It's a very proud history that the National Biodiesel Board enjoys," said Donnell Rehagen, NBB's chief executive officer. "Twenty-five years ago, NBB was founded on the principle of turning excess soybean oil that was on the market into fuel. It was extremely visionary, and when I speak to groups of farmers who have been around for many of those years, I applaud them for their patience. Through the early phases, they certainly must have wondered whether they should keep putting money into this, not knowing if there would be a positive outcome on the back end."

There were many years of investment in pure research and development, when leaders like the Missouri Soybean

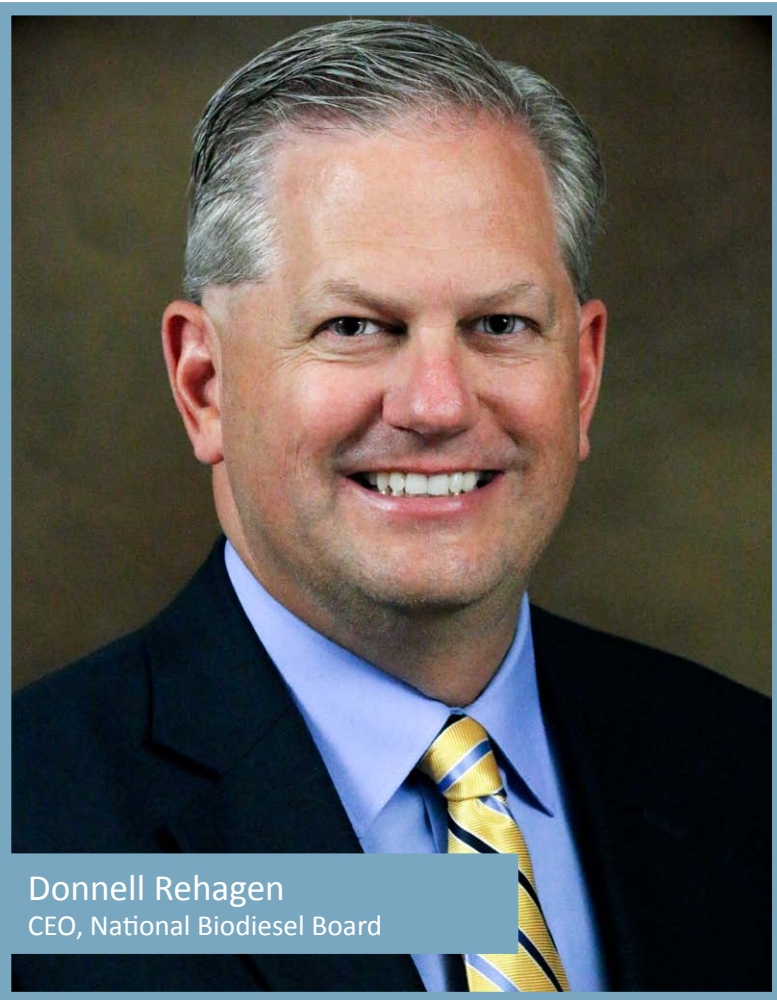
Association's Kenlon Johannes were promoting the biodiesel vision. "We weren't talking about tax credits, policy or state mandates," Rehagen said, "We first had to figure out whether technically you could transform soybean oil into fuel. Once the determination was made you could, that started Phase Two. How could we commercialize the fuel? What did we need to do with OEMs and equipment manufacturers?"

"There was a huge Phase Two of industry development. Out of that came some attention to policy and regulatory initiatives and the creation of a framework to support an emerging industry in a challenging industry. The liquid fuel sector is very different from other energy sectors such as electricity, which enjoys some certainty in regard to cost. We don't have that in liquid fuels. What's crude oil going to sell for six weeks from now? Nobody even knows what it's going to sell for six days from now. It's a very uncertain space that our biodiesel producers operate in."

NBB's task "is to knock down barriers and to help provide certainty to our membership," he added. "The U.S. model of business development and capitalism is well documented to be successful, but without certainty, it is really challenging for businesses to make the right decisions. Investment in downstream blending and infrastructure becomes highly questionable when the long-term certainty of your industry is in question."

NBB has gotten better at clearing the obstacles, whether they are technical or environmental. "We have become widely known experts in environmental policy for liquid fuels," the CEO said. "We need to be that knowledge base in order to make arguments from a positive policy standpoint and convince lawmakers that biodiesel is good for the environment and a sound investment of resources. I'm really proud to be a part of an association like this that is able to keep its eye on that prize and put resources where they need to be to knock down those barriers."

The ongoing support of the soybean checkoff has made NBB's mission attainable. "It has allowed us to punch above our weight class," Rehagen said. "It lets us totally leverage our membership dues so that nearly all of that goes



Donnell Rehagen  
CEO, National Biodiesel Board

1992 the organization  
that became NBB was founded

“We see an industry that is just waiting to burst with its ability to grow and produce more.”

to policy work. It’s a great model of partnership and respect that two different industries, farmers and biodiesel producers, have. They fund us, so we can accomplish a lot of great things.”

When the soy industry established NBB, the farmers who were paying into the checkoff program decided that the board should advocate from a feedstock-neutral point of view. “In 2018, we see a little over 50% of the biodiesel produced in the United States is made with soybean oil, so the other half is produced from other feedstocks,” he explained. “It was a very visionary decision by the soybean industry to see biodiesel as something bigger than just them. It has proved very beneficial not only to them, but it has also resulted in a lot higher value in other markets, such as restaurant oil collection and meat production.” NBB also advocates for renewable diesel producers.

The National Biodiesel Board has also helped the biodiesel industry build

bridges to heating oil dealers in the Northeast. “Our farmer leaders saw that a lot of heating oil dealers are just like them. Their businesses have been in the family for generations. They rely on the weather for their livelihood. And to hear that the heating oil dealers were being put out of business by the competition, that is not lost on the farmers, who saw many farms lost to challenges that they had no control over. It’s also a nice fit because heating oil is consumed primarily in the winter. With Paul Nazzaro’s guidance and the buy-in from a lot of leaders on our side, the cooperative research and investment have continued. It’s been a great match for our two industries.”

Policy has been a consistent challenge for NBB. Ten years ago, “biodiesel was the darling of the ball” on Capitol Hill, but some of that shine has now gone, Rehagen said. “We’ve got some work to do in that area, because it is important to have policy that is a backstop for the industry. Even though we’re 25 years

old, we are still the little kid in the family compared to petroleum and ethanol. We want to get back to where policy is not so on-again, off-again. We enjoy the support of Democrats and Republicans, but we just don’t enjoy the support of enough of them.”

NBB is also continuing to propel biodiesel technology forward. “The quality of the product going out today is much improved, and because of that, we’ve enjoyed more support from engine manufacturers. But they continue to develop their technology in response to policymakers seeking cleaner fuel, so we have to be ready to step up with research on our side. We have a lot to offer to conventional diesel fuel to make that end product much cleaner burning.”

The CEO is very optimistic about biodiesel’s future. “We see an industry that is just waiting to burst with its ability to grow and produce more. What has been missing is a consistent signal from our government that investment in this industry over a long term is a good idea. One of our primary goals is to get that settled down. There are a lot of our companies, as well as outside investors, that would like to put money back into this industry and see it grow.”

# Nebraska helps grow the biodiesel market

The biodiesel market adds significant value to soybean crops and the Nebraska Soybean Board (NSB) has aggressively supported fuel research projects year after year to expand opportunities for their members.

“When we first started with biodiesel fuel, we had a glut of soybean oil sitting around, and our board worked hard to build the market for that product,” said NSB Executive Director Victor Bohuslavsky. “We have a very good board that understands we need markets for products, and they are willing to support research to build those markets.”

Nebraska has a limited biodiesel production industry of its own so it uses its checkoff dollars to support the growth of emerging markets, mostly on the east and west coasts. When there is a healthy market for soybean oil, the value of each soybean bushel increases by about 65 cents, according to Cale Buhr, the association’s market development coordinator.

In recent years, NSB has directed funds for research into additives for the California biodiesel market. Nebraska’s support has helped create additives that reduce NOx

emissions and address air quality concerns raised by the California Air Resources Board.

The Nebraska association has also played an important role in the development of the Bioheat® fuel market on the East Coast. When the nascent biodiesel industry began exploring the opportunities to blend biodiesel into heating oil, NSB directed checkoff funding

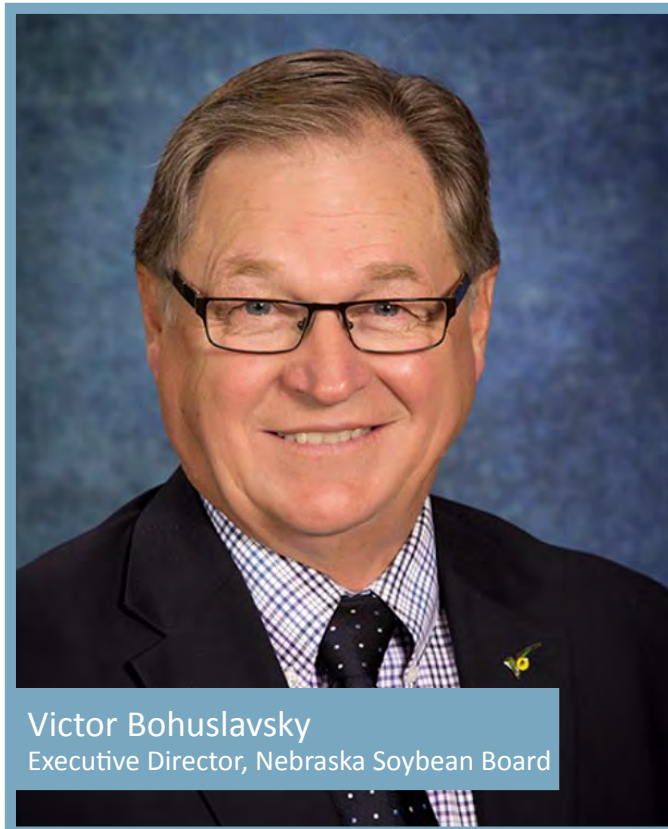
to organizations such as the National Oilheat Research Alliance (NORA) and Brookhaven National Laboratory.

Those organizations took advantage of the support to conduct fundamental research on fuel blending, combustion, storage, emissions, and other topics that set the stage for ASTM approval of biodiesel in heating oil applications.

In 2008, ASTM updated its heating oil specification, ASTM D396, to allow for biodiesel content of up to 5% in all heating oil applications. That revision to the standard made it possible for any fuel marketer to sell B5 Bioheat® without any risk of violating equipment warranties.

Many individual marketers quickly saw the value of Bioheat® and began promoting it to customers as an attractive alternative to traditional heating oil. It offered an improved emissions profile and directly displaced petroleum with biodiesel that could be produced with soybeans grown by U.S. farmers.

The Nebraska Soybean Board built a particularly strong bond with heating oil marketers in New York City. In 2012, B2 Bioheat® became the heating oil standard in the nation’s largest city, creating



**Victor Bohuslavsky**  
Executive Director, Nebraska Soybean Board





“The public is saying they want cleaner air and cleaner fuel, and that is what will push our industry forward.”

a 20-million-gallon market for biodiesel. “That has been a great thing for our members,” Bohuslavsky said.

As the Bioheat® market was emerging, NSB worked to build relationships between farmers and heating oil marketers. One focal point was ambassador-type programs that brought two groups together on each other’s turf. First, the New Yorkers visited the Midwest to see the soy farms and biodiesel production facilities that would ensure robust supply. Then the Midwesterners went to New York to meet the dealers and fleet operators who were putting biodiesel in their tanks.

The visits have continued through the years, and now NSB and other soy associations make an annual pilgrimage to New York to exchange ideas and forge greater cooperation. The New York City Council recently passed a measure that increased the biodiesel blend level in heating oil to B5 in 2017. The bill also implemented a series of increases that will culminate in a B20 standard in 2034.

Bohuslavsky says biodiesel’s strongest domestic markets are in the large

population centers on the east and west coasts. “The big cities are addressing the environment more quickly than Midwest cities are,” he said. “They want to have a cleaner, safer environment.”

He would like to see stronger biodiesel programs in the Midwest, and he is encouraged by recent developments in Omaha, NE, where policymakers are beginning to leverage biodiesel in bus fleets to improve air quality. “Biodiesel is a great way to clean the air,” he said.

He believes the biodiesel industry advocates effectively for the fuel in the face of stiff opposition from the petroleum industry. “We are doing a really good job for the amount of money or collateral that we have available. We are going against some industries that really have their pockets loaded.”

He believes the petroleum industry will continue to resist biodiesel. “They are concerned about their bottom line, not about the environment,” he said. “The public is

saying they want cleaner air and cleaner fuel, and that is what will push our industry forward.”

He believes policymakers do not have enough information about the benefits of biodiesel. “If they are not informed, they cannot move forward like some would like them to do,” he said. “That is our challenge, to get them informed and educated.

He is optimistic about biodiesel’s future. “I think the outlook is good, we have got a good group of retail distributors who believe in the product and merchandising, and we’ve got a good reputation for a product that is very compatible to the engines people are driving today.”

**21 Billion** gallons of advanced biofuel to be used in the US by 2022 through RFS-2\*

*\*Renewable Fuel Standard*

# There are government fleets and businesses with sustainability & emissions goals, biodiesel can help

**T**he biodiesel industry passed a major milestone on May 1, 2018 when fuel retailers throughout Minnesota began dispensing B20.

Minnesota's statewide standard, which calls for B5 in the winter months and B20 in the summer, is the fruit of nearly two decades of labor by the Minnesota Soybean Growers Association and its allied confederation of farmers, lawmakers and associations.

The journey began in the 1990s with the sale of packaged biodiesel fuel additives and progressed through many stages, with plenty of hard-fought battles along the way.

Of the many biodiesel advocates in the fray, one Minnesotan has worked steadfastly year after year since 1999. Mike Youngerberg, Senior Director of Product Development and Commercialization for the Minnesota Soybean Growers Association, was at the front lines when the first requirement was proposed in 2002, and he remains a driving force as B20 becomes Minnesota's standard summer fuel. The National Biodiesel Board (NBB) this year honored Youngerberg with its *Eye on Biodiesel Impact* award.

The "Minnesota miracle" was conceived during a dark era for soybean farmers in the years surrounding the

Millennium. Farmers were already struggling to sell oil when the U.S. Food and Drug Administration (FDA) began its campaign against hydrogenated oils and other "transfats." Suddenly, the market for soy frying oil dried up, and the soybean growers were left to search for a new, high-volume market. The National

a major opportunity in diesel fuel and began researching opportunities.

In Minnesota, the first fuel-related success was the creation of a packaged biodiesel fuel additive. "You could sell it in a small jug. It was mostly soy methyl ester and some additive that you could just dump into your pickup tank or tractor tank, and it would treat about 50 gallons of fuel," Youngerberg explained. "We started with that product and it was a huge success. We promoted the heck out of, 'Put some soy additive in your fuel. It's good for lubricity.' Then one of the petroleum companies in Minnesota said, 'Hey, that's such a great deal, how about we just start adding that automatically to the fuel, and we can sell that like crazy,' and they did."

That modest success led some farmers to float a far more radical idea: a state biodiesel mandate. The NBB had already worked with ASTM to create a biodiesel specification, and supply seemed strong enough, so Youngerberg found some legislators willing to sponsor a bill and got the ball rolling. "Little did we know how long and arduous an effort that was going to be," he said.

The legislative journey began with a string of hearings, where Youngerberg and association lobbyist Jerry Schoenfeld



**Mike Youngerberg**  
Sr. Director of Product Development  
& Commercialization  
Minnesota Soybean Growers Association

Soy Diesel Development Board, which was the predecessor of the NBB, saw



# 2.4 Billion

dollars in wages paid to biodiesel industry workers annually

quickly learned what they were up against. “The opposition came out of the woodwork: the petroleum industry, the trucking industry, school buses, the mining industry,” he said. “Everybody in the world seemed to be against us.” The environmental community looked favorably on biodiesel, but the proposed blend rate of 2% didn’t generate much enthusiasm. “If we’d have gone right to B20, I think the Sierra Club would have supported us,” Youngerberg said.

The state legislature finally passed the first biodiesel standard in 2002, but then-Governor Jesse Ventura wouldn’t sign it. He was supportive of biodiesel but reluctant to implement a blending mandate and he let the law take effect without his signature.

Passage of the law did not trigger implementation right away because the new law required that in-state production must first account for at least 50% of the 16 million biodiesel gallons that would be required. Producers hustled to bring 8 million gallons of capacity online, and on September 9, 2005, the state finally enacted the B2 standard.

The plan was always to ramp up from B2 to higher levels, but it wasn’t until Tim Pawlenty was elected governor that biodiesel adoption accelerated. He signed bills that called for B5 to be used in winter months starting in 2009, with B10 being used in summer months as of 2012, and B20 in summer as of 2015.

Even with those legislative victories in hand, the soybean association had

to continue fighting off challenges. The new laws required that the fuel delivery infrastructure be biodiesel-ready in all parts of the state before the new blend levels took effect.

The state had seen enough foot-dragging by then. “Last year we had two bills in the legislature to delay the B20 again, because the infrastructure guys said they weren’t ready,” Youngerberg explained. “It’s a credit to our governor and legislature that they said, ‘Hey, it’s been on the books since 2008,’ and they basically rejected any attempt to delay the implementation.”

Youngerberg sees the mandate as more effective than alternative policy approaches. “Mandates are hard to get, but we have watched states with incentive programs struggle at times with funding. Some of those measures have been repealed, or the state couldn’t fund the program, so you’re always at the

mercy of what the state budget is going to do. With a mandate you don’t have to deal with that, but you may have people coming after it every year.”

He believes the sustainability movement will create some good opportunities for biodiesel in the years ahead. “There are government fleets and businesses that have sustainability and emissions goals and biodiesel can help. People are looking for ways to hit their targets and there is only so much you can do with E85,” he said.

Minnesota has achieved its biodiesel miracle, and soybean acreage might exceed corn acreage for the first time ever in 2018. The soybean advocates can never rest on their laurels though. “It seems that in every legislative session, you have to be at the state capitol because there always are attempts to delay it or push it off,” he said.

Besides being an alternative fuel to petroleum diesel, biodiesel offers a number of health benefits. The U.S. EPA recognizes biodiesel as the only advanced biofuel for its ability to reduce greenhouse gas emissions by more than 50 percent. In Minnesota, using B20 in the summer and B5 in the winter has an effect equal to removing the emissions from nearly 202,000 vehicles from the roads each year.

B0



B5

96K



B10

128K



B20

201K (estimated)



Equivalent vehicles removed annually using biodiesel blends in Minnesota is like removing vehicles from our roads.



# BIODIESEL SHORT STORIES

Made from an increasingly diverse mix of resources such as recycled cooking oil, soybean oil and animal fats, biodiesel is a renewable, clean-burning diesel replacement that can be used in existing diesel engines and heating appliances\* without modification. It is the nation's first domestically produced, commercially available advanced biofuel.



## “BIO” HEATING

Biodiesel isn't just for vehicles – it can also heat homes and buildings. Most often used in the Northeast as a blended product, called Bioheat®, the National Oilheat Research Alliance has an aggressive goal of completely replacing petroleum-based heating oil with B100 Bioheat by the year 2050.

\* Bioheat® Fuel



## THE SEVEN SEAS

A blend of 20 percent biodiesel fueled a one-of-a-kind ship with a special mission during a 2016 voyage from New England-to-Florida-to-Cuba. The 200-foot Sailing School Vessel, Oliver Hazard Perry, took on 6,000 gallons of B20 at Newport Shipyard in Newport, Rhode Island. Newport Biodiesel supplied the fuel for the unique journey.



## CLEAR SKIES

The last thing a hiker wants to encounter is a haze of smog that diminishes the view from atop a picturesque vista. With more than 11 million visitors annually, Great Smoky Mountains National Park first began using biodiesel blends in 2003, ramping up to using B20 to power 40 pieces of heavy equipment. Bioheat® is used to heat the park's headquarters building.



## SEATTLE GREEN

When it comes to reducing their carbon footprint, biodiesel is a municipal darling. This includes the queen of the green cities—the City of Seattle. The city’s Green Action Fleet Plan has a goal of reducing carbon emissions by more than 40 percent by 2020, and biodiesel is helping. Seattle now uses nearly 200,000 gallons of biodiesel per year in a 20 percent blend, and proactively educates other fleets interested in biodiesel.



## ON THE ROAD AGAIN

Legendary musician Willie Nelson helped propel biodiesel into becoming a household word in the early 2000s, using biodiesel in his tour bus, promoting its benefits in media interviews, and even having his own brand of fuel. In 2006, he was a keynote speaker at the National Biodiesel Conference and Expo in San Diego.



## COOL RUNNING

Jackson Hole Mountain Resort in Wyoming may be famous for its challenging terrain, an aerial tram and a lively base village, but behind the scenes, this popular ski and snowboarding resort relies on biodiesel. Blends power its fleet of snowcats and plows even when temperatures plunge to 30 below.



## BREATHE EASY

The American Lung Association in Illinois says that if you want to save money on health costs, use biodiesel! “Vehicles fueled with B20 biodiesel generate less harmful emissions that contribute to asthma, bronchitis, cardiovascular disease and other health ailments. Considering hospitalizations, lost work days and other health costs, using B20 saves an estimated \$1.22 million.



## “SUPER” SUSTAINABLE

The Philadelphia Eagles finally won their first Super Bowl, but biodiesel helps the team as an environmental winner. At Lincoln Financial Field, used cooking oil is recycled into biodiesel, which is then used to power the stadium’s lawn mowers. Sustainable efforts like this helped make Super Bowl 52 the first to reach zero waste.

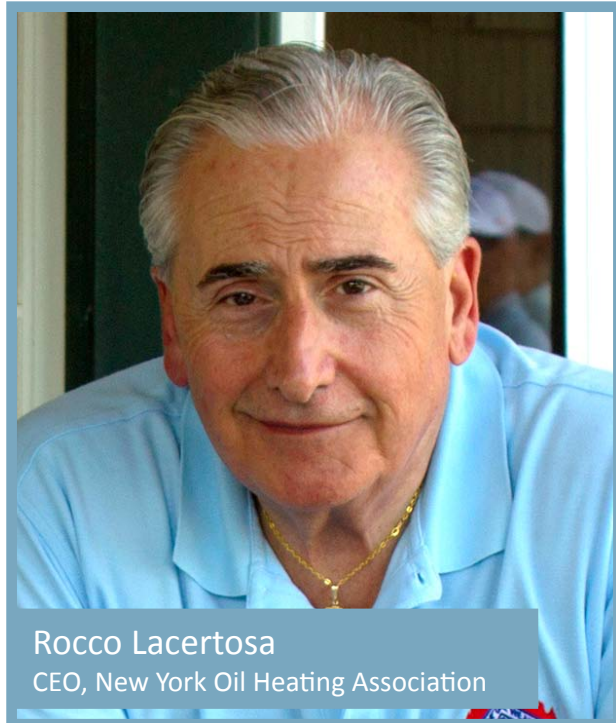


## RECORD SPEEDS

From motorcycles to pickup trucks, biodiesel has powered multiple land speed records. Using a mostly stock Ford F-250 pickup truck, Brent Hajek and his team in 2011 first achieved a record speed of 171.123 mph running on regular diesel. The team then filled the tank with the B20 biodiesel blend, and broke the record with a speed of 182 mph!



# The City wanted to clean up this environment, we found a way to do it



Rocco Lacertosa  
CEO, New York Oil Heating Association

Every movement needs its allies, and biodiesel has some of its most important backers in New York City.

The largest city in the United States has been a bold leader in biodiesel adoption, and one of the key players is the New York Oil Heating Association. NYOHA's Board of Directors and their Chief Executive Officer Rocco L. Lacertosa and his predecessor, John Maniscalco, have made the association an essential and vocal supporter of biodiesel blending.

"We exist to serve our members and incorporating biodiesel in heating oil has been an important part of our mission," Lacertosa said. "Energy suppliers need to be pro-environment these days, or you become a target instead of a participant."

With the heating oil dealers themselves stepping to the podium time and again and meeting with lawmakers to advocate for new fuel standards, New York's environmentalist policymakers have had the wind at their back.

The results have been phenomenal for the biodiesel industry. Since 2012, New York City has had made biodiesel part of its uniform fuel standard for heating oil, while also adopting biodiesel widely in fleets and setting the stage for Bioheat® adoption in three adjacent counties.

The breakthrough event occurred in 2010, when the New York City Council, led by Council Member James Gennaro, adopted legislation changing the city's heating oil standard to B2, effective in 2012. Given the enormous mass of New York's heating oil consumption, a 20-million gallon biodiesel market was born, and the biodiesel industry had its East Coast beachhead.

While the victory was an immense one, the biodiesel advocates at NYOHA and within the city government were just getting started. The first wave of biodiesel champions, Maniscalco and Gennaro, left the stage with their victories intact, and their mantle was picked up by Lacertosa and City Council Member Costa Constantinides.

In 2016, the City built on its B2 success story by passing the landmark local law Intro. 642-A, which changed the heating oil standard to B5 in 2017 and enacted incremental increases that will culminate in a B20 standard in 2034. The City also requires using B20 biodiesel in non-emergency vehicles (B5 in winter) like sanitation vehicles, and the police department is voluntarily using B10. There is a study under way of biodiesel usage in ferries. "This is a great victory for all New Yorkers and, of course, for our members," said Lacertosa.

NYOHA's successes were closely watched by heating oil dealers in the greater New York metro area, and in 2017, NYOHA's industry partners in the Downstate region led a drive at the Statehouse to make B5 the new fuel standard for Nassau, Suffolk, and Westchester counties effective later this year. Together with New York City, the region is home to 1.3 million oil-heated homes.

The switch to B5 in New York City alone raised biodiesel demand to 50 million gallons last year. As the adjacent counties come online and the City's biodiesel blend standard increases to B20, the biodiesel industry will have a concentrated market measured in hundreds of millions of gallons.

When NYOHA first emerged as the leading voice for biodiesel blending, its

**1.3 million** homes in New York  
will use a blend of biodiesel for heating



# “The more biodiesel we blend, the less carbon in the system, that can only help.”

members were, to some degree, acting in self-interest. Heating oil had a target on its back because environmentalists were pushing hard to reduce harmful emissions from the City. The long-running pursuit of cleaner air was converging with the emerging sentiment to make the city a leader in climate change, and petroleum was in the crosshairs.

Rather than sit back and let others decide their fate according to their petroleum-hostile agendas, NYOHA's leadership elected to push for a seat at the table. The association showed the region's environmental advocates that they could make great progress by addressing fuel quality instead of focusing exclusively on fuel conversion.

“The City wanted to clean up this environment, and we found this way to do it”, Lacertosa said. “We succeeded in positioning our dealers and their cleaner fuel as an important part of the solution. Bioheat® is a great way to improve the environmental performance of the equipment that is already in place at thousands of locations throughout the City.”

NYOHA successfully pursued two vital changes to fuel standards. One was blending biodiesel into the fuel, and the other was reducing the sulfur content. On-road diesel and other distillates were already in the process of converting over to ultra-low sulfur, as mandated by the U.S. Environmental Protection Agency (EPA), and the oil dealers saw an important opportunity. NYOHA and the state's other oilheat associations successfully pressed the state to make ultra-low sulfur (15 parts per million) the standard for heating oil statewide.

With both victories in hand, New York City became the home of what NYOHA called “Clean 2,” a one-of-a-kind ultra-low-sulfur Bioheat® Fuel blend that was the cleanest heating oil sold anywhere in the country.

“We are now the epicenter of this whole movement and we have built a great market for biodiesel,” Lacertosa said. “There was some hesitation in the beginning, but now everyone seems to have warmed up and embraced it,” he said.

Biodiesel suppliers have taken advantage of the Bioheat® standard to build out a robust infrastructure of terminals around the City. “As far as I know, no one has had any trouble securing biodiesel supply,” Lacertosa said. The city's legislation calls for waivers of biodiesel requirements in an emergency, and that option was invoked in the wake of Hurricane Sandy in 2012. “We were having trouble just getting diesel into New York Harbor at that time,” Lacertosa said.

Through its advocacy, NYOHA has gained an impressive list of political allies, such as the *National Resource Defense Council* (NRDC) and the *New York League of Conservation Voters*, who have welcomed the oil dealers' leadership on the environment.

NYOHA can never rest on its laurels, according to Lacertosa. “The mayor and the governor are no fans of fossil fuels, and we have our work cut out. But the more biodiesel we blend, the less carbon in the system, that can only help.”

The National Biodiesel Board (NBB) has supported NYOHA every step of the way and expressed its gratitude. In 2016, the Board honored Maniscalco with a *Biodiesel Pioneer* award, and last year Constantinides won a *Climate Leader* award from NBB.

“We have been trendsetters all along on biodiesel,” said Lacertosa. “I definitely see biodiesel continuing to grow, and it is great to be out front on this.”



## Biodiesel is an easy solution to becoming green

**H**arvard University strives to be a leader in sustainability among universities and institutions, and biodiesel is an important component of its clean energy portfolio.

The Cambridge, MA university has an Office of Sustainability that sets standards for the university and has published a 36-page guide for all departments to follow. Harvard President Drew Gilpin Faust tours the country and the world to talk about sustainability at universities and other institutions.

Harvard's attention to sustainable practices and greenhouse gas reduction spans all aspects of campus life, including the university's 300-vehicle fleet, which includes buses, cars, and work vehicles. Since 2004, the university has been running all its diesel vehicles on a B20 biodiesel blend, according to David Harris, Harvard's Director of Transit and Fleet Management. "Students like to

**D6751** ASTM's  
specification for neat biodiesel

know that the university is embracing sustainability and that the shuttle buses they ride are powered by biodiesel," he said. "Sustainability is an expected goal and practice."

The biodiesel program has earned the university recognition as a leader on the environment. In 2008, the National Biodiesel Board honored Harvard with an *Inspiration* award, and in 2016, the U.S. Environmental Protection Agency's Region 1 bestowed an *Environmental Merit* award on the university for its outstanding efforts in promoting New England's environment.

The Office of Sustainability is a fairly recent creation that grew out of Harvard's 2004 *Green Campus* initiative. During that initial push, Harris answered the call with a proposal to convert Harvard's 90 diesel-fueled vehicles to B20 biodiesel. The university green-lighted the project, and the fleet manager signed up World Energy and Dennis K. Burke as fueling partners.

"In 2004, biodiesel was not widely accepted," Harris said. "We started out using biodiesel in 55-gallon drums and putting it only in vehicles that were beyond their manufacturer's warranty, so that we couldn't be caught short. Once we had used biodiesel in a couple of shuttle buses for a while and validated that it did not pose any risks to the engines or to the fuel's cold flow properties, we made the calculated risk that we would use B20 in our university's vehicles."

The fleet department set up a 24-hour self-service biodiesel fueling station

with a 2,000-gallon dedicated outdoor tank, and quickly emerged as a leading biodiesel user in the region. World Energy supplied virgin stock vegetable oil at the outset to help Harvard comply with the ASTM standard that was recommended at the time by the National Biodiesel Board. Dennis K. Burke created the B20 blends.

"Back then we were looking for a fuel that was renewable and cleaner burning and we were looking to reduce our dependence on foreign oil," Harris explained. Before making the switch to B20, he had looked into compressed natural gas (CNG), which was the only competing option. "The infrastructure costs for CNG were too high," he said. "You would have to transition over and retrofit your equipment and facilities. It was certainly cost prohibitive."

"It was much more cost effective to go with biodiesel, because we already had diesel vehicles in our fleet, and we could source a cleaner-burning fuel that was renewable and helped reduce our dependence on foreign fuel. With Harvard preferring to be on the leading edge, whether in education or in the services provided, we certainly had the support of the university to look at these alternative fuels and build the fueling station."

He likes the way that biodiesel drops right into the diesel fleet fueling process. "Biodiesel is an easy solution to becoming



green,” he said. “You can use it in your heating oil and in your vehicles. You don’t have to buy new vehicles.”

In 2006, the *AltWheels* alternative fuel convention honored Harvard as the highest-volume biodiesel fleet in Massachusetts. Now the university is not even in the top 5 for the state. “That sort of tells a story about biodiesel gaining acceptance, and I like to think we’re a part of that,” Harris said. “It’s nice to think we helped raise the visibility and prove that it could be done.”

Harris has enjoyed sharing his experiences with fleet managers at other universities and institutions. Harvard has a lot to offer by way of

guidance, because the university not only fuels with biodiesel, but also performs its own vehicle maintenance. “There have been no problems at all,” Harris said. “I can count on one hand all the cold flow challenges we’ve had in 13 years, and they are not unlike what any diesel user would have. Engine problems have also been non-existent. Every vehicle we have procured or leased since 2004 has gone through its lifecycle without any mechanical challenges related to the use of biodiesel.”

By the end of 2014, Harvard had used a cumulative total of more than 1 million gallons of B20 fuel and continues to use about 100,000 gallons per year. Harris is pleased to use a

fuel that benefits the environment and economy in so many ways. “When you go to a biodiesel event and hear the farmers say how biodiesel gives them a market for soy oil beyond the cosmetics market, that’s great. Biodiesel supports a whole supply chain and creates jobs. It’s good for the country, and clean-burning, and it is part of why we are not so dependent on foreign oil. I hope it will continue to play a part on our energy independence.”

Harris would like to see biodiesel integrated into the fuel market as completely as ethanol is. “The only challenge that exists today is getting biodiesel in your fuel,” he said. “When you go to the pump in Massachusetts, you’re mandated to buy up to 10% ethanol, but you don’t have that kind of mandate for biodiesel, so retail availability of biodiesel remains very limited in the state. In most cases, you need to source it yourself and have your own dispensing facilities. To the extent you have to build your own fueling infrastructure, that’s probably the one challenge people face in trying to use more biodiesel.”

If he owned a diesel vehicle, he would like to be able to drive it coast to coast and find biodiesel at every filling station. “Even as we find cheaper ways to extract oil and become exporters of oil, we can still find a place for biodiesel, because it’s a sustainable fuel,” he said.

“It’s nice to think we helped raise the visibility and prove that it could be done.”



David Harris  
Director of Transit and Fleet Management, Harvard University



# Bioheat<sup>®</sup>, defense against natural gas

**B**iodiesel is an essential lifeline for Cubby Oil & Energy, a Massachusetts retail heating oil dealer that is locked in an existential struggle with natural gas utilities.

Heating oil was once the predominant heating fuel in Massachusetts, as it was in many Northeast states. Over the last three decades however, the region's utilities have used their financial advantages to capture market share by portraying natural gas as the "clean" alternative to "dirty" heating oil.

Serving homes and businesses within 30 miles of Boston, Cubby has watched the utilities eat into their market share, according to owner Charlie Uglietto. His strategy has been to accelerate blending biodiesel with petroleum heating oil, creating Bioheat<sup>®</sup> fuel, enabling Cubby to tell a winning story.

Cubby's journey to cleaner fuel began more than 10 years ago. "I initially adopted the inclusion of a proprietary fuel additive that helped mitigate unscheduled service calls. Several years later, I was introduced to the National Biodiesel Board's leadership; they were visiting New England to experience firsthand how biodiesel was having a positive impact on the heating oil community.

Following that meeting, I was entirely convinced that with biodiesel, which makes up the renewable component of Bioheat<sup>®</sup>, my family business, my customers and the industry at large would benefit greatly."



Charlie Uglietto

President, Cubby Oil

"I don't know how anyone could be in this business for a period of time and not realize that as an industry, if we don't transition to a greener fuel, we're just counting the days until we're no longer in business." "Either we're going to be legislated out of business or the industry as a whole is just going to become extinct. The idea that we are delivering a carbon-based fuel that is seen to destroy the environment and the equipment in which it is used, is not something that is going to sell for much longer."

At that time, Massachusetts was on the verge of enacting a mandate for blending 5% biodiesel into heating oil (which was never enacted) compelling Uglietto to "seize the opportunity before me." "I wanted to make the most of what a 5%

blend could deliver, then work on moving to higher and higher blends as time went on. It's no secret that the oilheat industry had been plagued with an ongoing public relations challenge and Bioheat<sup>®</sup> would be just the strategy to turn it all around—as it has at Cubby.

"The natural gas companies have been able to dictate the narrative so that we were always considered the worse fuel, the dirtier fuel. Obviously, they were extremely successful; they cut into our business by 30 to 40 percent in Massachusetts over the last 20-plus years. We wanted to jump out in front of it, and we changed the name to Bioheat<sup>®</sup> fuel, and now, years later we have Bioheat<sup>®</sup> Plus<sup>™</sup> and Bioheat<sup>®</sup> Super

Plus<sup>™</sup> referring to blends up to 100% biodiesel."

Consumer awareness of Bioheat<sup>®</sup> was minimal, so Cubby Oil made some noise. "We don't sell oil, we sell Bioheat<sup>®</sup>."

We started to educate our customers through our newsletters and everything else we could get our hands on about this new fuel that was better for the environment."

There were questions, such as whether the new fuel would work in existing heating systems, "but also it was embraced by many of our customers," he said. "They like that we're doing something more sustainable and that they didn't have to opt in. We've received

“If we don’t go to a greener fuel, then we’re basically just counting the days until we’re no longer in business.”

some good coverage from it, but we also wanted to impact change in how people viewed our fuel and services. “

“Initially, we applied Bioheat® logos on all four sides of every single truck and van and then added it to our stationery. We dedicated the front page of our spring and fall newsletters to share the positive attributes about the new fuel—bringing it up to people so that they would be aware of it. We also had our service technicians talk about it with homeowners every chance they had.”

Cubby began delivering a 20% blend (B20) to all customers in July 2016 and as of July 2018 the fuel they deliver is ultra low sulfur B20, which burns cleaner than natural gas. It improves combustion efficiency and extends service intervals by keeping heat exchangers virtually free of deposits.

In 2014, Massachusetts passed a law that added biodiesel to its *Alternative Energy Portfolio Standard* and made it eligible for *Alternative Energy Credits* (AECs) which are analogous to *Renewable Energy Credits* (RECs). Only biodiesel derived from waste vegetable oils, waste animal fats and grease trap waste qualifies and blends must have a minimum of 10% biofuel.

Ugletto said the waste-only requirement creates some supply challenges. “I give the state credit for wanting to commit to using waste as it is a good thing to keep it out of landfills and utilize it in a way that it would alleviate the negative issues associated with the heating oil of the past. They were not concerned about availability. They think the market will fill in as long as dealers like me are asking for it, but time will tell.”

Cubby purchases B99 from qualified producers and blends it in to qualify for available AECs. “We do treat our fuel as I mentioned earlier and since we kicked into the B20 blend, we have optimized the additives and worked on the cold-flow



protection of the fuel, that’s where you can see issues with the higher blends. However, we just endured a bitter cold December and January and we had only one tank that had a flow problem. It turned out the driver had not additized at the previous delivery.”

Maintenance issues have not increased with the move to higher blends. “I am more interested when we have a fuel pump issue now because of the stories we hear about pump seals leaking, but we have not had an increase in pump seals leaking, and that’s with a lot of customers using older equipment.”

He is testing higher blend levels in his own home. “I have confidence in B20 ultra low sulfur fuel and I’m just starting to introduce some higher blend levels to see what will happen. I went to a B60 blend and after three days, I had to make an adjustment to the burner. Now I know that a B60 blend is going to require equipment adjustments,” he said.

“There are restrictions if we are talking B100, but as an industry we have to push how far we can go with the product and see what housekeeping we’ll need to make sure our customers have working equipment,” he said. He has asked the National Oilheat Research Alliance to conduct additional testing and determine what measures are necessary to succeed with higher blend levels.

“We need to have legislators look at us as a fuel that will help them meet their greenhouse gas emissions goals while at the same time not being ‘non-renewable,’ like natural gas is.”

Ugletto is deeply committed to changing how customers think. “We still have gas conversions today, and it blows my mind that people will convert to gas,” he said. “We tell them straight up, ‘Fine, you want to pollute the environment? Go right ahead,’ but you’re not going to do that with Bioheat®, and certainly not with a B20 blend. “

“We talk to them and ask, ‘Have you ever walked through your neighborhood and smelled the gas leaking from the ground?’ It has happened 24 hours a day, seven days a week for years and it’s important that we continue to drive home that it is pollution. It doesn’t make a mess, but it is certainly contributing to the problems that we have. If we want to satisfy the Paris Accord in 2030 and 2050, we need to have a fuel that we can tell customers will help us get there.”

**D396** ASTM’s spec for neat heating oil and biodiesel blends

# Biodiesel helps schools be progressive

**T**he Medford, NJ school system originally switched its bus and vehicle fleet to a B20 biodiesel blend in 1997 in the pursuit of emissions reduction and the fuel has delivered beyond expectations, according to Joe Biluck, who recently retired as Director of Operations and Technology.

As the longest-running user of biodiesel among school districts nationwide, Medford has experienced direct improvements in fleet operations as well as many indirect benefits. The district has built goodwill in the community, created learning opportunities for students, bolstered pride among district staff, and even become a better magnet for educational talent.

The journey to biodiesel was long and circuitous. The genesis was Biluck's pursuit in 1990 of new ideas to improve fleet operations, starting with a system that would reduce the time spent changing the oil in the school's buses. This led him to a motor oil vendor, who facilitated an introduction to training specialist Wayne Johnson, who had helped bring alternative fuels in school bus fleets in Pennsylvania. Biluck was interested in the Pennsylvania program, and he reached out to energy officials in New Jersey to see if they wanted to test alternative fuel in bus fleets.

Biluck's original plan was to switch Medford's fleet to methanol, propane, or compressed natural gas (CNG), but state law prohibited the use of fuels other than gasoline and diesel in school buses.

The setback proved temporary, however, because Medford was now known to the state as a district interested

in alternative fuel, and in 1993, the state energy office reached out to see if Medford would be interested in being a pilot site for biodiesel. Medford had to pass on the state's first offer, because it was for new vehicles only, and Medford was not looking to replace its fleet.

The breakthrough finally came in 1996 when the state offered the district a \$115,000 grant to participate in a four-year program to test the performance of biodiesel blends in existing vehicles. Medford was an excellent candidate, because they had maintained meticulous records of fleet operations for the previous 10 years, which provided a solid baseline for data comparison.

There was a lot of preliminary work to do. The district needed to test its buses and divide them into a test group for biodiesel blends and a control group for straight diesel. Biluck inventoried the fleet and found he could divide vehicles of comparable age and engine type easily by simply assigning the even-numbered buses to the test group and the odd-numbered ones to the control group.

The district purchased and installed a new 4,000-gallon tank for biodiesel storage, and Biluck began seeking bids for the fuel. He had originally expected to purchase pure B100 biodiesel and blend it into diesel at the district's fleet facility, but the provider that the district chose, Twin River, said that the only way to ensure the consistency of the fuel blend quality was to blend the fuel prior to delivery.

In December 1997 Twin River (which later became World Energy), delivered its first load of B20 biodiesel to Medford's new tank. Based in Quincy, MA, Twin River would deliver two loads a week to



Joe Biluck

Director of Technology (retired),

Medford, which is located in south central New Jersey, about 15 miles east of Philadelphia.

Using biodiesel in a fleet might be no big deal today, but it was a different story in 1997. Biodiesel was largely unknown, and Biluck encountered some resistance from bus drivers, who did not like the idea of relying on an unproven fuel when they were driving buses full of school children in remote areas.

Nevertheless, the district put half its buses and vehicles on B20, and the positive results started piling up right away. Emissions testing showed that B20 was delivering notable reductions in emissions of particulate matter, hydrocarbon compounds, and NOx. The district also saw a \$0.02/mile reduction in operating costs, due primarily to reduced failure of exhaust systems and fuel injection systems. Cost savings also resulted from a reduction in engine vibration, which reduced the fatigue on engine mounts, mirror brackets and similar parts. Engines vibrated less because biodiesel has elevated oxygen content, Biluck said.

It did not take long for the bus drivers to come around. One driver who had expressed doubts about the fuel's reliability apologized and told Biluck about a student with pulmonary issues who seemed to tolerate the exhaust from the biodiesel-fueled buses much better than he had ever tolerated diesel exhaust fumes.





Medford, NJ School District

One area where biodiesel was initially disadvantaged was pricing. Medford could purchase traditional diesel fuel for \$0.55/gallon, while the biodiesel was priced at \$1.83. By 2016, however, biodiesel supplies and availability had improved, and the district was able to procure its biodiesel blends at the same price as ULSD. The \$0.02/vehicle mile reduction in operating costs led to savings of \$10,000 to \$12,000 from the use B20 blends, according to Biluck.

“It’s economically advantageous for the district. It is environmentally advantageous, and from an energy security perspective, you’re reducing your petroleum usage by 20%,” he said.

While the operational cost savings have been very beneficial, they are just the first chapter in Medford’s biodiesel success story. The district also enjoys great appreciation from the community for its commitment to the environment. “The feedback we have received from the community is that they are proud of the fact that the district is progressive. I was fortunate to work for a school board that expects their administrators to investigate progressive methods to improve their operations. It is part of the district’s DNA.”

The district’s success with biodiesel paved the way for more energy innovations. Medford outfitted four of its seven schools with geothermal heating and cooling systems and installed the state’s largest solar energy array. “The

economic benefits of those sustainability projects were huge in that we were able to release some \$300,000 of our operating budget and realign those funds to support the district’s educational goals,” Biluck said.

The district’s teachers use the biodiesel fueling facilities as a teaching tool to expose students to alternative energy adoption. “We have some fantastic opportunities to enhance our instructional environment,” he said. “We can use our fleet facilities as a lab to expose kids to career paths that they might not otherwise consider.”

Medford’s commitment to alternative energy makes the district a better workplace, according to Biluck. “People have a feeling of pride working in a district that encourages progressive thinking and not just doing the same old thing day after day.”

Medford’s students benefit directly, because the district has improved teacher retention, and it has an advantage in recruiting new talent. “Teachers want to be part of this program, and families do too,” Biluck said.

Biodiesel adoption had a few rough moments early on. The district ran into fuel plugging problems when, unbeknownst to them, a heat exchanger failed in a railway car that was delivering

“It is environmentally advantageous.... you’re reducing your petroleum usage by 20%”

biodiesel, and the cold fuel blended badly. The district used block heaters and fuel heaters to melt the solids and get the fuel flowing properly. Since that incident, he noted, biodiesel producers have begun using cold-filtering processes that reduce the incidence of solids falling out of the fuel, he said.

The district also learned about the importance of inspecting tanks before adding biodiesel. “We focused a lot more on tank maintenance, and that’s just good business. If you’re not maintaining your tanks now, you should be, because even at a blend as low as B2 or B5, biodiesel will dislodge contaminants, and you’ll get filter

**2.8 billion** gallons of biodiesel produced annually

plugging in your dispensing pumps. People want to blame the fuel, but the fuel is just revealing a preexisting problem in the tank. I always advise people to inspect their tanks before they introduce biodiesel.”

Given the success he has witnessed in Medford, Biluck hopes the federal government will strengthen its support of biodiesel. “I would like to see the *Renewable Fuel Standard* increase to allow the biodiesel market to expand beyond 2.2 billion gallons of annual production,” he said.

## Greenhouse gas reduction, better air quality, and a domestic, renewable fuel



Keith Kerman  
Deputy Commissioner Department of  
Citywide Administrative Services

New York City municipal fleet managers are deeply committed to sustainable, environmentally sound operations, and biodiesel plays a major role in reducing emissions from the city-owned vehicles.

Mayors Michael Bloomberg and Bill de Blasio and the New York City Council have passed a succession of laws to update fleet fuel standards. Current policy calls for B20 in non-emergency vehicles for most of the year, with a B5 standard in winter.

With the largest municipal fleet in the United States, the City is using its purchase power to help biodiesel gain a critical foothold on the East Coast, and it hopes to do the same for renewable diesel. New York also maintains a biodiesel standard for heating oil.

While policymakers are playing a critical role by encoding the biodiesel standards, it is the city's fleet managers who typically lead the charge, according

to Keith Kerman, Deputy Commissioner, Department of Citywide Administrative Services (DCAS).

For example, fleet managers have been experimenting with B20 usage in the winter for several years to learn what works and what doesn't. "We have used B20 successfully in the colder months," Kerman explained. "The real issue there is the mix, whether you mix with a D1 heavily winterized kind of kerosene fuel or what we call our winterized D2. When I was at the Parks Department in the late 2000s, we used B20 and D1 for the entire fleet over three consecutive winters, and it was very successful."

The City is well staffed to manage fuel blending. DCAS has its own Quality Assurance Bureau and the Fleets Division employs a fulltime PhD chemical engineer, Ramona Ledesma-Garrido. DCAS continues to study B20 and run pilots with B50 and B100. "We're confident we can use B20 year-round, but we're still looking at the best ways to do it," Kerman said.

Biodiesel adoption started in 2005, when the Parks and Recreation Department began pilot-testing fuel blends in some of its vehicles. Usage surged a few years later when the Sanitation Department, the municipality's largest consumer of diesel, piloted and then adopted B5. "Parks is the steward of the city's open spaces, and they were a very early adopter of hybrid vehicles," Kerman said. "They were always looking for ways to have their fleets represent their mission, and we got an opportunity to pilot biodiesel, via a donation. We first tested with garbage trucks on Staten Island using B100 for much of the summer, and it went very well. That really piqued our interest for all the reasons that people are interested in biodiesel: greenhouse gas reduction, better air quality emissions, and a domestic, renewable fuel."

In addition to biodiesel, the Parks Department uses hybrids, electric cars and even two solar-powered vehicles, and the clean-fuel commitment is promoted with decals and signage. The Department



64,000 green jobs supported by biodiesel

“New York is a world leader in biodiesel adoption and recently partnered with the City of London to share the benefits of its experiences.”

hosts an annual fleet and equipment event to showcase the alternative fuels and technologies it uses.

While Parks and Recreation was the early leader, “we have now seen that initiative move to all city agencies,” Kerman explained. As more departments came on board, the City began specifying biodiesel blends in its fuel contracts. By 2007, the City was already dispensing B20 in at some of its fueling stations and specifying B20 in fuel contracts.

Kerman appreciates the ease and economy of biodiesel. There is no need to change out vehicles or fueling

infrastructure. More than 150 types of vehicles and equipment use biodiesel blends in the New York City fleet, including garbage trucks, mowers, beach-cleaning equipment, tractors, light towers and generators.

Even with application in 11,000 vehicles, the City has experienced virtually no fuel related problems, according to Kerman. “Biodiesel has been environmentally positive, service-positive, and lately it has also been cost-positive,” Kerman said. “There has been no reason not to do it.”

The current mandate allows emergency departments to use straight petroleum

diesel, but some are voluntarily adopting biodiesel, such as the Police Department, which has opted for B10. It is critical that ambulance and police cars have no fuel related problems, and DCAS works with emergency fleet managers to help them gain comfort with biodiesel blends. “In every case the agencies started with B5 and as they have become more comfortable moved ahead,” Kerman said. “We spend the time to make sure we get it right.”

New York is a world leader in biodiesel adoption and recently partnered with the City of London to share the benefits of its experiences. “We’re looking to expand that,” Kerman explained. “We’ve been in discussion with a number of cities around the world to create a large fleet partnership.”

New Yorkers care about the environment, he noted. “They have elected mayors who promoted environmental stewardship, and the administration has worked with the City Council to enact environmental laws with near unanimity,” he said. “There has been a lot of support, and on the Bioheat® side, it’s not just city government that’s affected; all buildings are using Bioheat®.”





# Biodiesel has a seat at the table, and earns it

Carbon reduction matters to environmentally conscious consumers, and they will use their buying power to make it happen. If a fuel company can claim an 85% reduction in carbon intensity vs. petroleum, it stands to attract a lot of activist customers.

That is exactly the value proposition at SeSequential. The Eugene, OR-based biodiesel company is achieving an outstanding “carbon score” by collecting used cooking oil, refining it efficiently, and selling finished product to both wholesale and retail channels across a tight geographical footprint.

SeSequential is systematic about driving down carbon intensity, according to co-founder and CEO Tyson Kever. “Our feedstocks are 99.9% used cooking oils. We use B99 in our trucks. We have solar panels on the roof of our production facility, and we have really high yields and methanol recovery. We also have the greatest high-density concentration in the country of stations that sell B20 or above, so we have a really low carbon score on the delivery component.”

SeSequential now produces more than 8.4 million gallons a year and supplies 100 locations, but they started small.

“A bunch of guys got together in 1998 and formed a club called *Eugene Biosource*,” Kever explained. “We were home-brewing biodiesel in the garage, with a 55-gallon drum and a boat loader.”

In 2002, Kever co-founded SeSequential, using financing from friends and family. “We bought a truck and began delivering biodiesel to people’s



Tyson Kever  
CEO, SeSequential

homes in 55-gallon drums with little hand-cranked pumps,” he said. “We also did ‘parked retail,’ where we parked at a certain spot for four hours as a kind of mobile retail pump for people’s cars.”

SeSequential partnered with Pacific Biodiesel in 2005 to build a 1-million-gallon plant in Salem, OR. Then in 2008, they built a new, larger plant, and they have since tripled its capacity to 17 million gallons a year while also acquiring 15 cooking oil and rendering companies. “We now collect from the Mexican border to the Canadian border,” Kever said. “Our tagline has evolved to be, ‘Collect, refine, refuel,’ which reflects our model of vertical integration.”

The disciplined focus on reducing carbon intensity is a reflection of Kever’s nature. “This is the way I like to approach life. I got my degree in planning. My wife is a planner. We invest in good equipment. Our core values are innovation, relationships, results, and — one of my favorites — conscientiousness. We look at the big picture and build the company to last.”

Building the business has been a pleasure. “We’ve got a great team and a great community around us, and I think we are demonstrating that the economy and the environment can work together to create jobs and clean tailpipes,” he said. “I feel good about going to work every day.”

SeSequential is a BQ-9000 producer and marketer. “I was resistant to that at first, but going through the process has made us a better company and standardized a lot of our procedures. I think it is

incredibly important and has done a lot to advance the industry. Customers want to trust what they are buying, and BQ-9000 has helped resellers—the people who touch the fuel—with their handling of it.”

Oregon customers have come to appreciate SeQuential’s style. “We have spent a lot of time and energy trying to simplify the value proposition. We collect, refine and refuel and put that back in the tank and we tell a simple story about building a better energy model. A lot of consumers are searching out better choices, whether they’re buying direct carbon offsets, or a hybrid electric car, or paying for a solar installation on their house.”

Sequential has been trying to mirror the organic produce movement. “People are searching out organic food and the values that go with it, like sustainability and the health aspects. I think that same theory and mindset applies here, and that’s why biodiesel is such a compelling offering.”

Oregon is highly supportive of biodiesel, according to Keever. “The state has done a great job. Every gallon of diesel sold here has 5% biodiesel in it. That breaks down a lot of resistance from OEMs and the petroleum industry who were saying, ‘Oh no. You can’t go that high.’ Oregon is a cold state. We have a lot of regions that get down below zero for an extended period of time, and we have proved that it works.”

He believes the biodiesel industry can do more to market its products effectively. “We need to sell the molecule. We need to spend more time working on selling higher blends beyond B5, beyond B10 and really push for a B20 standard,” he said. “Biodiesel has 78% less CO<sub>2</sub> on average than petroleum diesel, and our product has 15% of the carbon intensity of that petroleum diesel! It’s a way better product, but we



need to do more as an industry to sell the molecule, push higher blends, get manufacturers on board, and get the traditional fuel distribution infrastructure more comfortable with higher blends.”

SeQuential enables wholesale customers to customize the fuel they buy. “We have a few terminal positions with inline rack blending, so we can offer any blend you want. We have a dozen or so pumps that offer B99 and blend down to B50 and B20 as the weather gets really cold.”

During winter, the company proactively adjusts its dispensers and works with wholesale customers to blend down their tanks. “We want to make it an easy process for them, and the best winterizing agent available now, unfortunately, is petroleum diesel.” Years of experience have shown SeQuential and its customers that B20 works well year-round, even in the dead of winter.

While winter blending is perfectly manageable, inconsistent federal biodiesel policy is highly problematic, according to Keever. “The disruptions to the *Renewable*

*Fuel Standard* and the biodiesel tax credit make it really hard to grow consistently. When you are trying to raise capital and you have a policy that is expired, that hurts our ability to get traditional financing. We need a longer-term horizon. If they really want to unleash the potential of the industry, the federal government needs to give us ten years of consistent policy.”

Keever sees an important role for biodiesel going forward. “Biodiesel isn’t the be-all and end-all, but it is a very good, logical next step. It is an available solution that works in our current infrastructure and vehicles today. It has immediate impact, and it’s a clear contributor as part of a comprehensive solution. In order to have a healthy, diversified energy supply, we need to look at all the different energy sources out there. Biodiesel has a seat at the table and earns it.”

**\$11.4 billion**  
biodiesel’s economic impact, 2016

# You get 3.5 units of energy out, for every one you put in

**H**ERO BX has enjoyed 10 great years as a biodiesel producer, and owner Pat Black is looking forward to many more. So strong is his belief in this young industry that he recently published a book, *The Biodiesel Solution*, to call attention to the enormous potential.

Black's biodiesel journey began in 2004 when he was shifting gears after a successful career in insurance and looking for a way to create good jobs in his hometown of Erie, PA. "Erie used to get 50 percent of its GDP from manufacturing, but that has fallen off as it has across the country. I wanted to build that back up, because the best-paying jobs with the most sustainable wages are in manufacturing."

He decided to pursue renewable energy production in either ethanol or biodiesel, and his research made the decision easy. "When you make biodiesel, you get more

than three and a half units of energy out for every unit you put in," he explained. "With ethanol, every unit you put in yields three-quarters of a unit. Biodiesel is a much more efficient process."

He launched Lake Erie Biofuels in 2004, built a plant from the ground up in Erie, and began production in November 2007 with a nameplate capacity of 45 million gallons per year. Lake Erie shipped its products to Europe at first, but then market conditions shifted between 2008 and 2010 with the imposition of tariffs in Europe, the passage of the federal *Renewable Fuel Standard 2* (RFS2), and Pennsylvania's enactment of a 2% biodiesel mandate for on-road diesel.

The newfound focus on the U.S. market led to several changes. The company revisited its branding and switched the name to HERO BX, and they retooled the Erie plant to increase feedstock versatility.

The RFS had created different classes of

obligated parties, including the petroleum giants such as Exxon-Mobil, Shell, Valero and Chevron. Those companies became major buyers of both biodiesel and biodiesel *Renewable Identification Numbers* (RINs). HERO BX also developed a strong clientele of truck stop operators and jobbers.

Between 2010 and 2015, the company focused on maximizing efficiency, which increased the capacity of the Erie plant to 50 million gallons a year. To better serve customers in the South, HERO BX also purchased a 15-million-gallon plant just south of Tuscaloosa, AL and retooled it.

In 2016, HERO BX made its first major investment outside the manufacturing space by purchasing a blending terminal operation in North Hampton, NH. The acquisition put HERO BX in the New England heating oil market, where marketers are adopting the blending of petroleum heating oil with biodiesel creating Bioheat® fuel as an environmentally friendly alternative to the pure petroleum product. The heating oil industry is committed to improving its product while ensuring its broad coalition of fuel dealers continue to enjoy a sustainable future. This is now possible with the advent of clean burning ultra-low sulfur heating oil blended with biodiesel, a fuel that is lower in greenhouse gas emissions and more aligned with policy decision makers' thinking.

To bring its proprietary product one step closer to its customers, HERO BX's New Hampshire facility offers electronic rack injection blending of biodiesel with heating oil using the Top Tech System MultiLoad II and TMS 6000 software. A card-based system, it enables dealers to select their preferred blend level for every truckload from presets that include B5, B10, B15, B20 and B80. The most popular



Pat Black  
Owner, HERO BX



choice is B20. "It allows retail dealers to walk the walk and say there is 20% biodiesel in the fuel," Black said. "And most importantly, it keeps them within the ASTM standard for heating oil blends."

HERO BX has worked to change the way its customers think about biodiesel feedstocks. While the fuel standards in Europe necessitate a virgin vegetable oil product, the U.S. market relies on ASTM specifications that can be achieved with a variety of feedstocks. HERO BX places the focus on the quality of the end product with its proprietary HBX-3000 standard, which is a fats and grease blend with a cloud point maximum of 9° C and a high cetane value. The company also offers HBX-1000, which is generally accepted as a winter blend transportation fuel to be used where colder ambient temperatures are prevalent, or where the product will be blended with a higher-cloud diesel fuel. HERO BX achieves consistent fuel quality as a BQ-9000 producer and encourages buyers to choose the product with the specification that matches their needs.

"Our plant runs on a multitude of feedstocks, which affords us the choice of purchasing the most economical products and creating fuel that is discounted against Soy Methyl Ester (SME)," Black said. "HBX-3000 has a higher cloud point than HBX-1000, but it makes a great blend stock for heating oil. In blends up to B10, it makes perfect bio-blends in all conditions."

HERO BX buys feedstocks in a daily spot market. "There are 15 different bio-feedstocks in the U.S., including used cooking oil, soybean oil, chicken fat and beef tallow. We use a mix, based on the specification of the fuel that the customer wants to buy."

Black believes in the social benefits of biodiesel. "We are making fuel out of byproducts that would otherwise be dumped in a landfill or poured down a drain," he said. In addition, biodiesel or biodiesel blends burn cleaner than straight petroleum diesel, and the biodiesel industry supports 64,000 workers nationwide while indirectly supporting contractors, logistics providers, and others. HERO BX itself employs about 100 people in Pennsylvania and Alabama



and is establishing a biodiesel research facility on the Erie campus of Penn State.

Black has been so impressed with the industry that he recently turned author and produced *The Biodiesel Solution: How Biodiesel Is Making a Difference for our Future*. "This industry is only 25 years old," he noted. "They struggled a lot in the early years, and I wanted to capture the story of the early pioneers and tell the story of what they went through to create this. The biodiesel industry has made some large strides already, such as having the City Council of New York create a biodiesel requirement for heating oil."

The accomplishments are notable, but Black says the industry has just scratched the surface. "The sky is the limit for biodiesel. Obviously, we can use more domestically, starting with the airline industry, which has not yet dealt with the pollution from their vehicles."

With their strong focus on solar and wind power, many green energy advocates are overlooking the great opportunity available by displacing petroleum diesel with cleaner-burning biodiesel. "There is a whole different model that could be in play," he said. "Considering how much diesel is produced in the U.S. each year, if we could just get up to 20% of the market, that would be a huge jump from where we are now."

He believes growth has been stunted by stop-and-go renewable energy policy that creates uncertainty and discourages

investors. The biodiesel blender's tax credit has expired four times in eight years, and there have been repeated delays in U.S. Environmental Protection Agency's announcement of the annual *Renewable Volume Obligation (RVO)*.

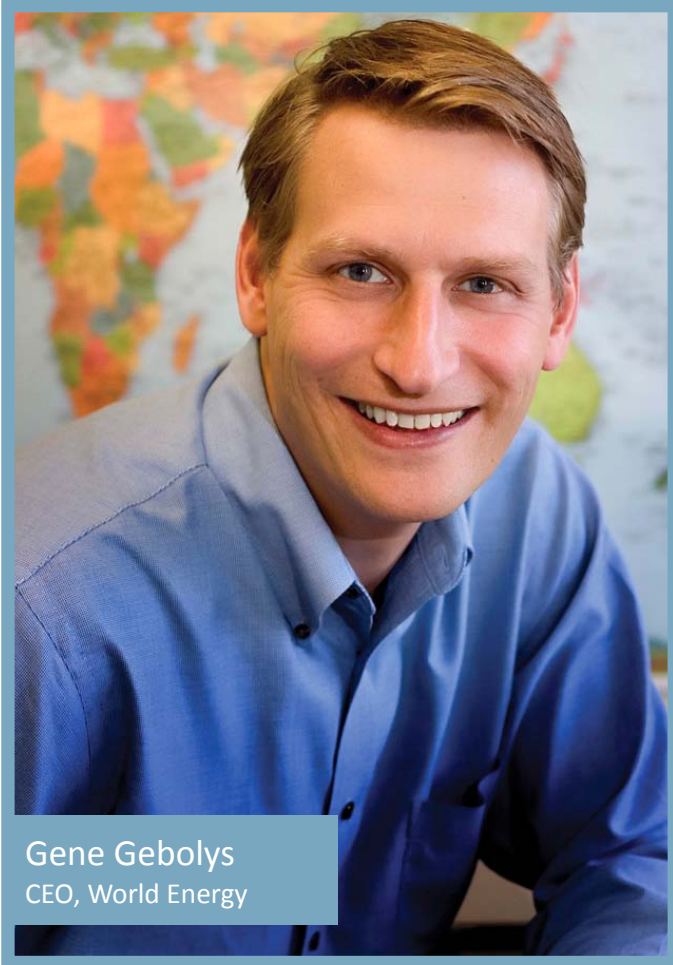
"The biodiesel industry is made up of entrepreneurs and innovators," Black said. "We just need to have clarity on whatever the rules are so that we can run our businesses. Attracting outside capital for increased growth is extremely difficult, as banks and equity partners are not completely understanding of the risks associated with lapsing credits and unknown mandates."

**2003** the term  
"Bioheat<sup>®</sup>" comes into existence

Policy makers could make a big difference. "A multi-year credit program would be enormously helpful in attracting new investment to spur expansion in the industry. The clarity provided by a multi-year package would allow financial folks to model returns more accurately, based on a level and known playing field. This would, in turn, give EPA the necessary information to predict and postulate future RVO levels on a timelier basis."

There are obstacles, to be sure, but Black is undeterred. "If there are no challenges in life, you don't get anywhere. Biodiesel offers important benefits that are worth pursuing as a nation."

# Are we better off using more fossil fuel? No



Gene Gebolys  
CEO, World Energy

Energy now operates seven manufacturing facilities, including recent purchases of a renewable diesel facility in California and two biodiesel plants in Ontario, Canada.

The company's journey mirrors the evolution of the biodiesel industry. "When we started there was no market, so half the first decade was spent not only creating a market but creating a reason for there to be a market," he explained.

"The biggest thing in the early development of the industry was trying to sell biodiesel to fuel suppliers so that they would deliver it to their fleets. Not surprisingly, none of them wanted to buy it, so we had to go and sell it to the fleets and

then buy what the fuel dealers supplied, which was hauling and input and then sell downstream to fleets."

World Energy was acquiring end-use customers and serving them from a network of distribution outlets around the country. "We were very focused on a direct customer interface and getting folks that had never heard of biodiesel to specify it in their fuel requirements."

The arrival of the biodiesel tax credit in 2005 ushered in a new market dynamic.

"The tax credit gave us a competitive advantage in Europe, so the business became one of international trade," Gebolys said. "Then once the *Renewable Fuel Standard* (RFS) was phased in around 2010, we had a standard-driven market for the first time. This showed promise that manufacturing of biodiesel would be required. It was in the transition in 2008 and 2009 that we started to lay the groundwork for what we now are, and we continue to transition today. We are kind of coming full circle, where the downstream distribution and delivery all the way into fleet applications are again emerging as key components of success in this business."

World Energy has learned to cope with the idiosyncrasies of biodiesel financing. "Because of the risk profile in this relatively complicated industry, it may be better suited to nontraditional, higher-risk capital rather than more mature capital," he said. "This is a very difficult industry to explain to a financier. With the uncertainty around the tax credit, many traditional financiers run for the hills. If we had more predictable, projectable growth, you would start to see more and more capital coming in to the space, and with that the cost of capital would get cheaper and cheaper."

The financial challenges make it hard to put together an efficient operation that extends from manufacturing to distribution, Gebolys said. "On the one hand, it's a serious obstacle, but on the other hand it's a real opportunity. If you are able to put together higher-risk, higher-reward capital, you can get to scale and efficiency that are hard to achieve otherwise." He noted that most of World Energy's manufacturing facilities are acquisitions that were built by others.

**W**orld Energy has solidified its standing as the second largest biodiesel producer in North America by looking ahead and changing with the times.

"I have been in many different businesses over the last 20 years," said founder and CEO Gene Gebolys. The company got its start in Quincy, MA, in 1998 when he purchased the biodiesel division of Twin River Technologies on maxed-out credit cards. World

“At some point, you have to achieve closer cooperation between biofuel suppliers and petroleum suppliers, and then we can start to sketch out a joint vision for the future.”

“The two largest players in the space really weren’t plant builders. They were plant acquirers,” he said.

Through good days and bad, Gebolys has maintained a strong belief in the future of biodiesel. “I don’t think we’re going back to a pure fossil fuel world. There is a greater and greater awareness of the need to move towards cleaner, more renewable sources of convective energy. Biodiesel is very important in the diesel side of the equation. As the leading advanced renewable energy in America, biodiesel is really at the forefront of where growth is going to happen.”

Biodiesel’s growth is tightly tied to pipeline access, and the future looks bright now that ASTM has revised the jet fuel specification to allow up to 50 parts per million (ppm) of biodiesel in jet fuel. The former limit of 5 ppm had forced shippers to keep biodiesel blends out of pipelines that also shipped jet fuel.

“Pipelines are by far the most efficient way to move fuels from one point to the other,” Gebolys said. “Biodiesel really has not been moving by pipeline in any significant way throughout its history. Now pipeline shippers are increasingly looking at shipments up to B5 in the mainstream pipelines of the country. As that effort continues to progress, we will be in a dramatically different spot where we can move biodiesel as efficiently as we move diesel fuel.”

Pipeline shipments can dramatically reduce biodiesel cost, he said. “If you can get 25 cents per gallon taken out of your costs, you can really change the industry. It took a long time to get here, but this is about to become a very important

part of the emergence of this industry.” World Energy is poised to capitalize on the pipeline opportunity with a plant in Galena Park, TX connects to a Kinder Morgan pipeline.

Biodiesel blending is poised to shift from a source of economic advantage for some suppliers to an economic necessity, according to Gebolys. “It’s binary. There is some point at which adoption of moving B5 in pipelines is something you just have to do to keep pace. Biodiesel always trades, net of RINS and net of tax credits, at a discount to heating oil, so if you can move product up the pipe that has the discounted materials blended in at its origination points, that’s an opportunity. But if the competitor is doing it every day, at that point it becomes ubiquitous. Nobody is worried about what they might gain; they stress out over what they might lose.”

That change has already happened at truck stops, Gebolys notes. “If you’re a truck stop operator in the United States and you have not maximized biodiesel blends in your fuel, you’re just marking time until someone buys you.” Trucks stops in the south are already maxing-out at B20 six months a year.

“I don’t think we’re going to be B20 everywhere all the time, because you have seasonal, logistics and supply chain constraints, but I think we’re going to be pretty standard B5 virtually everywhere, and in a 60-billion-gallon distillate market, that’s 3 billion gallons a year, with a fair amount of blending up to B20 beyond that. Certainly, an on-average B10 market is within our sights in the foreseeable future.”

While the future looks bright, Gebolys doesn’t think it will be easy. Big petroleum has fought hard to guard its market share, but he believes renewable energy has secured its place in the world economy. “Are we better off using more fossil fuel? No. So they are arguing for their own benefits, and that’s fine, but we just shouldn’t be hoodwinked to thinking that is a wise thing for society to do.”

The debate has been particularly pitched in 2018, with some politicians stoking a passion for annihilation of the RFS and the biofuels industry. “I think the outcomes will soon provide clarity about where we go from here. It’s becoming

**B5** the blend adopted into Grade No. 1 and No. 2 heating oils

increasingly clear that we’re just not going back to a world where we don’t put renewable fuel into our fossil fuel. If we are going to grow the concept of renewable fuel in our fuel supply, the question becomes how do we do it most efficiently.

“It is not efficient to have constant policy squabbles, because then you can only attract the most expensive capital. At some point, you have to achieve closer cooperation between biofuel suppliers and petroleum suppliers, and then we can start to sketch out a joint vision for the future,” he said. “I really do think we’re going to get to a better place.”



# We switched to biodiesel and never looked back



Timothy Fitzgerald  
Director Fleet Management, DC Water

That is the sentiment of Timothy Fitzgerald, Director of Fleets, DC Water, the water and sewer authority for the nation's capital.

More than 672,000 residents, 17.8 million annual visitors, and 700,000 people who are employed in the District of Columbia count on DC Water. The agency maintains infrastructure above and below ground.

Fitzgerald has worked to make biodiesel an important part of DC Water's environmental stewardship, and he believes the fuel has a great future that includes applications of pure biodiesel. "Let's

forge ahead with it and move it into the next millennium, but let's involve the kids, then we'll have a gift that keeps on giving," he said.

DC Water uses biodiesel blends in about 75 vehicles as well as stationary equipment such as generators, compressors and cement mixers.

Fitzgerald and his colleagues have taken their transition from diesel to biodiesel very seriously.

Most engines made the transition seamlessly. They have also reached

out to engine manufacturers to make sure that they choose engines that support biodiesel and that they heed the OEMs' recommendations. Along the way, DC Water and other agencies have influenced OEMs to accommodate their preference for cleaner fuels, according to Fitzgerald.

"There used to be a fear (around biodiesel usage)," said Fitzgerald. "You know, I'm not going to put my job on the line and take this \$300,000 or \$400,000 piece of equipment and introduce a unproven fuel to it. But now we are at the point where the OEMs are taking off with the cleaner fuels. They have listened to us."

With blends from B5 to B20 in use, DC Water avoided using nearly 15,000 gallons of petroleum diesel during one recent 12-month span. Protecting the environment is part of the culture at DC Water. "We're an environmentally friendly agency," Fitzgerald said. "We make sure we are conscious about what we're using and how, in terms of choosing cleaner fuels and making better use of fuels."

The agency's current CEO and his predecessor are thought leaders, according to the Fleet Director. "They have put an emphasis on this, making sure we are driving in the right direction in terms of environmental leadership. We want to be more than a government authority. We are a conscious authority, and we want to be a formidable force for the betterment of our citizens and our children. We're

"I'm glad to see biodiesel is finally getting the respect it deserves. It just makes sense. We switched to biodiesel and have never looked back. It can be used in existing diesel engines, reduces emissions, and our drivers notice a big difference in fumes."

160°C the flash point of most biodiesel

“Biodiesel plays a significant role because it is a viable, energetic fuel, and when we use it, we don’t have to use as much of the other fuels. It’s a win-win for everyone.”

not a sexy fortune 100 company, but our choices mean just as much. If we don’t do it in Washington D.C., where else are we going to do it?”

The authority’s other sustainability efforts include the promotion of clean waterways and the reduction of combined sewer overflows. Working with the D.C. Department of Transportation, the authority has installed permeable pavement that minimizes storm runoff into the combined sewer system.

DC Water started using biodiesel in 2009 on its own initiative, but not before checking with the manufacturers of the engines they were using. The authority also needed to secure the cooperation of the city government as it buys all its fuel from the city. “We had to make sure they had the infrastructure in place,” he said.

DC Water adjusts its fuel blends based on the weather and equipment type, Fitzgerald explained, and they have never experienced any problems with biodiesel fuel quality.

The performance of their vehicles and equipment is carefully monitored. “We look at the performance, efficiency and longevity on an ongoing basis. Since introducing biodiesel, we have seen no negative impact and in fact, often improvements.

“Biodiesel plays a significant role because it is a viable, energetic fuel, and when we use it, we don’t have to use as much of the other fuels,” he said. “It’s a win-win for everyone.”



Ron S. Flowers, President, RK Solutions LLC with Timothy Fitzgerald

# Biodiesel really fits right into what we do, we are a very green company

**F**lorida Power & Light Company embraces environmental stewardship as a core value, and they have used biodiesel regularly for nearly 20 years – one vital component of their corporate responsibility strategy.

The utility is a subsidiary of NextEra Energy, which is the world’s largest

producer of renewable power from wind and solar, and it powers its entire fleet of diesel vehicles and equipment with biodiesel blends.

Patti Earley, FPL’s Fleet Fuels Operations Specialist, manages fuel for 3,900 vehicles that serve and support 4.9 million customer accounts in 35 counties. “Biodiesel really fits right in to what we do,” she said. “We are a very green company.”

Biodiesel helps FPL meet its alternative energy commitments under the Energy Policy Act (EPAAct) by reducing petroleum consumption in vehicles. Through its use of electric, hybrid and biodiesel vehicles, the utility avoided using 690,000 gallons of petroleum fuel in 2017 and reduced CO<sub>2</sub> emissions by 6,700 tons. More than half of those benefits were achieved with biodiesel. “We over-comply every year by a large number because of the amount of bio we burn,” she said. FPL promotes its green fuel policies with messaging on its trucks and storage tanks.

The biodiesel program began quietly in 1999, when the utility authorized its wet-hose fuel supplier to begin filling many diesel vehicles and pieces of equipment with B20. The utility did not alert employees to the change but tracked maintenance records over a six-month period. No issues were detected, and employees reported no performance changes, so the utility made the switch official, and they have been using biodiesel blends fleet-wide ever since.

Due to the 2004 hurricane season, the utility decided it needed its own fuel storage because of shortages that hurricanes have caused. The fleet department leased a 2-million gallon tank in Miami to store their diesel before refurbishing a 4-million gallon tank about four years ago. “Last year when Irma hit, we had 3.3 million gallons in it. We keep it at that level during storm season, because there are extreme fuel shortages in a hurricane. Having the fuel on hand insures our restoration isn’t delayed because we can’t find fuel,” she said.

Earley said the fleet has used blends up to B35 with no problem but has now standardized at B20 so that it can maintain a consistent standard across all operations. FPL started as a biodiesel customer only but eventually became a purveyor. “We do a lot of outreach through the *Clean Cities* program and to municipalities across the state,” she said. “After a number of these presentations, municipal officials would ask if they could buy from us.”



**Patti Earley**  
Fleet Fuels Operations Specialist  
Florida Power & Light





In the interest of expanding biodiesel usage, the utility now sells biodiesel blends under their own *Earth Era* brand.

Earley appreciates the simplicity of FPL's fuel program. "The great thing about biodiesel is it is a drop-in fuel. You don't make any changes to fixed fuel sites or changes to the transport equipment. You don't have to make any changes to the equipment it is being pumped into. If one of our trucks needs to go to a filling station and get straight ultra low sulfur diesel and then go back to B20 when we fill it the next time, it doesn't matter."

That flexibility is particularly valuable in utility work, because repair crews and equipment travel across the country to provide mutual aid in the event of hurricanes and other catastrophes. They switch from straight diesel to biodiesel blends depending on where they are and

they cannot afford to have fuel-related issues. "When Hurricane Irma hit last year, we had a workforce of 28,000 restoring power to customers. We had over 150 pieces of fueling equipment doing 14,000 fuel transactions a night and many of those vehicles were burning B20 with no issues, she said.

The utility also hauled biodiesel blends in fuel transports to New Jersey during the *Super Storm Sandy* restoration in 2012. "We pumped it into vehicles from a number of other utilities and there were no issues, even in the cold."

FPL is particular about the specifications of its fuel. "We buy fuel at ASTM spec, but there are some parameters we require a tighter standard on, including glycerin, acid and oxidation stability, because we have hot, humid conditions," she explained. The utility works with local biodiesel producers

whenever possible but they also bring B99 into the state by rail.

The utility has a new fuel facility coming on line in Port Everglades with a B99 tank, an ultra low sulfur diesel tank and injection blending equipment. "This facility will give us the ability to easily change the blend level in our fuel," she said.

"The great thing about biodiesel is it is a drop-in fuel. You don't make any changes to fixed fuel sites or changes to the transport equipment."



**32lbs** protein produced for each gallon of biodiesel

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# Biodiesel

## SUCCESS STORIES



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