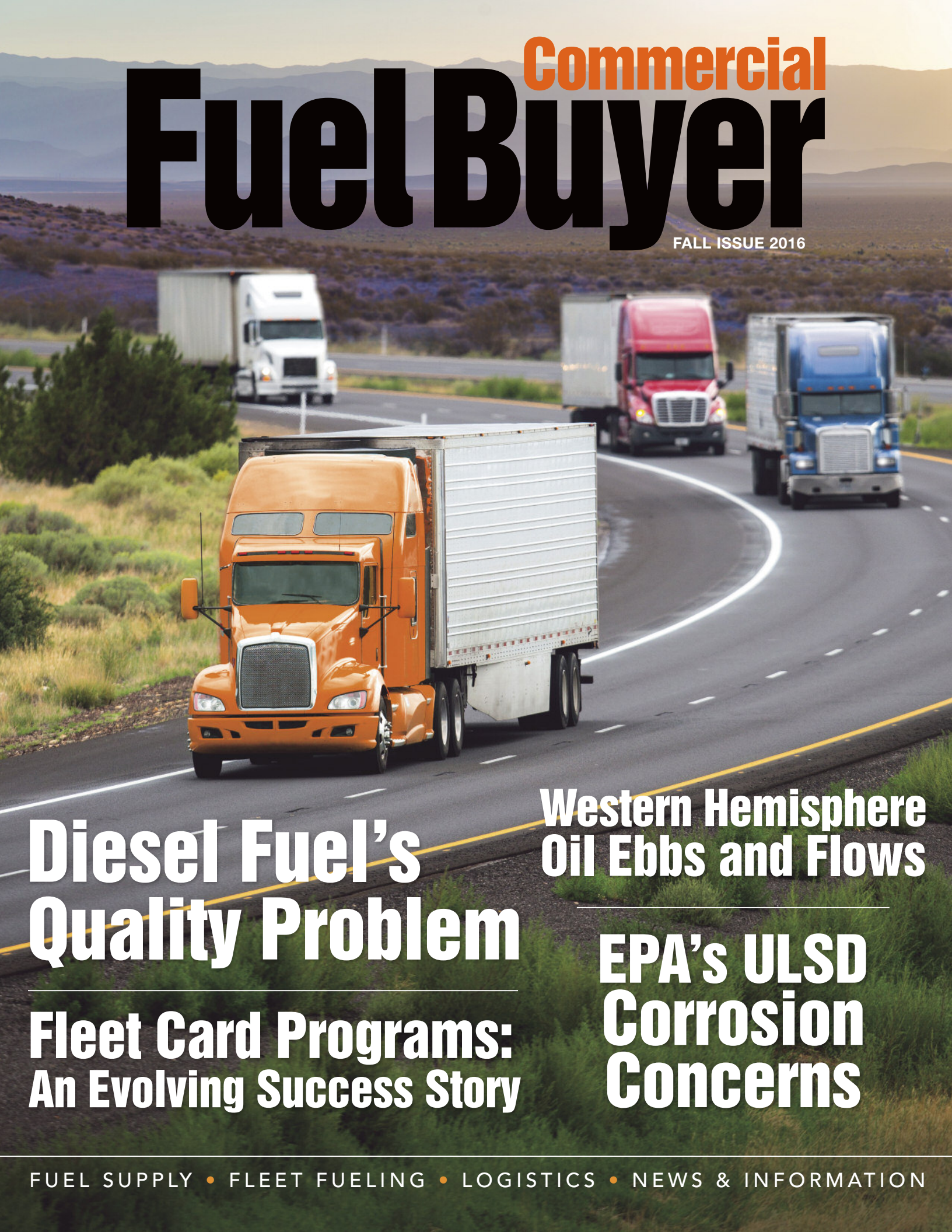

Commercial Fuel Buyer

FALL ISSUE 2016

Diesel Fuel's Quality Problem

Western Hemisphere Oil Ebbs and Flows

Fleet Card Programs: An Evolving Success Story

EPA's ULSD Corrosion Concerns

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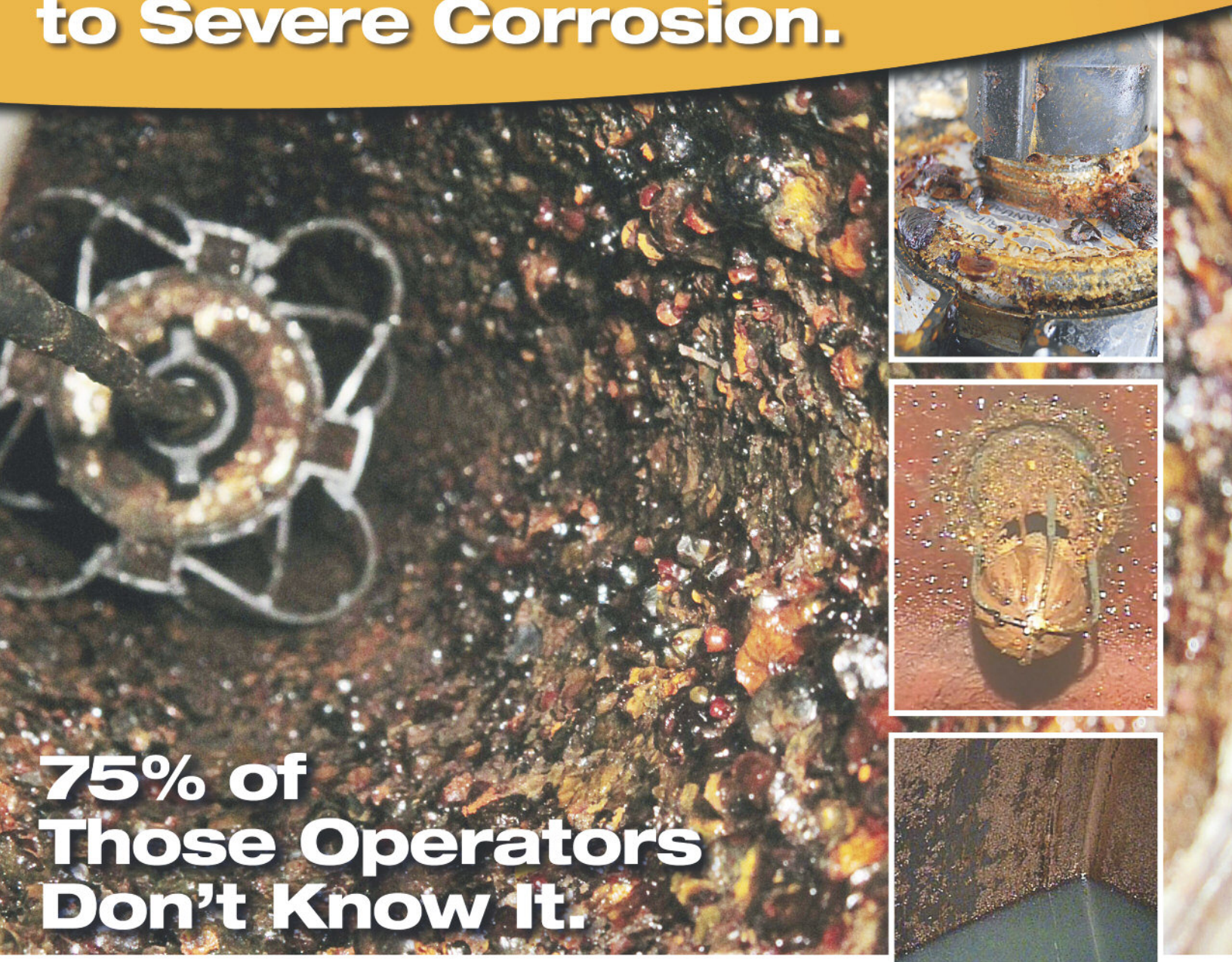
EPA STUDY: 83% of Diesel UST Systems Have Moderate to Severe Corrosion.



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A note from

Gary Bevers, Group Publisher

Welcome to the inaugural print issue of *Commercial Fuel Buyer* magazine, a sister publication to *Fuel Marketer News*. Since fuel spend is typically the second largest operational cost for a commercial industrial transportation management company, we felt the market was long overdue for a publication specifically focused on your industry's needs. Whether backyard tank or mobile fueling, over the road fleet fueling at truck stops, card locks and retail outlets that accept fleet cards, we will cover it all—helping you to better manage your fuel spend and control operational costs in a volatile fuel market.

If it burns, combusts or powers a motor, we intend to cover the news that is relevant to the downstream motor fuels marketplace. And that includes alternative energy sources such as biofuels, compressed natural gas (CNG), hydrogen and, yes, even electricity if it is "pumped" into a vehicle or motorized piece of equipment. If you study history, then you already know that the first automobile was powered by an electric motor, with biodiesel as a viable fuel quickly following. Ford's Model T was originally designed to run on ethanol until prohibition put an end to his dream to circumvent Major Oil's monopoly on petroleum refining and gasoline production. So, in the world of automobiles, trucks, motorized equipment and fuel, there is very little new under the sun.

Previously, I had the privilege of serving as the Publisher of *National Petroleum News*, which was founded over a century ago. It started its news coverage of the petroleum industry when kerosene was the dominate money-making refined product, and gasoline was pretty much a discard from the product stream as it had no commercial value. In some ways, the petroleum industry has come a long way, and in others, it has hardly changed at all. We still deliver a tremendous amount of fuel into small tanks by tank wagons, though they are no longer pulled by horses. We still measure 42 gallons of crude to the barrel, not 55 like the standard barrel measurement. We finally stopped hedging off heating oil for transportation fuels. And though retail gasoline and diesel are now delivered through convenience stores and truck stops, not gas stations, they are still dominated by independent dealers and jobber-owned outlets.

At *Commercial Fuel Buyer*, we pride ourselves on extensively covering all the news you need to run your fleet fueling operations and the buying and handling of all types of fuels. We strive to serve the motor fuels market through providing timely, relevant industry news, in-depth feature articles, thought leader analysis and educational events. Through our data and analytics division, we will also be delivering daily retail and wholesale motor fuels pricing.

In this issue, we will cover everything from diesel fuel quality to feet card programs to ultra-low-sulfur diesel (ULSD) corrosion, as well as articles on fuel truck drivers and the growth of diesel exhaust fluid (DEF) in the market. And, of course, extensive coverage of all the market fundamentals that affect the price of fuel on the street will be covered.

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We promise to work hard to make sure you have every reason to make us your go-to motor fuels news and pricing data source for your daily purchasing decisions.

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BREXIT and Energy

POLICY BRIEF

> The BREXIT leave vote, and the underlying conflict of nationalism/populism versus globalism, raises at least some questions over the stability of the more aggressive climate change policies of the EU, just as a Donald Trump presidency would do so in the United States.

The June 23 vote by Britain to leave the European Union (EU) caused a bit of a ruckus with significant losses in the financial markets and an approximate five percent drop in the price of oil. None of this was particularly surprising in retrospect, given the general thought leader perceptions before the vote that a withdrawal was unlikely. It should be noted that both the financial markets and the price of oil have rebounded.

by Keith Reid

Longer term, a variety of analysts have, as usual, provided a variety of projections. These range from a calamity relative to Britain leaving the EU, to a golden age for Britain. However, many of these projections seem to have been aimed at influencing the vote. You can similarly find far more moderate projections that would indicate a short-term period of disruption, followed by a return to relative normal. Frankly, this is one of those cases where it's going to take time to tell, and the ramifications for the EU likely outweigh the ramifications for Britain.

The BREXIT leave vote, and the underlying conflict of nationalism/populism versus globalism, raises at least some questions over the stability of the more aggressive climate change policies of the EU, just as a Donald Trump presidency would do so in the United States. A contemporary article in *Scientific American* spells out some of the basic ramifications: "If it 'brexits,' the United Kingdom would likely chart its own course within the UN climate process, seeing its influence shrink overall while pro-coal Poland gained clout within the group of nations in opposition to more climate-ambitious Germany and France," analysts said.

"So in terms of shifting the balance of power in Europe toward less ambition on climate, it would be quite a big deal for European power in the world," said Nick Mabey, CEO at the UK-based Third Generation Environmentalism.

And also according to the article, there is a potential ripple-down effect on climate policy in general: "It would be a massive distraction for the next couple of years, not only in the UK but more broadly," said Andrew Steer, President and CEO of the World Resources Institute, who is British. "It will encourage a sort of inward-lookingness at a time when we need an outward-lookingness. Ideas need to be shared across country borders, technologies need to be shared, ambitions need to be shared as well.

"So we need a race to the top, not a sort of closing down," he said.

Since this Policy Brief was first posted, there have been some notable developments in the UK relative to BREXIT's impact on climate change policy.

The new government under Theresa May has already abolished the Department of Energy and Climate Change with its responsibilities moved

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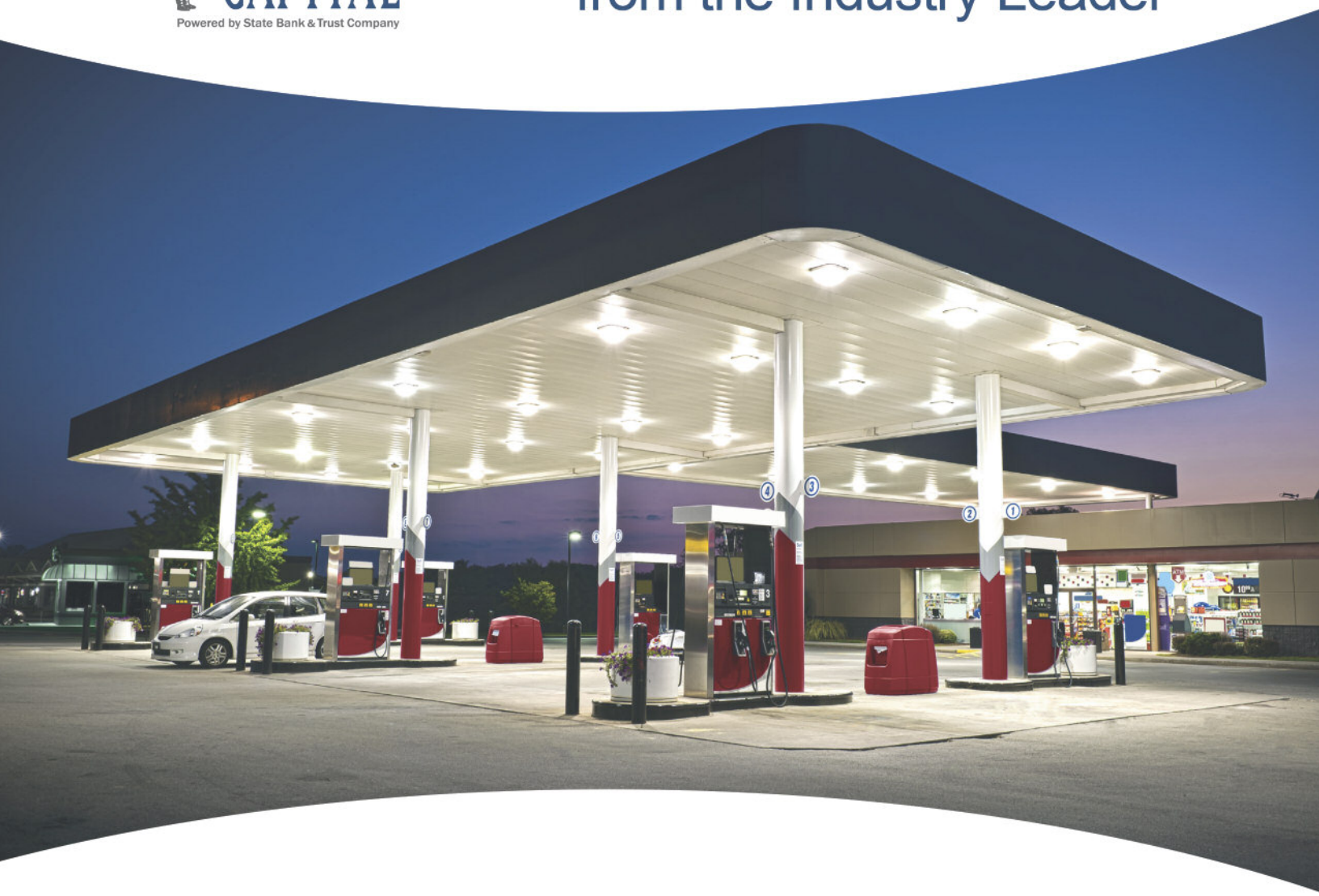

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to a new, more business-oriented Department for Business, Energy and Industrial Strategy. The reaction was swift.

"This is shocking news. Less than a day into the job and it appears that the new Prime Minister has already downgraded action to tackle climate change, one of the biggest threats we face," said Craig Bennett, Chief Executive of Friends of the Earth.

Also, a new group has been formed called CLEXIT (for Climate Exit). As its secretary Viv Forbes noted in a launch statement: "For developing countries, the Paris Treaty would deny them the benefits of reliable low-cost hydrocarbon energy, compelling them to rely on biomass heating and costly weather-dependent and unreliable power supplies, thus prolonging and increasing their dependency on international handouts. They will soon resent being told to remain forever in an energy-deprived wind/solar/wood/bicycle economy."

If the Paris COP21 accord that was recently signed is actually followed, and given the entirely voluntary nature of the accord that is an open question, Western economies and their citizens will increasingly start to feel significant impacts from the carbon reduction efforts.

He further went on to note the profiteering aspects of current climate change policy: "Naturally some smart politicians and speculators in the BRICS nations (Brazil, Russia, India, China and South Africa) and in the small island nations, understand that they can profit from the Paris Treaty by gaming the rules on things like carbon credits, or milking the green fund for 'climate compensation' or 'green energy technology.' This will only work for a while, and when the handouts stop, the re-adjustment to reality will be very painful."

Tea and Toast

There are numerous factors that make up the nationalism/populism sentiment behind the BREXIT. Most predominant recently has been the immigration crisis. But even that is just a symptom (a major one to be sure) of what is seen by UK populists as a lack of national sovereignty under the EU, and a death by 1,000 cuts from faceless, unaccountable bureaucrats in Brussels. One of those cuts, and one that was to be put off until after the vote (and suppressed beforehand), was an assault on the English tradition of tea and toast.

As a May 11, 2016, article in the UK media outlet the *Telegraph* noted: "The European Commission plans to unveil long-delayed 'eco-design' restrictions on small household appliances in the autumn. They are expected to ban the most energy-inefficient devices from sale in order to cut carbon emissions.

"The plans have been ready for many months, but were shelved for fear of undermining the referendum campaign if they were perceived as an assault on the British staples of tea and toast.

"A sales ban on high-powered vacuum cleaners and inefficient electric ovens in 2014 sparked a public outcry in Britain."

The article further noted that David Coburn, a UKIP (UK Independence Party) member of parliament, previously blamed the EU after finding it took his toaster four attempts to brown the bread sufficiently to spread marmalade. Which itself questions the energy efficiency rational if the appliance has to be used four times to get the same end result. Apparently, next on the list for new eco-design rules are Internet routers, hand-dryers, mobile phones and—the energy scourge of patio jet-washers. Yes, patio jet-washers use a lot of energy because energy is necessary to generate a high-pressure water stream to actually perform the difficult cleaning required. But, just how many households in Europe own one, and how often are they used? To a regulatory hammer everything looks like a nail.

As I've touched on in previous pieces, up until now this aggressive Western climate change remediation push has generally been absorbed in government debt, and in relatively minor disruptions—though messing with tea and toast is not considered minor to the British. For the bureaucrats and national leaders involved, poorly performing appliances are likely more of an issue for the household kitchen and cleaning staff than something that would be a personal impact. But as aggressive climate policy ramps up, so will the impact on the average person.

If the Paris COP21 accord that was recently signed is actually followed, and given the entirely voluntary nature of the accord that is an open question, Western economies and their citizens will increasingly start to feel significant impacts from

> The major developing economies, most specifically China and India, are already outstripping the current carbon contribution from the West yet remain far behind the West in development. These nations, while giving lip service to voluntary carbon reduction goals that have been hailed as "breakthroughs" on the environmental left, have also provided statements that indicate they are not going to let such goals get in the way of their economic expansion.

the carbon reduction efforts. For example, with COP21 the Obama Administration supported its established target to reduce emissions 26% – 28% (compared to 2005 levels) by 2025. The long-term goal is 80% by 2050. The goal is generally near zero emissions by that point.

Before long it won't just be tea kettles and toasters and light bulbs and vacuum cleaners and dishwashers and clothes dryers getting the pinch for those in the developed West.

As UK's *Daily Mail* covered in an article after the COP21 conference ended: "Bob Ward, who is policy director at the Grantham Research Institute of Climate Change, said that to meet Britain's commitments the days of cooking with gas were numbered.

"He said: 'The only possible use of fossil fuels that will continue is if they are used to generate electricity, but this will only happen if the carbon dioxide they create is captured and stored.

" 'Gas cookers will be phased out, probably as soon as possible. I suspect manufacturers will simply stop making them.'

"He added that in years to come some form of carbon tax putting up the cost of gas is inevitable—which will make electric cookers much cheaper than their gas rivals.

"[Committee on Climate Change] Chief Executive Matthew Bell said: 'For something like heating, by 2050 gas will be playing a much more limited role and a range of other technologies will have taken its place, meaning low-carbon sources of warmth—heat pumps and so on.' "

Philosophical Ramifications

It's broadly regarded that the BREXIT, and closer to home, the Trump candidacy, represent a populist repudiation of the globalization movement that has been underway since the George H.W. Bush administration following the collapse of Soviet Union and the end of the Cold War. The epicenter of Western globalization is centered in the EU and fully supported though the UN, and both bodies have been in an extraordinarily aggressive, Western-focused push to address climate change. In the United States, aggressive climate change policy that could not get passed through legislative bodies has been implemented by fiat through government agencies with the bureaucrats located in Washington instead of Brussels. Long term, the likelihood that aggressive climate change policies will continue should also come under some doubt if the current movement has legs.

The Western economies have done a fantastic job of reducing carbon. They have been so effective that the low-hanging fruit is pretty much gone. For example, while the United States is still a leading carbon emitter, it is also a leading, fully-modernized economy with a high standard of living created in no small part by inexpensive energy. While the "gross" carbon figure might be large, the "net" carbon that can be reduced without reducing a modern quality of life or economic growth is not so large. Squeezing the remaining carbon out of our society becomes increasingly expensive and disruptive—all against the backdrop of what has been a fossil fuel revolution through the fracking process.

The major developing economies, most specifically China and India, are already outstripping the current

carbon contribution from the West yet remain far behind the West in development. These nations, while giving lip service to voluntary carbon reduction goals that have been hailed as "breakthroughs" on the environmental left, have also provided statements that indicate they are not going to let such goals get in the way of their economic expansion. In fact, under COP21 they are allowed to continue their rapid carbon expansion for years to come before the promised reductions.

For variety of reasons, the current view out of the UN, EU and the Obama Administration tends to be that carbon reduction efforts and any associated pain must be felt at the expense of the developed West (whether or not such efforts are practical, functionally possible or for that matter actually necessary). The West must set an example, and the concerns of the citizens in the West are not necessarily more significant to their leaders than those of others.

Some of this comes from the globalist/progressive viewpoint of humanitarian universalism as covered well in a post-BREXIT editorial by Damon Linker in the *Week*. As Linker wrote: "And this means that the progressive future will even result in the end of politics itself—at least if politics are understood as encompassing more than the jostling of interest groups, bureaucratic administration and the management of government benefits. Politics in that narrow sense will remain. But politics in Aristotle's sense—this particular community in this place with this history and heritage, determining its own character for itself, deciding who is and who is not a citizen, who will rule and in the name of which vision of the good life—that existential form of politics will cease to exist in the progressive future."

A cynic might also point out that this very specific, globalist approach to climate change additionally gives large bureaucratic governmental entities tremendous direct control over the private sector and the citizens, supports long-standing UN wealth distribution goals and invariably works against free market economics to create "winners" and wealth in a new and disruptive market while failure is backstopped by government subsidies.

There are other approaches, centered on future remediation if required, that are not being considered to any significant degree. This is especially notable because, even if humans are the primary drivers of any warming (which is not as scientifically established as the proponents would suggest), there is plenty of debate even within that position over the actual degree of human influence and the actual extent to which warming would be a net negative versus a net positive. But, these approaches tend to lack the "ancillary benefits" found in the current approach. ■

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Climate Change Policy Realities

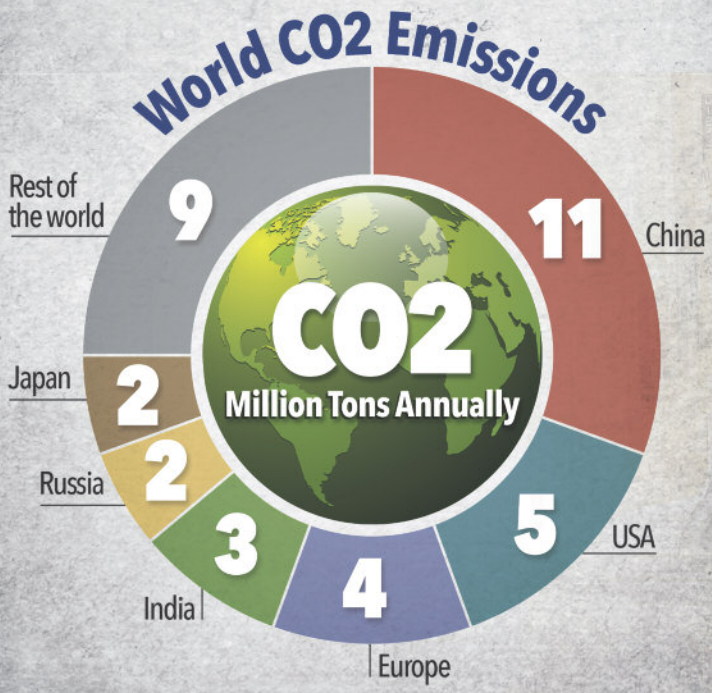
by Joe Petrowski

World CO2 emissions are 36 million tons annually and for now declining as the United States, China and EEC replace coal-fired power plants with wind, solar, hydro, natural gas and nuclear. The individual country contribution to these 36 million tons is as follows:

The good news is China and the United States are declining in CO2 emissions, partly driven by the Kyoto protocols and the switch to alternate fuels. Though to be frank, China was declining before the concern with climate change, which was driven more by the need to remove particulates, sulfur and nitrogen dioxide and other nasty pollutants from the burning of coal, including arsenic (there were 5,000 deaths in homes burning coal in an open fire in China in 2012).

The bad news is world power demand is growing by 6% per annum, which is 2.5 times faster growth than world GDP. And China is now the largest vehicle market in the world. Half of U.S. CO2 production comes from transport fuels. It is estimated that Chinese vehicle growth in the next decade will add two million tons of CO2 to the balance sheet alone.

So what are the practical policy initiatives besides walking, sitting in the dark at non-controlled temperatures or signing more "feel good" protocols demanding change? There are a variety of ways to address the 2.5 million tons of CO2 emissions per year from the U.S. transport fuel industry (half of total U.S. emissions annually):



Hydro power

(it is outrageous that we have net decreased hydro production in the United States and have restricted Canadian access to U.S. markets to protect incumbent power generators). We currently have 2,600 hydroelectric dams producing 400 million megawatts or 7% of our electricity. This is down from 2,900 dams 40 years ago.

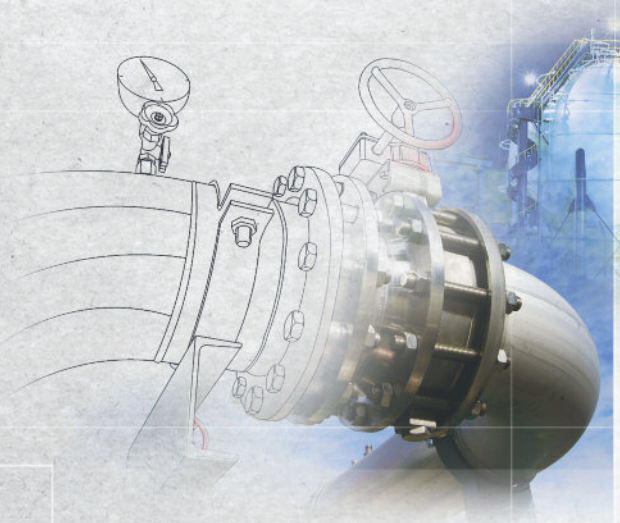
> Cap and Trade is fraught with manipulation and gaming risks by traders and it puts more power to grant favors into the hands of politicians and bureaucrats, which is counter to political trends (see the UK).

CAFE standards and new OEM and transport design

for traditional petroleum vehicles. It is happening, and will continue to progress, but it is a long haul (pun intended).

Rapid development of hydrogen and natural gas vehicles

and the supporting fueling infrastructure. Probably the most promising, but again with a time delay.



Build more pipelines and LNG export facilities

to get natural gas to export points helping India, China and Japan feed their growing transport and power demand with a cleaner fuel.

I have left off electric cars

given price, range anxiety and the inconvenient truth that it is hard to embrace a solution whose fuel is still made 60% by coal. Rapid charging stations, which existing fuel retailers would need to keep the fueling experience almost as convenient as today, would cost $150,000 per location and for a network of 50,000 stations would therefore cost $8 billion in new capital. And remember, one ton of coal produces three tons of CO_2 while producing 2,000 kWh of electricity, so the average EV would use 300 kWh per year. As a result, the average EV would produce one-half ton of CO_2 emissions per year, indirectly. With 400,000 EVs on the road today, that is 200,000 tons of CO_2 emissions. The Sierra Club calls for 10 million EVs by 2025, which would actually double CO_2 transport emissions at the current power/fuel mix. Even if all of the coal is replaced by other fuels (and the Sierra Club opposes new natural gas power plants and the infrastructure to supply them), the reduction in CO_2 emissions would be de minimis.

We need to **encourage carbon mitigation** either by Cap and Trade, a carbon tax or the development of a vigorous offset market that would invest in trees, solar or wind to offset carbon emissions. A carbon tax, while simple to administer at current values, would add 12 cents/gallon to fuel cost, removing on a regressive basis $34 billion from consumers' pockets and reducing GDP by two points (see Germany). Cap and Trade is fraught with manipulation and gaming risks by traders and it puts more power to grant favors into the hands of politicians and bureaucrats, which is counter to political trends (see the UK).

Carbon Tax

It is safe to assume that a carbon tax of some sort is in our future if we have a Democratic presidential administration and less so, but still a probability, with a Republican administration (depending on how the House and Senate races go). If you thought this election was important triple that concern.

The only major uncertainty is will it be a straight tax or a system of Cap and Trade and allotments, which I personally fear as much or more than a clean tax given the political favoritism and corruptio/distortion it will introduce. In either case, here are the facts:

> The Sierra Club calls for 10 million EVs by 2025, which would actually double CO2 transport emissions at the current power/fuel mix. Even if all of the coal is replaced by other fuels (and the Sierra Club opposes new natural gas power plants and the infrastructure to supply them), the reduction in CO2 emissions would be de minimis.

1 gallon of gasoline produces 18 pounds of CO2. (Ethanol actually adds to CO2 production.)

1 gallon of diesel produces 23 pounds of CO2.

The current market price of a pound of carbon based on where it is valued/traded (California and Europe) is between $6 to $10 per ton so let's use $8 for analysis.

Using the basis current transport consumption in the United States, we produce 3.5 billion tons of CO2 annually, so at $8 we are talking $26 billion annual cost and realistically as high as $35 billion per year (or 11 cents per gallon). Or, in an economy of 19 million bbl/d of petroleum at 11 cents/gallon, it's almost $35 billion dollars per year.

While the multiplier effect of a $35 billion "tax" is a topic of economic debate, everyone agrees energy costs and especially transport fuels (since they are visible and mostly directly born by consumers who are the largest component of GDP) bring it close to five. This means that a $35 billion increase in the price of fuel will have a $175 billion annual drag on GDP. While not crippling, it is a 1 – 2% drag (depending upon the price of raw fuel) on a $16.7 trillion economy at a time where our annual growth rate is trending a full 2 points under long-term performance and less than the rest of the world with exception of Japan and the European Union. In Japan growth is significantly lower due to their age, and to understand Europe's anemic growth, look at their energy policy—which we seem in a rush to copy (fools love to crowd together).

Carbon Offset

A better solution is an offset approach for the social and market adoption of mitigation. Here is how it would work:

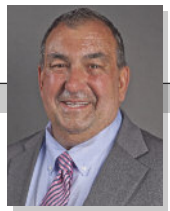
A company, let's call it "Green Fuel," partners with existing retailers to label locations with the Green Fuel Signage. The retailer and its customers purchase the same fuel they always do (and a fuel that will become "cleaner" over time), and Green Fuel assumes the 18,000 tons of CO2 that a two million/gallon/year retailer produces (while a gallon of gasoline is about 7 pounds, it produces 18 pounds of CO2 when combusted with oxygen). Green Fuel then "offsets" that 18,000 tons through various approved and audited programs like investments in wind and solar, tree planting and other forms of carbon sequestration. The cost for this would be about 5 cents/gallon, mostly for administrative and transaction costs.

The value for the retailer is obvious. They get to use the cheapest fuel and fuel they can sell.

Consumers pay a slight premium but much less than they would with a carbon tax or Cap and Trade, and like a Leeds building certification, feel they are committed to improving the climate.

A vigorous market for carbon offsets is developed, and many great projects in non-transport areas get funded.

Other than oversight and auditing, the government goes back to doing what it does best (if only I could remember). ■



Joe Petrowski

Joe has had a long career in international commodity trading, energy and retail management and public policy development. In 2005, he was named President and CEO of Gulf Oil LP and elected to the Gulf Oil LP Board of Directors. In October of 2008 he was named CEO of the now combined Gulf Oil and Cumberland Farms whose annual revenues exceed $11 billion and that now operates in 27 states. In September 2013, Petrowski stepped down as CEO of The Cumberland Gulf Group. He is now managing director of Mercantor Partners, a private equity firm investing in convenience and energy distribution and is a member of the Gulf board.

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Diesel Fuel's Quality Problem

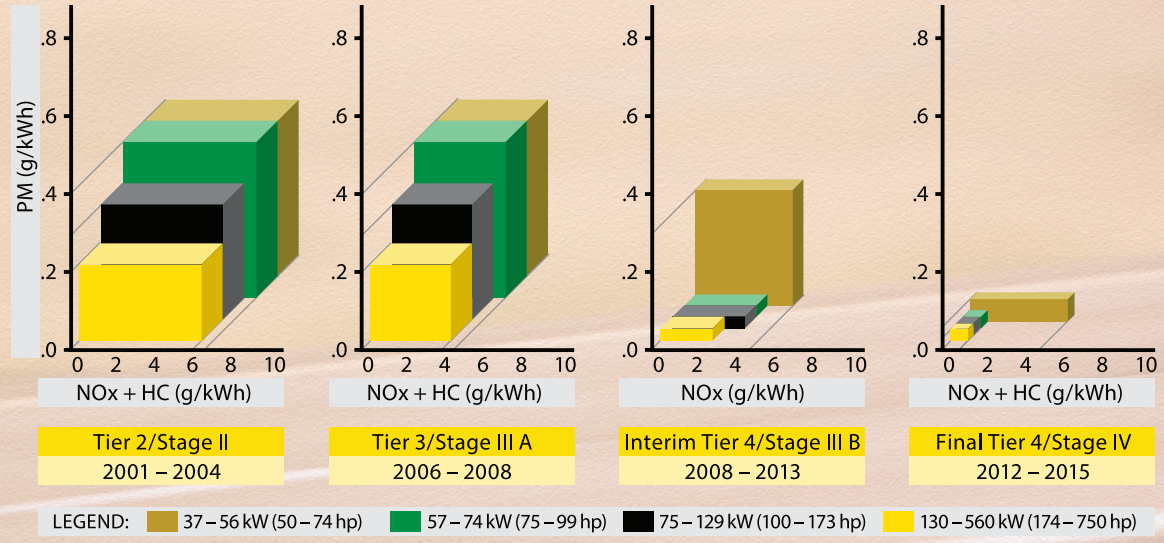
Let us start with one simple fact: it is illegal to even sell gasoline without the minimum amount of detergent additives established by the EPA. Specifically citing the code 40 CFR 80.161, "Gasoline may not be sold or transferred to a party who sells or transfers gasoline to the ultimate consumer unless such gasoline contains detergent additives which have been certified according to the requirements of this section." While this minimum requirement is a necessary starting point, most engine OEMs today recommend going far beyond the EPA minimum requirements by encouraging that Top Tier gasolines be used in their engines.

So one might wonder what would happen if you decided to run your car on raw gasoline and just ignored the detergent and performance requirements of modern engines? The results would not likely be good. Injectors would clog, emissions would increase and you just might find yourself stuck on the roadside. Despite that reality, diesel fuel users, both on the consumer side at home and in commercial fleets at work, are doing that very thing. They are dumping raw diesel fuel into a very advanced engine and many are learning the hard way that this may not be a great idea.

Diesel has never had the best image. From the black smoke bellowing out of that truck in front of you on your drive home to the scandalous Volkswagen emissions fraud case, diesel seems to work hard at looking bad. But the other side of the story is that diesel is a tenaciously competitive fuel. It provides relatively cheap and dense BTUs that are better at powering the engines that move heavy loads than anything else we've come up with.

Despite the many challenges diesel faces, engine manufacturers have recently made some amazing progress. With the implementation of EPA Tier 4 Final in 2015, diesel engines of all classes now have nearly eliminated their smoke, soot, NOx and SOX emissions. The chart produced by John Deere (below) shows just how dramatic the reductions in pollutants have been since 1996.

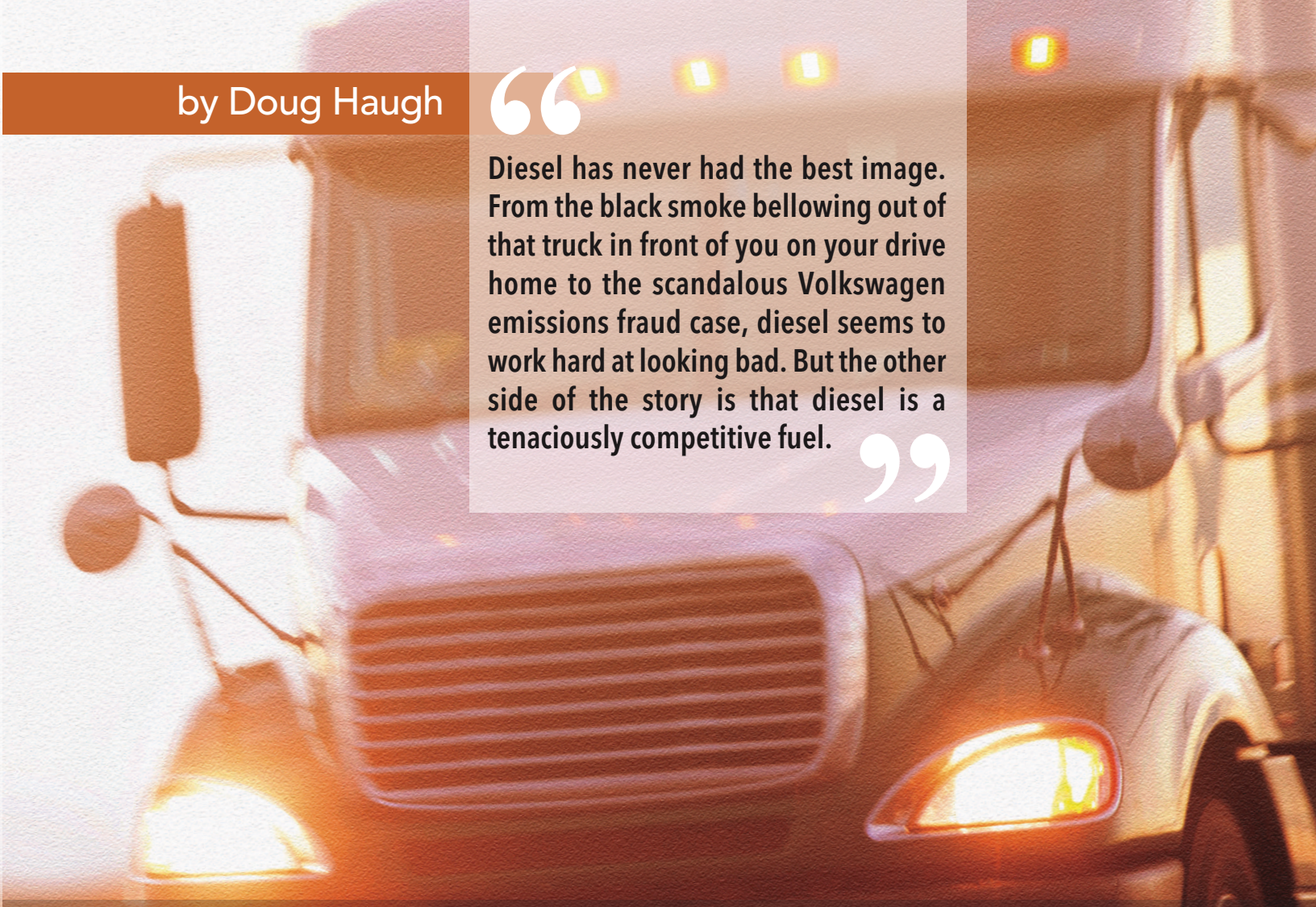
EPA and EU Nonroad Emissions Regulations B37-560 kW (50-750 hp)



NOx – Nitrogen oxides, which react in the atmosphere with hydrocarbons
HC – Hydrocarbons, a by-product of combustion
PM – Particulate matter, a non-gaseous product of combustion

Source: John Deere

by Doug Haugh



> **Diesel has never had the best image. From the black smoke bellowing out of that truck in front of you on your drive home to the scandalous Volkswagen emissions fraud case, diesel seems to work hard at looking bad. But the other side of the story is that diesel is a tenaciously competitive fuel.**

So if this story is about diesel fuel quality, why are we talking about emissions? Well, the progress on emissions has resulted in engines that put tremendous new demands on the diesel fuel. The most obvious of these demands was the reduction of sulfur in 2006 for use in the 2007 model year engines. What have been far less obvious are the unintended consequences of removing the sulfur from the fuel. With sulfur removed, diesel fuel can hold far less water in solution. When that water drops out of solution in storage tanks, the bacteria and algae that feed on the hydrocarbons while living in the water start having quite a feast. In the process, these organisms are creating a hideous mess inside diesel tanks of all shapes and sizes.

Emissions requirements have also resulted in engines with a daisy chain of emissions reduction equipment on the exhaust that includes a diesel particulate filter (DPF), a diesel oxidation catalyst (DOC) and a selective catalytic reduction (SCR) unit. Each of these components introduces new maintenance challenges and burdens on the engine and the fuel. If injectors clog with deposits from dirty fuel, dirty tanks or unstable biodiesel, the downstream impact on each emission control component can be severe.

So is this really a diesel quality problem or a diesel specification problem? The short answer is both. With sulfur out of the fuel, diesel tanks simply require a much more stringent maintenance and cleanliness regime than they have had in the past. Keep the water out and the bugs and algae won't grow. It sounds simple, but that leads us back to the diesel specification itself: ASTM D-975 for diesel fuels in the U.S., or more specifically, for the vast majority of fleets we are talking about, "1.1.4 Grade No. 2-D S15—a general purpose, middle distillate fuel for use in diesel engine applications requiring a fuel with 15 ppm sulfur (maximum)."

To spare you reading the 27-page specification, let us summarize the primary areas contributing to our biggest quality concerns:

- **Can contain up to 5% biodiesel and still be labeled ULSD #2**
- **Can contain up to 500 parts per million of water and sediment**
- **No minimum requirement for detergent or dispersant**

Now there is nothing wrong with biodiesel of course, and most progressive fuel suppliers are integrating biodiesel into their diesel fuels—and in several states you simply do not have a choice. The challenge with using increasing amounts of biodiesel is that at the temperature and pressures of modern diesel engines, there are likely to be deposits formed in the engine if no additive chemistry is employed to provide detergency.

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Water in the fuel may sound like an obvious issue, but perhaps at just 500 ppm it is really not something to worry much about. Well, to illustrate just how much water that is, consider this: if each truck load of 7,000 gallons of diesel fuel came in just below the specification, that would mean that there are 3.5 gallons of water in every truckload of fuel. You just thought the water cooler guy was the only one delivering water to your business; it seems he may have some competition.

So if you are dumping nearly a 5-gallon pail of water in your diesel tank every time you get a load of diesel and that low sulfur diesel no longer holds that water in suspension, let's guess what we find in our tanks at the end of a year. I am not even going to talk about the sediment part of the specification—let's just assume running dirt through an engine with 2 – 4 micro-clearances is on the face of it a really bad idea.

As a big fan of diesel in general, I hope we can clean this up, but like any problem, getting to a solution starts with some recognition that the problem is real. On that note, I am starting to see a few suppliers run at this problem instead of away from it. They are offering advanced additive treatment programs, tank cleaning and maintenance solutions, and first and foremost, they are talking with their customers openly about the challenges with diesel fuel quality. Those marketers and suppliers that get in front of this to protect their customers are going to take market share and win business. ■

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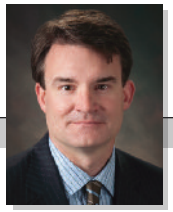
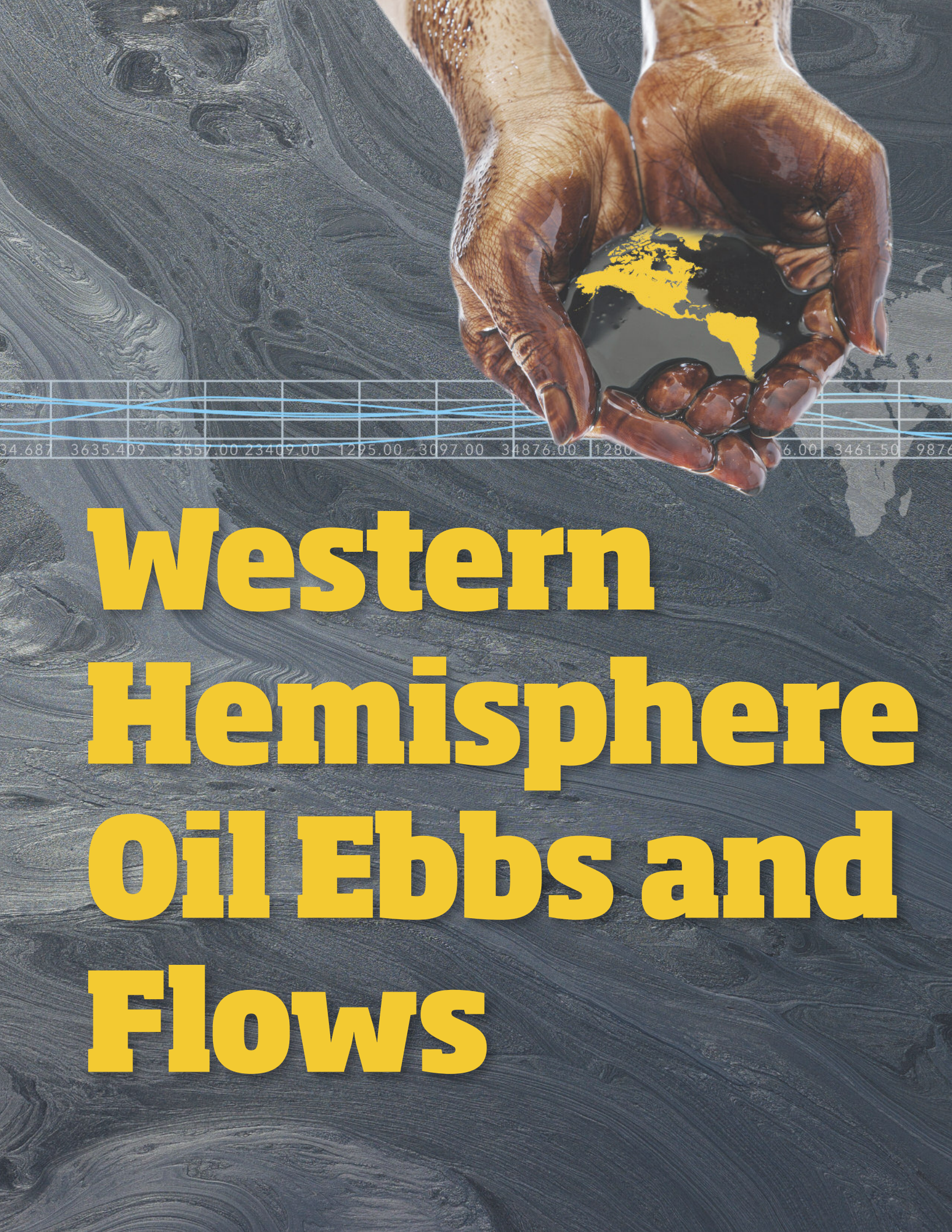


Douglas H. Haugh

Doug is currently President of Mansfield, a $9-billion industry innovator recently ranked by Information Week as the No. 1 technology innovator in Energy & Utilities and the only nationwide provider of fuel supply, biofuels, propane and diesel exhaust fluid. Haugh is a frequent speaker on energy, supply chain technology and entrepreneurship. He can often be found leading general sessions or seminars at many national conferences and conventions. He also blogs on energy issues at: http://thinkingonenergy.com.

The opinions expressed there (and here) are his, and not those of Mansfield.



Western Hemisphere Oil Ebbs and Flows

Oil Flows in the Western Hemisphere: The Dictates of a Liquid

by Dr. Nancy Yamaguchi

There are many factors that influence trade in oil and oil products, but chief among them is one simple idea: oil is a liquid. It flows along the path of least resistance. It flows from a burgeoning pool to a thirsty pool. It flows from where it is not needed to where it is needed. It must be contained as it flows, in pipelines, tankers, trucks and the like. It must avoid blockages to its free flow. And because oil is the largest commodity in world trade, it tends to flow along the least-cost pathways to reach the highest value end uses. These pathways are influenced by public policy, including issues of health and safety, environmental protection, right of way, social justice and international relations. The laws build canals, dams, weirs and the like to control the flow and perhaps to cope with floods.

In the Western Hemisphere, geography, economics and politics have shaped an extensive network of oil infrastructure. As an example, the 800-mile long Trans-Alaska Pipeline System (TAPS) was built only after the 1973 – 1974 oil price shock. The high prices and new concern over oil security made it possible to develop Alaska North Slope (ANS) crude and build TAPS. The project was permitted only after lengthy negotiations with Native American groups and conservationists, many of whom still believe the project was a mistake. Once completed, additional infrastructure was built to allow the transit of oil to refineries in the U.S. West Coast, the U.S. Gulf Coast and the U.S. Virgin Islands. The Trans-Panama Pipeline was opened in 1982 to facilitate the transport of crude from the Pacific Ocean side of Central America to the Caribbean Sea. When ANS production declined, this pipeline was closed, and in later years it was reversed. It was not considered economically or politically feasible to build a pipeline all the way from the North Slope of Alaska, through Canada and onward to U.S. refineries.

Similarly, the topography of the Americas makes it difficult to build long pipelines running east to west or west to east. The Rocky Mountains form a natural north-south running barrier in Canada and the United States, as do the Coast Mountains, the Cascade Range and the Sierra Nevada mountains. The Sierra Madre range bisects much of Mexico. The Andes separate the west coast of South America from the rest of the continent. In Canada, there is only one pipeline that runs from east to west across the Rocky Mountains: the Trans Mountain Pipeline. In the U.S., there are none. Most of the pipelines run north and south. This also holds true in Mexico and Latin America. In North America, there are huge reserves of oil, oil sands and shale oils in the central part of Canada and the United States. The North American oil transport network may be likened to a river system, where most to the flow heads south to the U.S. Gulf Coast, where it meets the sea and must change its transport mode. Within the center of North America, the shale boom caused the riverbanks to flood, and there were not enough tributaries to reach new destinations. New trade patterns had to emerge, and most of these have focused on trade links within the Americas, creating a higher degree of Western Hemisphere oil market integration.

> We liken the flow of oil to a complex, far-reaching river system. It is not always clear what will happen when a new dam is built or a canal is widened or rerouted. Demand for the liquid remains, however, so it will continue to flow.

The Americas account for approximately 33% of the world's oil demand, 33% of its proven oil reserves, 30% of its oil production and 28% of its oil refining capacity. The bulk of this is concentrated in North America, with the exception of reserves, where Venezuela is the leader. North America's oil market has been strongly tied to the markets of Europe and the Middle East. In many ways, it is a simpler matter to ship oil across the North Atlantic Ocean than it is to ship oil across the South Atlantic Ocean, or to ship oil across the Pacific Ocean, particularly when a Panama Canal crossing is involved. Nonetheless, oil trade is flourishing within the Western Hemisphere and a regional petroleum market is becoming more distinct.

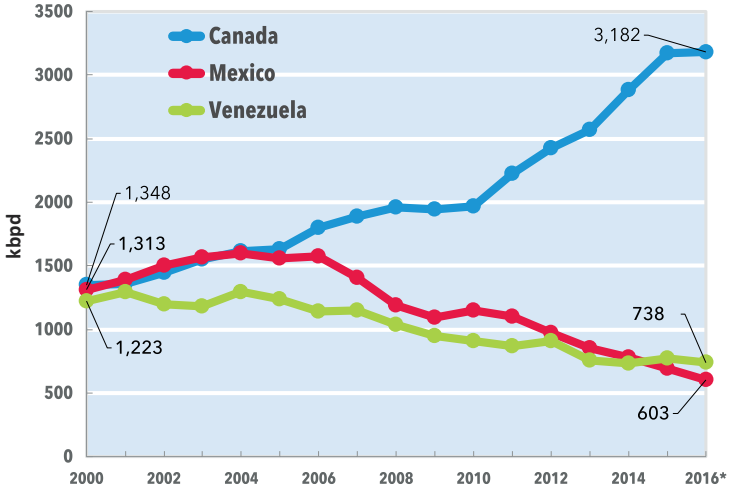
In this article, we liken the flow of oil to a complex, far-reaching river system. It is not always clear what will happen when a new dam is built or a canal is widened or rerouted. Demand for the liquid remains, however, so it will continue to flow. If a dam is removed, what will happen to the waterways downstream? Some of the natural flows in the Western Hemisphere have been reinforced by economics, politics and geography, but the complete free flow of crude oil is stymied by those same factors. In this article, we will discuss how crude flows have changed because of the shale boom in the U.S., the growth in Canadian output, the languishing of Mexican and Venezuelan output and the strict controls on exports of U.S. domestic crudes. We will also trace the impacts into the refining side and show the impacts on product trade.

Western Hemisphere Crude Trade

The advances in horizontal drilling and hydraulic fracturing have had a profound impact on the U.S. and greater Western Hemisphere oil balance. In the year 2000, the United States produced 5822 thousand barrels per day (kbpd) of crude oil. In 2015, crude production averaged 9414 kbpd, an increase of 3592 kbpd. This gain exceeds Iran's total output in 2015, which was 2840 kbpd, according to the OPEC Secretariat. It exceeded the output of Kuwait (2730 kbpd) and Venezuela (2357 kbpd). It was nearly on par with the output of Iraq (3933 kbpd). It greatly exceeded the output of all other OPEC countries except Saudi Arabia. Essentially, therefore, the increase in U.S. production has displaced the output of an entire OPEC country. During the same time period, Canadian output grew by 1682 kbpd, greater than the 2015 output of Algeria (1106 kbpd), Libya (405 kbpd) and Qatar (667 kbpd).

For many years, forecasts of U.S. oil supply assumed that imports would continue to grow, and that the U.S. would become more reliant on the Middle East. This was to be supplemented by crudes from Canada, Mexico and Venezuela. **Figure 1** presents the trend in U.S. crude imports from the top three Western Hemisphere oil exporters, as reported by the U.S. Energy Information Administration (EIA). As the figure illustrates, in the year 2000, Canada, Mexico and Venezuela were roughly equal in the amount of crude oil they exported to the U.S., all in the vicinity of 1.2 – 1.3 million barrels per day (mmbpd). For the three together, the total was approximately 3.9 mmbpd. U.S. crude imports from the Persian Gulf and Africa were close to this amount, at approximately 3.8 mmbpd. Since then, however, Venezuelan and Mexican crude exports to the U.S. have fallen to approximately 0.7 mmbpd and 0.6 mmbpd respectively. Both have had political and economic conditions that have constrained exports. In contrast, Canadian exports to the U.S. have grown to nearly 3.2 mmbpd.

Figure 1: Canadian crudes surpass Mexico and Venezuela



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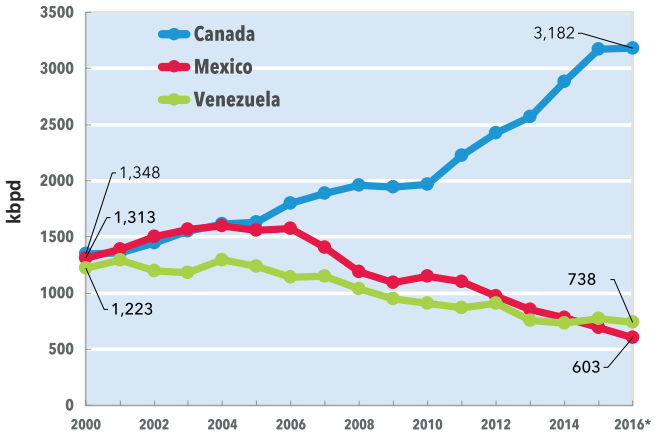
In addition to the new light tight oil (LTO) output from U.S. shale plays, it is largely because of Canada, therefore, that Western Hemisphere crudes have toppled Middle Eastern and African crudes from their position in the U.S. crude market. As **Figure 2** illustrates, the U.S. is importing 4.5 mmbpd of crude from the top three Western Hemisphere crude exporters, up from 3.9 mmbpd in the year 2000. In contrast, imports from the Persian Gulf and Africa have fallen to 2.2 mmbpd, down from nearly 3.8 mmbpd in 2000. Heavy sour crudes from the Americas have reduced the need for some Middle Eastern sour crudes, while LTO largely has supplanted imports of African light sweet crudes. Note a recent uptick in these imports during the first part of 2016, however. The low prices have caused U.S. production to decline, and some additional, inexpensive foreign crudes have found their way back into the import picture.

Figure 2: Canada propels Western Hemisphere crudes past the Persian Gulf and Africa in the U.S. import picture



Source: EIA. 2016 is January-July average.

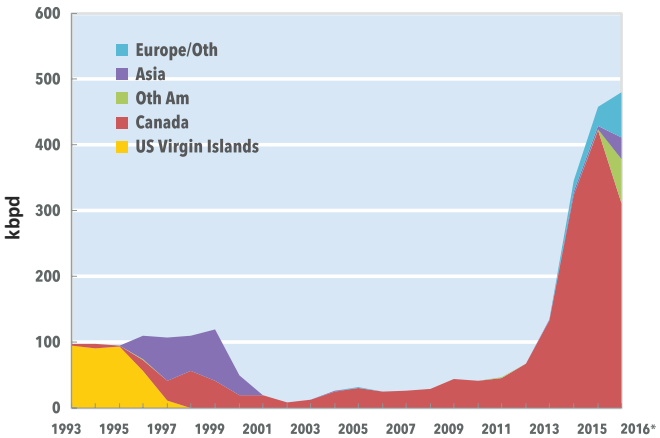
Sustained high prices encouraged the development of oil sands resources in Canada and the shale boom in the U.S., and this also stimulated transport infrastructure. Canadian production from oil sands has continued to grow, and U.S. imports have risen dramatically, but expanding the pipeline conduits into and through the U.S. became a challenge. Canada is seeking to send more oil out to the west and east. It is possible to do this, of course, and it is even possible that additional Canadian flows to the west could end up in the U.S. West Coast, while flows to the east could end up in PADD 1 and PADD 2. The U.S. still would be the main recipient. It is not clear that stopping the construction of the Keystone Pipeline, or other possible projects, will halt Canadian development, or reduce Canadian exports to the U.S., but it is likely that the economics of such projects will be even less favorable.

Naturally, since global oil prices have been at low ebb, many new developments are on hold. In late 2015, many market watchers hoped that the OPEC meeting in Vienna would result in actions to curb production and support prices. In the author's assessment, there was no reason to believe that they would do this. It was perplexing that so many market analysts expressed surprise, and that stock markets reacted so strongly. The OPEC members with the ability to put production on- and off-line had indicated that they would wait out the period of low prices to regain market share. It remains to be seen how much non-OPEC production will be shut in, but already the impacts are being felt. Nearly a year later, the market is awaiting the outcome of the November 2016 OPEC meeting, where the organization plans to institute a production cut. Prices have strengthened in response.

There still are options to streamline crude trade within the Western Hemisphere. A variety of oil trade patterns have emerged because of the U.S. policy regulating exports of domestic crude. Federal policy regulates exports of domestic crude oil under the authority of the Mineral Leasing Act of 1920, the Energy Policy and Conservation Act of 1975 and the Export Administration Act of 1979. This is not a "crude export ban," but it is a significant hurdle, and it creates a definite barrier to trade. This became much more noticeable because of the increase in LTO production, and most oil producing companies have called for these controls to be lifted.

U.S. crude exports are shown in **Figure 3**. The restrictions allow trade with Canada, and the figure shows a steep surge in exports to Canada. Historically, Alaskan crude was shipped to the U.S. Virgin Islands, and some quantities of Alaskan and Californian crude were exported to Asia. But these exports vanished when production dropped. Canada remains the main importer. In October 2015, Mexico's national oil company, PEMEX, received a license to import up to 75 kbpd of U.S. crude. If the restrictions on crude trade are eased even more in the future, the U.S. crude market may become even more firmly tied to the greater Western Hemisphere market. Data for the first seven months of 2016 already show a considerable amount of diversification in crude exports, with growth in exports to other American countries, Asia and Europe. Crude exports averaged 480 kbpd during the January – July 2016 period.

Figure 3: U.S. Crude exports by destination, 1993 – 2015



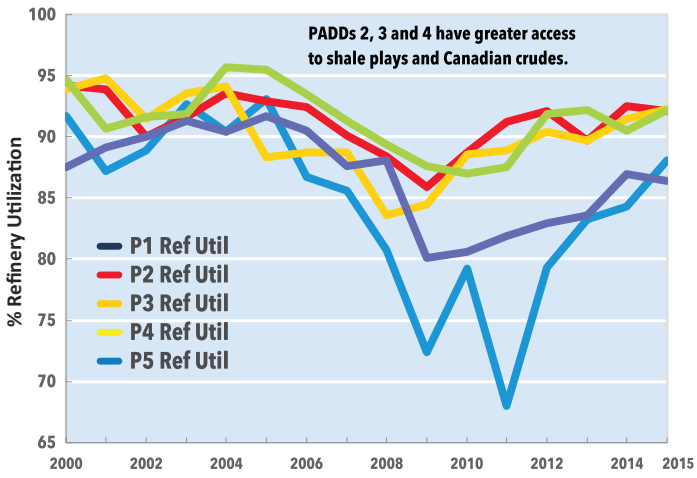
Source: EIA. 2016 is January-July average.

Changes Downstream: Import Substitution and the Rise of U.S. Product Exports

The rise in U.S. crude production, coupled with the restrictions on its export, has been causing a surge in U.S. refinery crude runs. Currently, U.S. refinery utilization rates are averaging 89.8% for the January – July 2016 period. But utilization rates are not uniform across the U.S. They are significantly higher in regions with access to inexpensive crudes. **Figure 4** shows the trend in U.S. refinery utilization rates by Petroleum Administration Defense District (PADD). The PADDs are:

PADD 1—U.S. East Coast
PADD 2—U.S. Great Lakes and Midwest
PADD 3—U.S. Gulf Coast
PADD 4—U.S. Rocky Mountains
PADD 5—U.S. West Coast, including Alaska and Hawai'i

Figure 4: U.S. refinery utilization rates by PADD



Source: EIA

In the year 2000, PADD 5 had the lowest utilization rates, 87.5%, while PADDs 2, 3 and 4 all had very high utilization rates of 94 – 95% (considered close to the maximum possible rate). The drop in refinery utilization seen in 2008 – 2009 is attributed to the spike in oil prices and the U.S. economic recession, which cut into demand. But the high prices also stimulated domestic crude production from the shale plays that were under development. As the U.S. economy improved in the 2012 – 2015 period, U.S. oil demand rose as well, and refinery throughput climbed. The EIA reports that U.S. oil demand rose by 883 kbpd between 2012 and the first eight months of 2015. Gross inputs to refining grew at an even faster rate, increasing by 1070 kbpd during the same period of time, with the excess flowing into the export pool.

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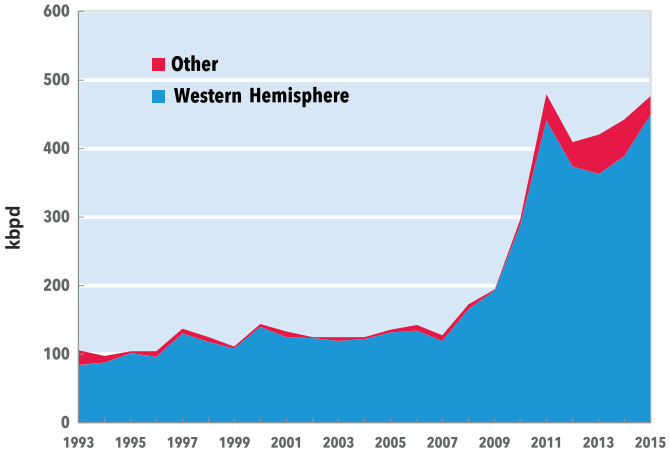
As the figure demonstrates, refinery utilization recovered first in PADDs 2, 3 and 4. These are the areas in the center of the country with the best access to pipeline supply of domestic crude and Canadian crude. Refinery utilization on the East Coast and West Coast continued to languish. On the East Coast, utilization rates plummeted below 70%, until some refinery capacity was idled and eventually closed. On the West Coast, utilization rates fell to around 80%. In PADD 5, refinery throughput is now more or less flat, but utilization rates have improved to 86 – 87% because of capacity shut-ins.

In contrast, refinery throughput has risen at refineries with access to inexpensive feedstocks. This has reduced product import requirements. In the year 2000, the U.S. imported 1556 kbpd of finished petroleum products. Refined product imports continued to grow, reaching 2075 kbpd in 2005. Following this, crude production and crude runs continued to grow while demand stagnated, particularly during the worst years of the economic recession. U.S. refined product imports dropped from their peak of 2075 kbpd to just 628 kbpd in 2014, before the recent low prices and demand recovery caused a moderate rebound in imports to 778 kbpd during the January – August period of 2015.

In the overall product balance, U.S. refinery net production of petroleum products expanded by 2 mmbpd during the decade from 2005 – 2015, whereas U.S. demand fell by 1.4 MMbpd. This has created a swing of 3.4 mmbpd of new refined product in the Western Hemisphere. The change in product trade has been dramatic, with even stronger links to other Western Hemisphere markets. **Figure 5** shows the surge in U.S. gasoline exports. During the 1993 – 2006 period, gasoline exports were in the vicinity of 100 kbpd. The drop in demand and rise in refinery throughput caused exports to rise to approximately 400 – 450 kbpd during the last five years. The great majority of this is exported to other Western Hemisphere countries.

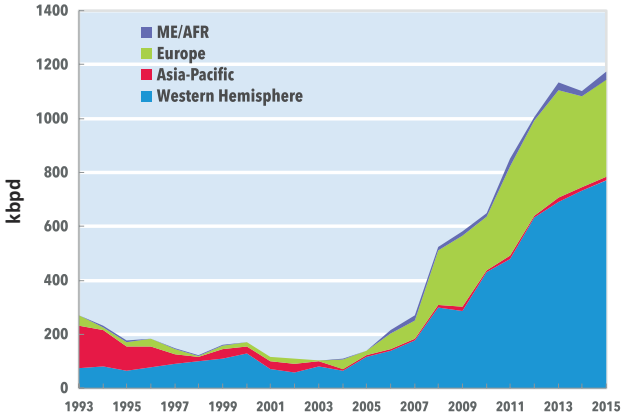
Figure 5: U.S. gasoline exports have soared, chiefly to other Western Hemisphere markets



Source: EIA.

The growth in U.S. diesel exports has been even more dramatic. **Figure 6** shows the growth in U.S. diesel exports by destination. Europe is a key market, with smaller volumes heading to the Middle East, Africa, Asia and the Pacific. The U.S. is now exporting over 1.1 mmbpd of diesel. Once again, the Western Hemisphere is the main destination. From 1993 – 2004, U.S. diesel exports to the Western Hemisphere typically were around 100 kbpd. They are currently averaging approximately 770 kbpd, and they are reaching even the smallest and most far-flung island markets in the Caribbean. Even though many of these markets are small, collectively they are one of the most important and growing markets in the world.

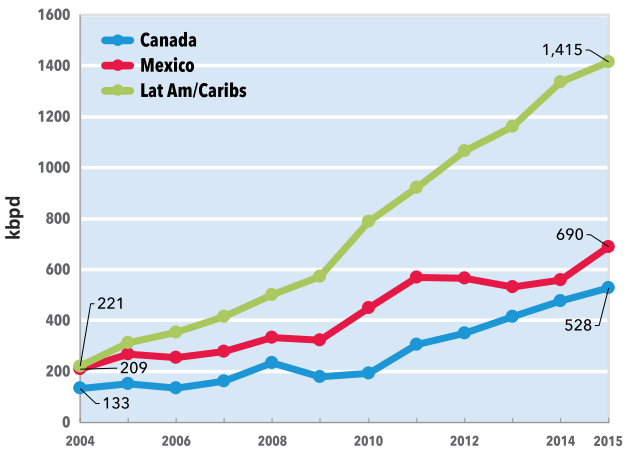
Figure 6: U.S. diesel exports have soared, largely to the Western Hemisphere



Source: EIA.

Figure 7 shows the growth in product exports to Canada, Mexico and the rest of Latin America and the Caribbean. In the year 2004, exports to these three markets were roughly comparable: refined product exports to Canada were 133 kbpd, exports to Mexico were 209 kbpd and exports to the rest of the Western Hemisphere markets were 221 kbpd. By 2015, exports to Canada had grown to 528 kbpd, and exports to Mexico had grown to 690 kbpd. This is significant growth, but it pales in comparison to exports to other Western Hemisphere markets, which are now receiving approximately 1.41 mmbpd of refined product from the U.S.

Figure 7: Growth in U.S. refined product exports to other Western Hemisphere markets



Source: EIA.

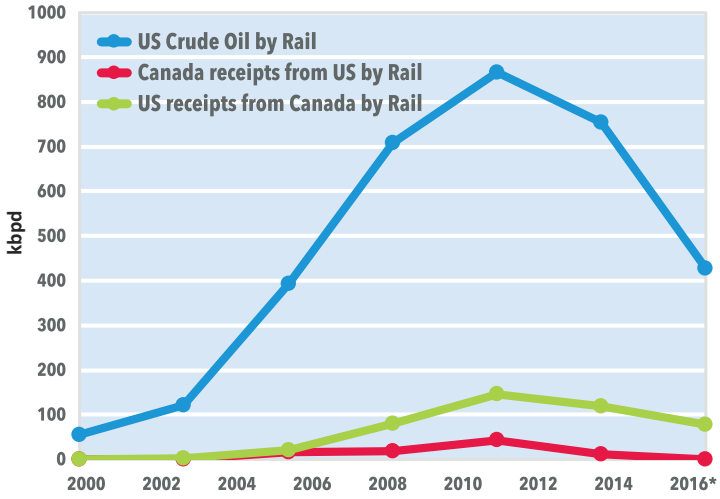
A Flood of Crude or Product, Now Receding

Oil, as a liquid, needs to flow, and we have used the concept of "path of least resistance" to explain the movement. The Western Hemisphere has a complex web of oil trade patterns, some of which have evolved over decades according to laws of supply, demand and geography. But the Shale Revolution in the U.S. and the increase in oil sands development in Canada created a flood in the center of North America. If we view the oil as following a riverbed, the course tends to run north and south, with few tributaries managing to meander all the way west to the Pacific Ocean or east to the Atlantic Ocean. The flood caused many changes downstream, some of which came about because of the dam caused by U.S. policies restricting the export of domestic crude. Only a certain volume of oil behind the dam could access the spillway and be taken off, and most of this went to Canada, which is itself a net exporter seeking external markets—chiefly the United States. Pipelines and storage were full. Rail and truck traffic rose. North American crude prices fell relative to the rest of the world. Refineries along the path of the flood ran their units flat out, filling product pipelines and sending a growing flow of product out into the rest of the Western Hemisphere and beyond.

There was a major push to build new transport infrastructure, including the ill-fated Keystone Pipeline. This line would have eased the passage of both Canadian crudes and U.S. shale play crudes. Now, oil prices have been low for nearly two years. U.S. and Canadian production are leveling off. The years of wrangling over the Keystone Pipeline were costly and politically divisive, but it is no longer such an important relief valve on the oil river system. Additional crude pipelines were completed as well.

Figure 8 offers a final thought on oil flow. When pipelines—the main river channels—were full, the second option was rail. In 2010, the U.S. shipped 55 kbpd of crude by rail. There was also a small amount of rail trade from Canada to the U.S., and from the U.S. to Canada. The growth in rail traffic has been astonishing. In 2014, U.S. crude oil by rail had grown to 867 kbpd. U.S. receipts from Canada by rail had grown to 140 kbpd. Canadian receipts from the U.S. had grown to 35 kbpd. But was 2014 the peak? Based on data for the January – July period of 2016, all three of these flows have ebbed. U.S. crude by rail is now averaging 426 kbpd. U.S. receipts from Canada are now 79 kbpd. And Canadian receipts from the U.S. have vanished. The flood may indeed be ebbing, and it would take a major resurgence in production to raise levels again.

Figure 8: U.S. and Canada crude by rail; was 2014 the peak?



Source: EIA. 2016 is January-July average.

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> **Whether or not a group favors removing the restrictions on crude exports, all must acknowledge the restrictions for what they are: an artificial barrier to trade.**

Conclusion: The Flood Recedes, But the Rivers Flow

The Americas from north to south have an abundance of petroleum resources, a massive amount of refinery capability and numerous population and demand centers. Channeling resources to their highest-value uses has created an extensive trade network that we have likened to a river system. The flooding of the North American internal river system caused numerous new flows and adjustments. One way or another, the path of least resistance for U.S. and Canadian crudes has been down the center of the continent, down to the U.S. Gulf Coast. But there, both geography and politics create a barrier. First, oil bound for the rest of the world must board a ship, changing its mode. Second, most domestic crude reaches a dam with only limited spillway, governed by export controls. Only in the past year have these export controls been relaxed, allowing diversification of export markets. The overflow crude in the past was refined. This created new flows of refined product that started as a trickle but now reach virtually every country in the Western Hemisphere.

The market changed immensely during the shale boom, and it is changing now once again in response to low prices. While U.S. and Canadian crude production will not plummet, certainly it will begin to level. As the restrictions on exports of U.S. crude were relaxed, this is changing flows. The export of refined product in some places may fall in favor of crude exports and/or crude swaps.

Whether or not a group favors removing the restrictions on crude exports, all must acknowledge the restrictions for what they are: an artificial barrier to trade. We have likened it to a dam, with a limited spillway over the top. But upstream from it, who knows how many canals, weirs, ponds and the like have been formed over the years? If we contemplate the massive outflow of refined products as an estuary, certainly it is nourishing for some. If we drain it, some will lose that nourishment. Changing an element in our bioregion will change other flows. These diversions to oil's flow become a political decision. In the political realm, however, nothing happens quickly, so government policy change will not cause an immediate drought or an immediate flood. In the near term, we can expect a gradual increase in crude trade with Canada and Mexico, but probably not an immediate opening of crude trade. If refining in Mexico and other Western Hemisphere markets is expanded, this will reduce the flow of refined products from the U.S. The less expensive resource will flow to where it is needed. There are many forces at work that may affect the flow. On the crude supply side, the opening of Mexico's oil industry may revitalize its flagging production. Like tides, the oil business has cycles. At this point in history, the low prices discourage the upwelling of oil from pools in shale plays, oil sands deposits and other unconventional oil reserves. There are more pools of oil available at lower cost, or available because of the severe need to produce. Many oil producers, OPEC and non-OPEC, depend on oil revenues and cannot afford to shut in production. Others, including Iran, hope to expand output. On the other side of the coin, supply may tighten because of war, political unrest or natural disaster. Trade flows may reach an equilibrium, or the tide may turn. The North American flood is receding, but the rationale behind Western Hemisphere oil market integration remains sound, and the rivers will continue to flow. ■

Dr. Nancy Yamaguchi

Nancy is an author and petroleum industry expert specializing in the advanced analysis of energy markets. Dr. Yamaguchi is the President of Trans-Energy Research Associates, Inc. focusing on a wide spectrum of fuel related issues such as economics and the environment. She possesses a strong interest in global oil industry, including supply, demand, trading trends, as well as transport, refining, product blending, alternative and reformulated fuels, product quality and price behavior. Dr. Yamaguchi can be reached at nyamaguchi@trans-energy.com.

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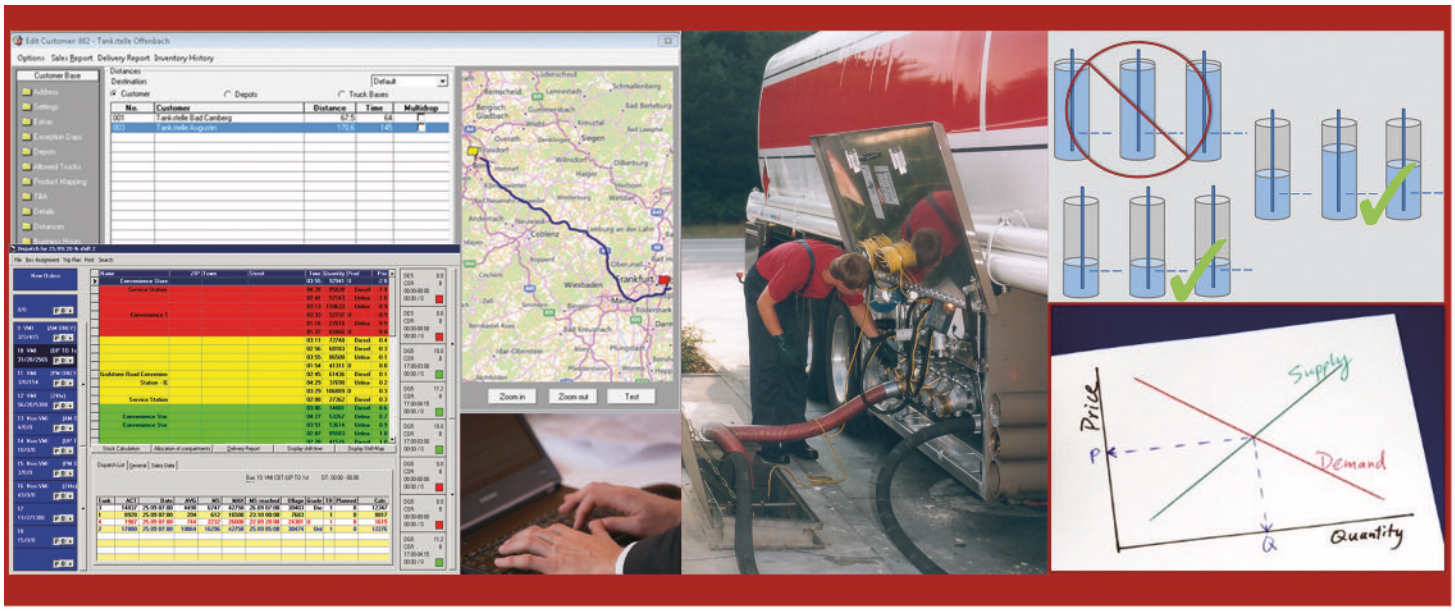

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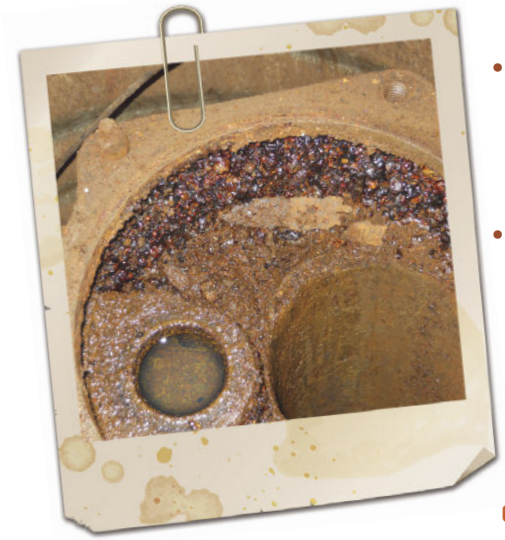
by Keith Reid

EPA Provides Next Chapter on ULSD Corrosion Concerns

Shortly after the introduction of ultra-low sulfur diesel in 2007, reports began to emerge about unexpected corrosion problems with metal equipment and fittings in tank sumps and fill buckets and areas. These reports defied any common explanation relative to such issues as supplier or geography. The Clean Diesel Fuel Alliance was formed, which commissioned the Battelle Memorial Institute to conduct a study on the issue.

The 2012 study hypothesized that ethanol cross contamination was creating aerobic and anaerobic microbial growth that introduced acetic acid into the system leading to aggressive corrosion. However, the limited sample size (six sites) was not seen as definitive, particularly with ethanol producers.

EPA just announced the results of its study on the issue that involved 42 diverse underground storage tank (UST) systems at 40 sites across the country. It featured extensive testing of fuels and vapors.



The study identified an actual problem, but failed to conclusively identify a cause. Highlights include:

- **Corrosion of metal components in UST systems storing diesel appears to be common.**
- **Many owners are likely not aware of corrosion in their diesel UST systems.**
- **The corrosion is geographically widespread, affects UST systems with steel tanks and with fiberglass tanks, and poses a risk to most internal metal components.**
- **Ethanol was present in 90 percent of 42 samples, suggesting that cross-contamination of diesel fuel with ethanol is likely the norm, not the exception.**
- **The quality of diesel fuel stored in USTs was mixed.**
- **Particulates and water content in the fuel were closest to being statistically significant predictive factors for metal corrosion, but causation cannot be discerned.**
- **Microbiologically-influenced corrosion could be involved as hypothesized by previous research.**
- **EPA recommends owners visually inspect USTs storing diesel as part of routine monitoring.**

Offered below is the executive summary.[1]

Executive Summary Investigation of Corrosion-Influencing Factors in Underground Storage Tanks with Diesel Service

This research focused on better understanding a type of rapid and severe corrosion of metal components in underground storage tanks (USTs) storing diesel fuel. UST owners first began reporting this corrosion to UST industry servicing companies in 2007. Several changes to the national fuel supply and fuel storage practices have occurred since the mid-2000s. To address the potential for corrosion problems, the U.S. Environmental Protection Agency's (EPA) Office of Underground Storage Tanks began working on this research in 2014 to understand how serious and widespread the metal corrosion problem could be. In addition, to help identify the cause or solutions, we wanted to identify predictive factors between UST systems with corrosion issues and UST systems relatively free of the problem. EPA's objective for the research was to develop a better understanding of potential risks to human health and the environment caused by the evolving corrosion problem in USTs storing diesel fuel.

In 2014, EPA held discussions with UST industry experts and worked collaboratively to develop field-based research that would further the understanding of corrosion inside USTs storing diesel. EPA designed our research to examine many factors on a diverse population of 42 UST systems in order to find potential predictive factors among them. We thought any predictive factors identified in our research would help focus the search of potential causes for the next phase of follow-on research.

> **The major finding from our research is that moderate or severe corrosion on metal components in UST systems storing diesel fuel in the United States could be a very common occurrence. Observations suggest that corrosion may be commonly severe on metal surfaces in the upper vapor space of UST systems, an area that before 2007 was not known to be prone to corrosion.**

In January and February 2015, EPA conducted on-site inspections of 42 diverse, operating UST systems at 40 sites across the country. Of these UST systems, 24 had fiberglass tanks, and 18 had steel tanks. Field teams documented the conditions of the UST systems with in-tank video cameras and photos so they could later assign a category of corrosion coverage to each system. The field teams also collected samples of vapor, fuel, and aqueous phase (also known as water bottom), if present, from each of the tanks. Field teams used a detailed questionnaire to gather information from each owner about the storage history, operation, and maintenance practices of each UST system.

EPA chemically analyzed the vapor, fuel, and aqueous phase samples. Three assessors reviewed the videos of each UST and categorized the USTs by the extent of the corrosion judged to be present: minimal, moderate, or severe. In an attempt to identify corrosion predicting factors among UST systems experiencing either minimal corrosion or severe corrosion, we then statistically evaluated the analytical results and responses from the questionnaires against the corrosion categories.

The major finding from our research is that moderate or severe corrosion on metal components in UST systems storing diesel fuel in the United States could be a very common occurrence. Observations suggest that corrosion may be commonly severe on metal surfaces in the upper vapor space of UST systems, an area that before 2007 was not known to be prone to corrosion. Furthermore, it appears many owners may not be aware of the corrosion nor are they aware that corrosion, which could affect the operability of their UST systems, could already be at an advanced stage. We observed 83 percent of the inspected tanks had moderate or severe metal corrosion. Prior to our research inspections, less than 25 percent of owners reported knowledge of corrosion in their UST systems.

It appears from our research that corrosion inside of UST systems could result in an increased chance of releases of fuel to the environment and subsequent groundwater contamination. Across the sample population, EPA observed corrosion occurring on all types of UST system metal components, including submersible turbine pump shafts, automatic tank gauge probe shafts, risers, overfill equipment like flapper valves and ball valves, bungs around tank penetrations, inner walls of tanks, and fuel suction tubes. Many of these UST system components are designed to prevent overfilling the tank or to identify leaks, and the components must be able to move and function as designed. Corrosion of some metal components could hinder their proper operation and possibly allow a release of fuel to occur or continue unnoticed. Anecdotal reports since EPA began our research suggest that other metal components in UST systems, such as tank walls, could also eventually fail by corroding completely through the metal if corrosion is not stopped. This would most likely occur in the bottom of an UST where aqueous phase and tank sludge collect. Corrosion through the bottom or wall of a tank could potentially allow fuel to leak into secondary containment areas or release to the environment.

Reference:
[1] U.S. Environmental Protection Agency Office of Underground Storage Tanks, July 2016. www.epa.gov

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EPA has heard anecdotes of functionality failures of release prevention equipment and leak detectors, as well as failures of metal walls resulting in leaks into secondary containment areas. Outside of anecdotes, however, very little verifiable data exists about how equipment functionality and integrity are being affected by corrosion in USTs storing diesel fuel. However, that information should become more available as owners become more aware of the findings of our research and corrosion in USTs storing diesel becomes more visible.

Even absent a release of fuel to the environment, severe corrosion poses concerns for owners. Corrosion increases servicing and equipment maintenance costs for UST system owners. Anecdotes suggest that dispenser filters may become clogged with corrosion debris that resembles coffee grounds, resulting in filters needing to be changed more frequently. Other equipment may need to be repaired more often and sometimes may need to be prematurely replaced.

“Even absent a release of fuel to the environment, severe corrosion poses concerns for owners. Corrosion increases servicing and equipment maintenance costs for UST system owners. Anecdotes suggest that dispenser filters may become clogged with corrosion debris that resembles coffee grounds, resulting in filters needing to be changed more frequently. Other equipment may need to be repaired more often and sometimes may need to be prematurely replaced.”

The data and analyses could not pinpoint a cause of corrosion that UST owners began reporting in 2007. It appears multiple underlying factors and corrosion mechanisms could be contributing to the corrosion; one such mechanism is microbiologically-influenced corrosion (MIC). Previous research on the recent corrosion phenomenon is limited, but suggests that the reduced sulfur in diesel could be allowing microbial life to proliferate in ultra-low sulfur diesel tanks and, through MIC, cause corrosive conditions that were less possible in USTs storing low sulfur diesel. Several independent organizations have produced publicly available resources that suggest following certain enhanced maintenance practices when storing diesel fuel in USTs. If followed, these practices can likely minimize MIC risks by reducing bacterial populations or preventing an environment where microbial life can thrive.

EPA's research builds on industry's first study about rapid and severe corrosion in USTs storing diesel, which the Clean Diesel Fuel Alliance (CDFA) completed in 2012. The objective of CDFA's study was to produce an initial hypothesis about the mechanism of corrosion from data collected on six UST systems. EPA's Office of Research and Development (ORD) completed research shortly after CDFA.2 Both the CDFA and ORD research hypothesized that biofuel components in diesel, such as ethanol and biodiesel, could be providing the energy source for microbial populations of bacteria like Acetobacter in USTs. This genus of bacteria was the most abundant in samples that underwent DNA sequencing in CDFA's study. EPA's research plan to identify any predictive factors by default included checking the plausibility of the hypotheses previously suggested. However, there are numerous other types of bacteria that could also be consuming chemical components of the fuel or fuel contaminants found in USTs. In addition to bacteria, there are also a number of other microorganisms that could cause or contribute to the corrosion attacks, including fungi, archaea, and eukaryotic organisms. A combination of one or more of these factors could also be responsible, but we did not test for those factors in our research.

Because only limited scientific research was available, EPA assumed from the beginning of our research that, within our research scope, it was not feasible to definitively pinpoint a cause of the corrosion. Further, most familiarity with the extent and geographic spread of the problem was anecdotal. Therefore, an exploratory approach was most helpful in expanding the knowledge around the issue. Our research suggests that MIC is likely involved in the moderate or severe internal corrosion in USTs storing diesel. However, further identification of specific bacteria was not possible within the scope of our research. Therefore, while previous research hypotheses about the role of specific species of a genus oxidizing biofuel components were not disproven by the results of our research, validation would be speculative. EPA's research population of 42 USTs was geographically, materially, and operationally diverse and was the largest field research of this issue to date. However, the population is a small percentage of diesel USTs across the United States, and the types of USTs and maintenance practices by owners in the research population may differ from those in the national population of USTs storing diesel. Therefore, EPA cannot predict if the presence of moderate or severe corrosion in diesel USTs across the United States will be higher or lower than identified in our research.

EPA recommends owners check their diesel UST systems for corrosion and take steps to ensure the proper operability of their UST systems. EPA is recommending this because 83 percent of USTs in the study affected by moderate or severe corrosion is very high, most of the owners were not aware of the extent of the corrosion in their USTs, and it appears that corrosion could potentially affect equipment functionality and potentially lead to a release of fuel to the environment.

Our research provided us with key takeaways that, by increasing the knowledge around corrosion, may help prevent releases of diesel fuel from UST systems. ■

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VENDOR VIEWPOINT:

On the Ground with Diesel Corrosion

by Brad Hoffman

> **I have been an engineer in the petroleum industry for my entire career, first with Exxon and for the last 23 years, with Tanknology. I have never in my life seen corrosion of this magnitude in a fueling system.**

When the EPA revealed the results of its study in July on the increasing presence of substantial corrosion in diesel fuel tanks, it proved that the problem is much larger than anyone anticipated.

The facts are staggering:

- 83% of the diesel tank systems exhibited moderate-to-severe corrosion.
- 75% of the owner/operators of those diesel tanks had no idea it was happening.
- The corrosion is developing in both steel and fiberglass tank systems.

Even more staggering is the severity of the corrosion.

I have been an engineer in the petroleum industry for my entire career, first with Exxon and for the last 23 years, with Tanknology. I have never in my life seen corrosion of this magnitude in a fueling system. The fact it was found in moderate-to-severe states in 83% of the systems points to a major industry problem.

Tanknology partnered with Battelle and performed all the fieldwork for this EPA study, which the agency termed the "largest field research of this issue to date." Our fieldwork consisted of inspecting and sampling each of the 42 tanks in the survey. The sites were from all over the country, covering widespread geography.

Our work consisted of collecting fuel, water and vapor samples, and inspecting fuel filters and the tank system access points for signs of corrosion. We also used our TankCam® remote internal video system to record the conditions inside the tanks. The images you see here are representative of the extreme conditions we discovered.

In this article I'll address a little more about what we found, why it might be happening, and what you can do as an owner/operator to mitigate the potential for severe corrosion degradation of your diesel system.

Our findings

During our fieldwork for this study last year, as well as subsequent studies performed for our clients, we have observed and documented what I consider to be unique, rapidly accelerated corrosion on the metal components of USTs storing diesel. Virtually all on-road diesel for sale today is ultra-low sulfur diesel, or ULSD, which has been in use since 2006.

Unlike the mild orange-colored oxidation that would be typical for corrosion in this environment, we have seen large tubercles and nodules that can vary in color from yellow to orange to reddish brown and even black. The metal components in the vapor space of both steel and fiberglass tanks, including bungs, risers, caps, plugs, submersible turbine pump (STP) shafts, ball float assemblies and flapper valves have all exhibited this unusual form of aggressive corrosion.

It has not been uncommon to find a severely corroded ball float assembly or bungs completely covered in tubercles, some of which can be up to an inch long. On one occasion, the top of a riser pipe broke completely in half as a result of the corrosion.

We have pulled completely corroded STP shafts from tanks, and in some cases are not even able to remove them due to the excessive corrosion in the riser. Layers of corrosion and tubercles have built up so severely that the inside of the riser is no longer wide enough for the STP motor to be removed or serviced.

We have seen the same problem with automatic tank gauge (ATG) probes; corrosion build up in the riser pipe can make it impossible to remove the ATG floats. Consequently, the probes and STPs remain in the corrosive environment of the upper vapor space, either unable to be serviced, or in some cases, replaced with smaller diameter ATG floats once the original floats are knocked off and left to fall down into the tank.

As the study concluded, 83% of the tanks exhibited moderate to severe corrosion. This large percentage of such a diverse experimental group indicates that this issue is not limited by geographic conditions. It can, and is, happening everywhere.

This corrosion can, and in some cases did, compromise the functionality and structural integrity of the UST systems, leaving even the most responsible of UST owners unaware of the problem and potentially exposed to significant environmental impact.

Why is this happening?

Unfortunately, the EPA study was unable to pinpoint a direct cause. Multiple factors are likely acting as confounding variables, including bacteria and gasoline-ethanol blended fuels.

Ethanol was found in 90% of the fuel samples taken in the study. Obviously, ethanol is not intentionally blended with diesel, so this suggests that cross contamination is prevalent. As the EPA study concluded, it's "likely the norm, not the exception."

As close as EPA got to a cause was the consistent presence of water content and particulate matter in the fuel tested from these tanks. We know that water is no friend of diesel—it is the essential element for microbes to develop and grow in the water-diesel interface—and that results in corrosion.

The water and particulate content, EPA concluded, is "the closest to being statistically significant predictive factors for metal corrosion, but causation cannot be discerned."

What you can do about it?

So the experts can't determine why, exactly, this is happening and even the most diligent of owner/operators could have a severe corrosion problem they aren't even aware of. What is there to do to protect yourself?

You can take steps to monitor, and even prevent, this corrosion while industry experts continue to look for answers.

Here are some steps we recommend:

Perform regular visual inspection inside the ATG or other riser pipes accessible from grade, looking for any sign of potential corrosion.

Remove and inspect the ball float or flapper valve overfill prevention equipment–perhaps incorporated as part of a periodic inspection such as PEI RP900.

The single biggest thing you can do is manage water. Do everything possible to keep water from entering the tank:

- *Remove standing water, ice and/or snow around tank fill covers.*
- *Make sure all opening bungs, caps and cord grips are tight and replace caps or gaskets as needed.*
- *Keep fill and vapor recovery spill buckets clean. Pump out any water; clean out excess fuel and dirt. Don't drain water into tanks!*
- *Change filters frequently, especially if slow-flow occurs, and look for signs of corrosion on the filter and housing.*
- *Pay close attention to leak detection equipment and call for immediate service if any leak alarms or conditions occur.*
- *Verify that tank vents have rain caps.*
- *Avoid prolonged periods of low tank volume to minimize tank water from condensation.*
- *Check tanks for water bottoms frequently, especially before and after deliveries.*
- *No detectable water is acceptable in your diesel tank. It should be removed as soon as possible. Removed water should be tested for microbes and, if detected, appropriate corrective action should be taken immediately.*

When it comes to corrosion in a UST, if you can see it during a visual inspection, it's most likely the tip of the iceberg. You almost surely have it elsewhere in your system. It's important to know—and to address it as quickly as possible.

One of EPA's recommendations is to perform an internal video inspection of your tank. Tanknology's TankCam® remote visual tank inspection service, for example, can be used for this purpose, as it was for the EPA study. Such an inspection provides you with a clear picture of what's happening inside your tank without having to empty it.

More recommendations can be found in the Preventive Maintenance Guide for Diesel Storage and Dispensing Systems, published by the Coordinating Research Council (CRC). We have posted this document, many more actual corrosion photos and more information about the issue of corrosion in diesel fueling systems on our website at Tanknology.com/DieselCorrosion. ■

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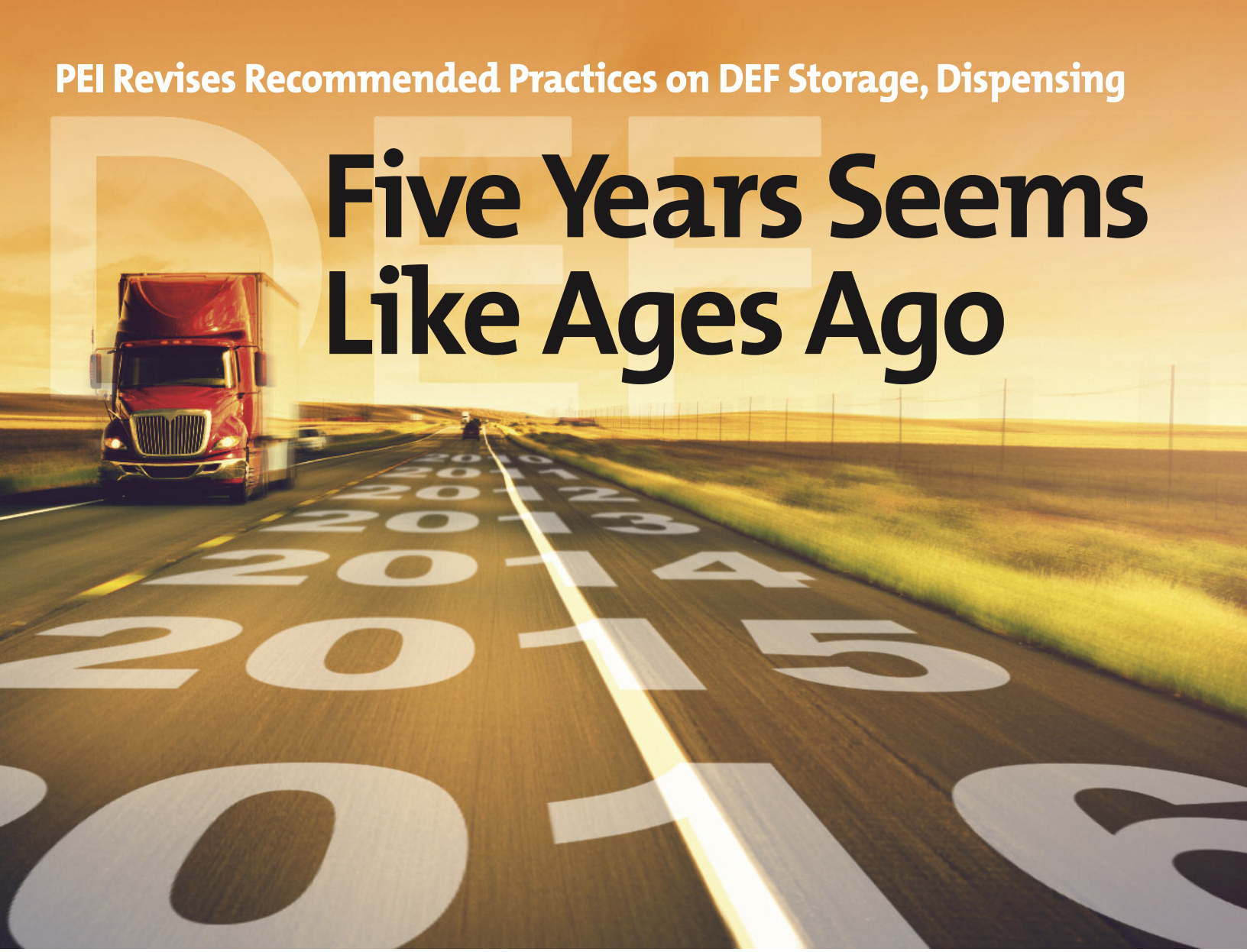
Brad Hoffman

Brad is Vice President of Engineering, Research & Development for Tanknology Inc. of Austin, Texas, the largest UST compliance services company in the world. Brad is a 28-year industry veteran, formerly an engineer and program manager for Exxon. He serves on a variety of PEI and API technical committees. Brad can be reached via email at: bhoffman@tanknology.com.

PEI Revises Recommended Practices on DEF Storage, Dispensing

Five Years Seems Like Ages Ago



Taking lessons learned during the past five years into account, PEI's Diesel Exhaust Fluid (DEF) Committee recently released the second edition (2015) of RP1100. The document makes technical corrections and clarifications to the original work and adds guidance on several key topics related to DEF storage and dispensing.

As was true in for the first edition, Steve Hieber of PWI, Inc., in New Oxford, Pennsylvania, chaired the committee of experts who drafted the revision. Hieber expressed his gratitude for the knowledge and cooperation of all the committee members.

PEI published the first edition of RP1100: Recommended Practices for the Storage and Dispensing of Diesel Exhaust Fluid (DEF) in 2010 in response to changes in federal emission requirements for diesel vehicles and a new diesel engine technology: selective catalytic reduction (SCR).

The emission requirements lowered the allowable oxides of nitrogen from diesel vehicle exhaust. And SCR, which uses DEF for after-treatment of the vehicles' exhaust, was emerging as the accepted solution to meet those requirements.

That first edition was intended to provide basic guidance on the new DEF storage and dispensing equipment that would best preserve the product's quality and prevent releases into the environment.

Five years later, SCR-equipped diesel vehicles and DEF-related infrastructure are firmly established as essentials of the U.S. transportation system. Annual DEzF consumption in the U.S. is expected to increase from 400 million gallons in 2015 to 1 billion gallons in 2019. And much has been learned in the process by installers, service contractors, fuel marketers and other DEF stakeholders.

Here are eight of the most important changes, clarifications and additions in this version:

by Rick Long

1 Labeling

As the DEF industry has matured during the past five years, so has the regulatory environment in which the industry operates. One regulatory development has to do with labeling requirements. Effective January 1, 2016, the National Conference on Weights and Measures (NCWM) added requirements for the labeling of DEF dispensers to its Handbook 130, the document that covers engine fuels, liquids and fueling systems.

"Handbook 130 has been adopted in full by nearly 20 states, and many other states accept portions of the document," Hieber said. "The PEI DEF Committee felt it was important for users of RP1100 to know that specific language is now required on DEF dispensers, so we amended Chapter 6 to point users to Handbook 130 for those labeling requirements."

2 Material Compatibility

To prevent contamination or an unintended release, equipment that comes into contact with DEF—including tanks, dispensers, piping and other associated components—must be compatible with the product. The 2010 version of RP1100 included examples of compatible and incompatible materials which were referenced in two standards: the International Organization for Standardization's ISO 22241 and the German Institute for Standardization's DIN 70070.

The 2015 edition removed the reference to the DIN standard.

"ISO 22241 has gained wide acceptance in the industry in the last few years," Hieber said. "DIN 70070, on the other hand, is seldom cited and has essentially become obsolete. As a result, the committee thought it would be unwise to reference both documents in the new edition. In particular, we wanted to avoid any opportunities for conflict or confusion if one of the standards changed in the future and the other did not. Given ISO 22241's prominence, sticking to that standard was the obvious choice."

As in the first edition, however, the reference to ISO 22241 is not meant to specify the only materials that are compatible.

"While we elected to defer to the work ISO has done in identifying compatible and incompatible materials, readers should be aware that the ISO materials lists are for guidance only," Hieber said. "Manufacturers may test other materials for compatibility with DEF as long as the test conditions reflect the expected temperature range and contact time to give a fair assessment of any material degradation or other effects."

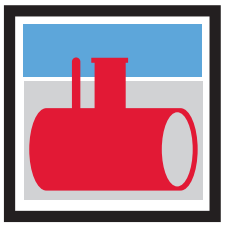
3 Quality

The introduction of impurities will degrade DEF and negatively affect the performance of SCR systems. The first edition of RP1100 stressed the importance of maintaining product quality throughout each phase of storage and dispensing.

"For this edition, the committee decided to go even further by giving users some guidance on how to ensure that the product is still on spec," Hieber said. "One often-used tool for doing that is a DEF refractometer, which tests the concentration of urea in the DEF, so we mentioned that approach in the new document.

"It's important to mention, however, that the committee did not go as far as it could have with specific sampling and testing procedures for determining DEF specifications. The reference to refractometers simply states that the use of this device is 'one way' to do it."

4 Underground Storage Tanks



As DEF quantities have grown during the past few years, underground storage tanks (USTs) have become a common solution for storing the product. The 2010 edition gave early guidance on DEF USTs, noting specifically that:

1. All DEF USTs should be double-walled, have secondary containment with monitoring or both.
2. The inner tank must be constructed of compatible materials.
3. The inner tank and outer containment must be liquid-tight.

The new document further refined the tank requirements.

"Hydrostatic monitoring systems, in which the interstitial space is filled with brine, clearly would cause contamination of the DEF if the inner wall were to leak," Hieber said. "In the new edition, the committee pointed out this danger, in effect recommending the use of tanks with a dry interstice."

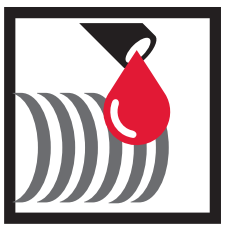
5 Overfill Protection

Sometimes one word makes all the difference. A change to section 5.2.2.6 in the revised RP1100 is an example.

This section, which addresses overfill prevention, previously stated that tanks "should" be equipped with overfill protection. The new sentence states "equip" DEF USTs and ASTs with overfill protection.

The committee's deletion of the word "should" turned what had been a suggestion into a requirement. This change represents a clear decision in favor of overfill protection.

6 Thread Sealant



Not every change in the revised RP1100 represents a major shift or new information. Some revisions are clarifications. One example involves the recommendations on how best to prevent DEF migration through small gaps in seemingly tight joints and fittings.

The 2010 document noted correctly that installers should use a sealant on tapered threads to prevent leakage and creep. The revised document reinforces this point, adding that any sealant used on tapered threads should be compatible with DEF because sealants that are incompatible with DEF could contaminate the product, leak or creep.

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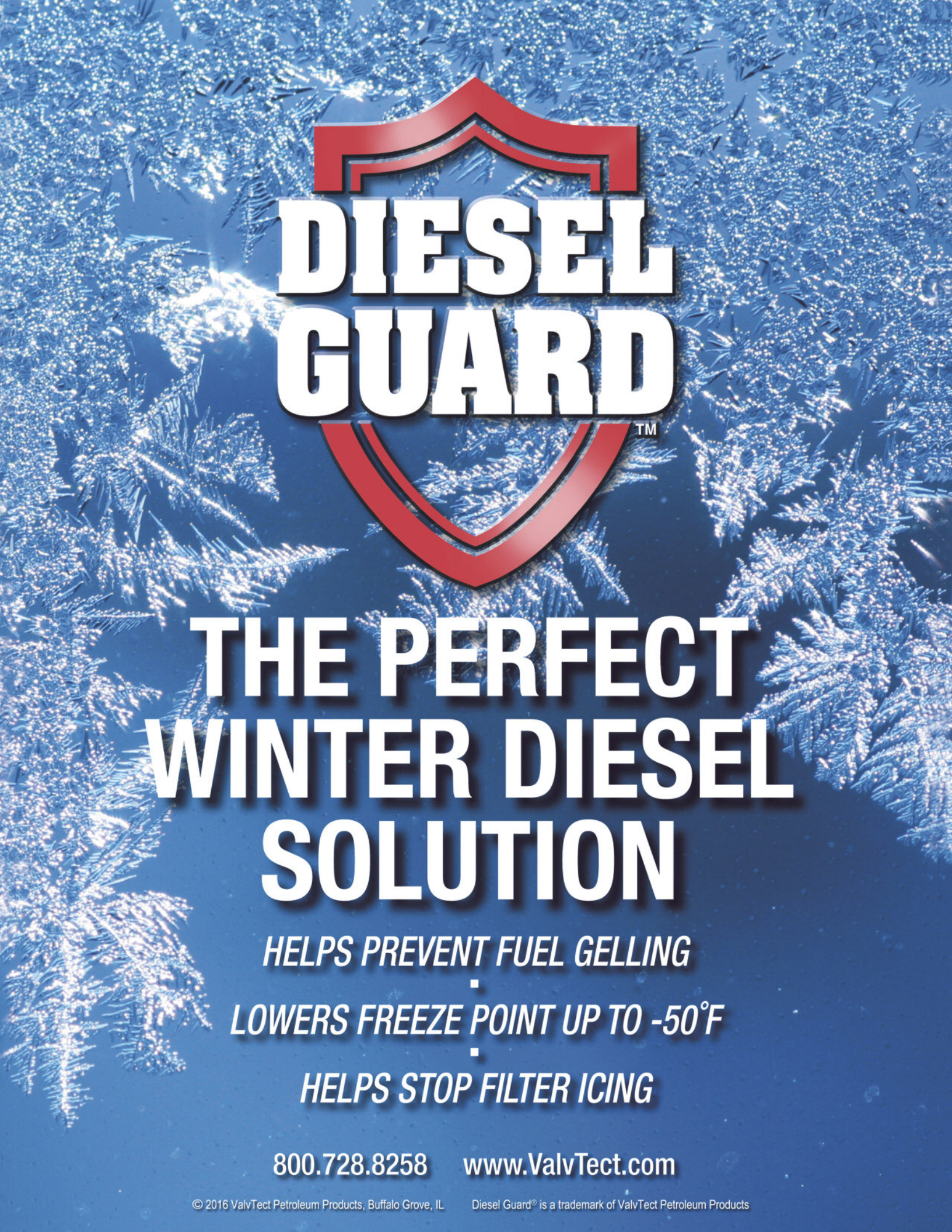
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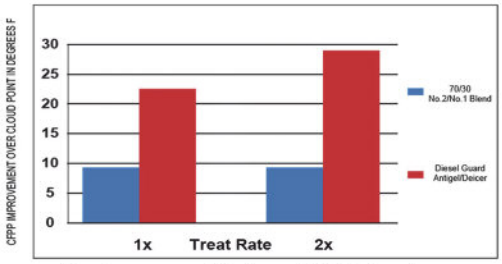
- Wax antisettling to keep wax suspended.
- Synergist boosts performance of hard to treat fuels

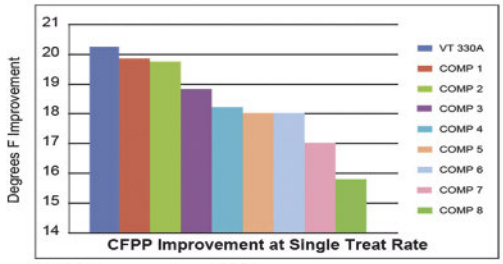
COLD FILTER PLUG POINT

DIESEL GUARD VS NO 1



Results are average of 5 reference ULSD No.2 samples.
1x= Diesel Guard Standard Treat Rate 2x= Double Treat

DIESEL GUARD VS OTHER ADDITIVES



- VT 330A improvement was 20.4° F
- Average improvement of all competitive cold flow improvers was 18.1° F

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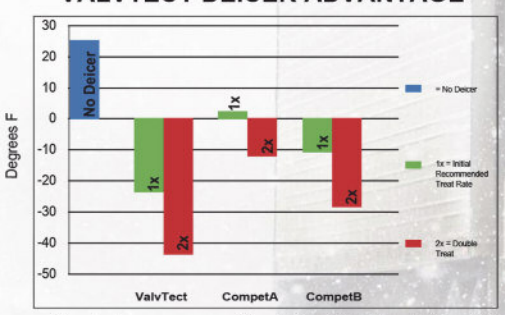
- Better freeze point dpression.
- Disperses entrained moisture.

SUPERIOR ICING PERFORMANCE

VALVTECT DEICER ADVANTAGE



Freeze point reduction was measured in wet diesel fuels (Ave. Moisture=96ppm).
Sampling taken from 20 different ULSD fuel sources nationwide.

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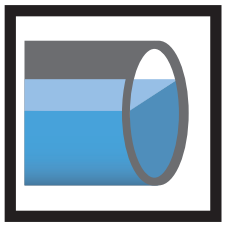
7 Safety

As DEF quantities have grown during the past few years, underground storage tanks (USTs) have become a common solution for storing the product. The 2010 edition gave early guidance on DEF USTs, noting specifically that:

1. All DEF USTs should be double-walled, have secondary containment with monitoring or both.
2. The inner tank must be constructed of compatible materials.
3. The inner tank and outer containment must be liquid-tight.

The new document further refined the tank requirements.

"Hydrostatic monitoring systems, in which the interstitial space is filled with brine, clearly would cause contamination of the DEF if the inner wall were to leak," Hieber said. "In the new edition, the committee pointed out this danger, in effect recommending the use of tanks with a dry interstice."



8 Ballast

One concern that has arisen since the first edition was published has to do with ballasting DEF tanks during installation.

"The committee was aware that some installation contractors have used water containing chlorine as ballast when installing DEF tanks," Hieber said. "New language in Chapter 5 makes it clear that only DEF, distilled water or deionized water should be used as the ballasting medium. This requirement essentially ensures that there will be no risk of contaminating the DEF that is later introduced into the tank."

Status Quo

After debate, the committee also chose not to change several decisions reflected in the 2010 edition.

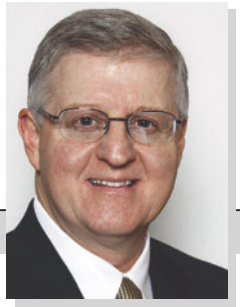
Marine DEF

In 2010, the drafting committee limited the recommended practices to motor fuel dispensing facilities, repair/maintenance garages and service centers. This excluded marine diesel environments, which use a more concentrated aqueous urea solution (AUS 40) than that used in motor vehicle fueling (AUS 32). Equipment used for the storage and dispensing of AUS 40 must be designed to meet the unique challenges of marine environments. The committee said that the installation, service and maintenance demands of marine applications were beyond their expertise and did not include recommendations for marine facilities. Similarly, no mention was made of a new Marine DEF certification program soon to be launched by the American Petroleum Institute.

Tank installation practices

Another area the committee did not address in depth was installation procedures for underground and aboveground DEF tanks. As in the 2010 document, the committee instead refers readers to PEI's RP100 and RP200, the documents that cover the installation of USTs and ASTs, respectively.

"We decided to again rely on the expertise of the PEI committees charged with recommending installation practices, rather than cluttering RP1100 with dozens of pages on a subject we know something but not everything about," Hieber said. ■



Rick Long

Rick Long is the general manager and associate general counsel of PEI, as well as editor in chief of the PEI Journal. To learn more about PEI/RP1100, view the complete table of contents or order a printed or PDF copy, visit www.pei.org/rp1100.

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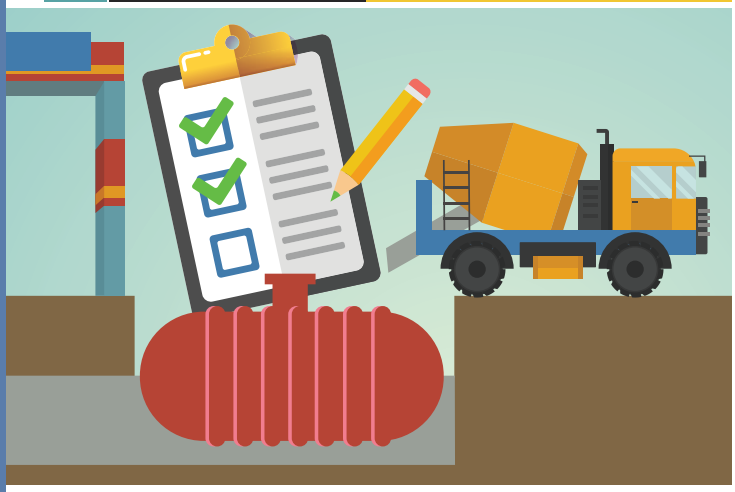
VENDOR VIEWPOINT:



New Installation Testing:

Why Test Before Concreting?

by Reed Leighton

Picture this: A conversation two petroleum industry executives might have at a trade conference or a chance encounter at an airport gate lounge in Dallas, Denver or Detroit.

The topic of conversation is testing newly installed underground storage tanks (UST).

"I'm not convinced you guys in the tank-testing business understand that we don't have a profit margin—or time—that allows us to pay for bells and whistles when we're putting in USTs at a new site—no offense," remarked the national retail-petroleum executive.

"No offense taken," replied the CEO of a company that tests UST installations and monitors wetstock. His company, based in Australia, was a market leader in the United States and Asia. The company had examined literally thousands of UST systems—and documented many leaks.

"We have a very good idea what you blokes are up against to get USTs into the ground, hooked up and operational—especially in a tight regulatory climate," the CEO said. "It's tough."

"You got that right," the retailer said. "We leave no stone unturned to ensure life safety, environmental protection and compliance with the appropriate regs."

The USTs, he explained, are installed by highly competent contractors whose crews know what they are doing. "Once the new USTs are emplaced, connected and ready, the crews use industry-standard pressure tests to ensure integrity. Then, when everything passes the tests, it's backfill and pour concrete. So, what's wrong with that—do you think my UST installer needs a third party looking over his shoulder?"

"Let me answer it this way," the CEO replied. "Several years ago in cooperation with some major oil customers, we ran an engineering research study on new UST-installation practices and started doing certified tests before and after concrete to study system integrity. Before and after. We were quite staggered by the results—and it's taken some time for the industry to understand what was discovered.

> **One of the things our research uncovered was that quality-control checks by UST installers had a wide variation. But, even where the installer checked their work well, the use of an analog pressure gauge with a 1-psi resolution was not detecting leaks as small as 380 milliliters per hour or less.**

"One of the things our research uncovered was that quality-control checks by UST installers had a wide variation. But, even where the installer checked their work well, the use of an analog pressure gauge with a 1-psi resolution was not detecting leaks as small as 380 milliliters per hour or less.

"There was one site where our inspectors brought back a photo of a gauge—lying on the ground, connected to nothing, but reading three psi—that they pulled off a secondary line at a pre-bury. The contractor said he had pressure on it for a week, but our team found multiple leaks. So, even with the best intentions and experience, errors can occur."

"It is a vastly underappreciated fact," continued the CEO, "that 90% of remodeled and new sites have an installation issue like small leaks and weeps from pipes and fittings, which stem from the date of the original site construction. Once concrete is poured, these small nuisance issues are often too difficult to address. By conducting precision testing before concrete is poured,

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By conducting precision testing before concrete is poured, these nuisance weeps and ingress sources are identified, repaired and eliminated.

these nuisance weeps and ingress sources are identified, repaired and eliminated. And contractors almost always welcome this independent confirmation on their work quality," he added.

"Assuming a retail operator has the best UST installer in the world who only has a leak at one in 10 sites, consider the potential costs at that one site.

"The site is operational but a post-bury test indicates there is a leak of gasoline or diesel. The exact location of the leak's source(s) is unknown. Fuel has to be removed from the suspect line; retail traffic suffers. The line has to be located; concrete has to be chopped up. The entire line is excavated before the repair. Then, post-repair, the line/system is retested. If it passes, the excavation is backfilled and re-covered with concrete."

"That's a bad scenario, for sure," the retailer agreed. "But, if the new UST system at one of our sites fails a post-bury test, it's the installation contractor who has to pick up the tab for the repairs."

"A minute ago," the CEO countered, "you said that if the motoring public doesn't like the appearance of one of your gas stations, it will spend its money at the competition next door. Well, how bad will one of your stores look if part of the parking lot is blocked off with barriers and orange cones, men in hardhats are operating loud equipment to cut up your concrete and there are 'Not in Service' signs on some of your fuel pumps? Not only are you losing business, but consider the negative brand impact—not to mention poor customer experience. And your company's relationship with its UST installer could be damaged, too."

He concluded, "The cost of repairing one leak on one site would easily cover the cost of third-party, pre-burial testing on 10 sites.

"It's as simple as this," he said. "If you want to comply with the law you have to do a post-bury test with a precision test. Why would you even consider a less precise test before you put a hundred thousand dollars of backfill and concrete over the system?

"And let me leave you with this thought," he said. "How big is your maintenance budget? With today's reformulated fuels with low sulfur and ethanol, your storage system needs to be as tight as possible to prevent water ingress that causes issues such as biological activity, accelerated corrosion and contaminated product unfit for sale."

The airport loudspeaker squawked with first calls of departing flights. The two men stood up and glanced at their respective departure gates. "Great talking to you," the retailer said as he reached down for his briefcase. They shook hands. "See you around." The CEO nodded. "No worries, mate." ■

Reed Leighton

Reed is the CEO and director of Leighton O'Brien, a global leader in fuel analytics software and field technologies and services to manage petroleum storage compliance and asset integrity. Reed is a well-known industry leader with a career spanning over 26 years in the oil industry. For more information about UST-compliance testing, contact Leighton O'Brien at usasales@leightonobrien.com or go to www.leightonobrien.com.

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VENDOR VIEWPOINT:

How to Chart a Cost-Effective Compliance Program for the Future

Compliance management is becoming increasingly demanding for today's retail and commercial fuel site operators as regulatory agencies continue to implement more stringent compliance requirements. For instance, the U.S. Environmental Protection Agency (EPA) recently revised its underground storage tank regulations, adding secondary containment, maintenance, operation and training stipulations. Failure to meet compliance regulations such as these can be extremely costly; EPA penalties for UST violations can reach up to $37,500 per day of noncompliance.

However, maintaining site compliance isn't necessarily cheap or easy. Installing new monitoring equipment can result in undue downtime and significant installation costs. As the regulations become stricter, U.S. fuel site operators need to implement fuel monitoring systems that will provide cost-effective compliance monitoring now and flexibility for the future. Fortunately, innovations in tank monitoring equipment and infrastructure can simplify new installations and reduce installation costs.

Modern tank gauges, such as OPW's SiteSentinel® Nano® Console shown here, offer an intuitive touchscreen and user-friendly monitoring tools.

by Bobby Hayes

Wiring is Expensive

Most tank gauges require monitoring devices such as probes and sensors to be installed on individual, separate wires. This type of wiring configuration is both inefficient and expensive because it requires a high number of "home runs" to be wired back to the tank gauge. The higher the number of home runs needed, the more wire and time required to complete a new tank gauge installation. The more time needed to complete the installation increases site downtime and labor costs (the more wiring runs a contractor must install, the longer it will take him to complete the job).

For example, a fuel site with four dispensers and three storage tanks that uses a conventional wiring configuration is likely to need 10 or more home run cables back to the tank gauge. Older tank gauging systems and wiring configurations also waste a larger amount of the wire purchased in order to complete the installation. For almost every spool of wiring purchased for the installation of a fuel tank monitoring system, there is a length of wire at the end of the spool that cannot be used. Here's why: spools are available in lengths of 500 feet and 1,000 feet of wire; runs are often 150 – 200 feet in length. As a result, there are often extra 100 – 200-foot lengths of wire remaining at the end of spools that cannot be used for home runs. The more spools the installation requires, the more wire that is wasted.

Fortunately, advancements in tank monitoring technologies make inefficient wiring configurations no longer necessary. Today, there are tank gauges on the market that support a streamlined wiring configuration, which significantly lowers the amount of cable needed for installation—in some cases reducing the number of home runs to just two or three. This reduction in home runs can decrease the amount of wire needed by hundreds of feet.

Some equipment manufacturers, such as OPW Fuel Management Systems, have engineered efficient wiring configurations for their tank gauges.

Tank Monitoring Solutions That Reduce Costs

Manufacturers of fuel management equipment recognize that fuel site operators face numerous challenges when it comes to managing their storage tank environments, including rising operating costs and changing compliance requirements. To help fuel site managers maximize their equipment investments and simplify compliance management, manufacturers are engineering tank monitoring solutions that not only provide state-of-the-art compliance monitoring, they also minimize the site downtime that occurs during typical installation and equipment upgrades. Fuel management equipment manufacturers are also designing tank monitoring systems with flexibility in mind, so fuel site managers can more easily—and cost-effectively—adapt their systems to changing compliance requirements.

> **Although modern tank gauges are being engineered with efficiency in mind, it doesn't mean they are sacrificing functionality for efficiency. In fact, today's tank monitoring systems offer feature sets that are more powerful than their predecessors.**

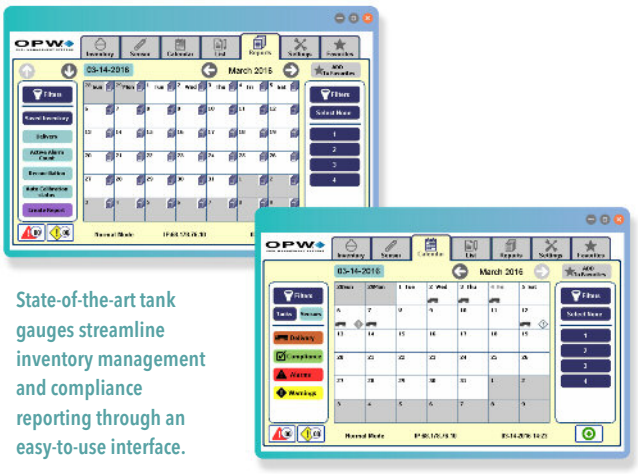
For example, there are tank monitoring solutions on the market that pair a cost-saving tank gauge with an innovative wiring configuration that allows probes and sensors to be run back to the gauge on the same wire. Recent advancements to this technology now enable multiple probes and sensors to be mixed and matched on the same wire, which significantly reduces the amount of wire needed for a new tank gauge installation.

For a fuel site with three tanks and four dispensers, a tank monitoring system that permits an efficient wiring installation can reduce the amount of wire needed for installation by as much as 60 – 70 percent. At smaller sites, the wiring technology can enable the number of home runs to be pared to just two or three runs. By using a tank monitoring system that supports a lean wiring configuration, a 3-tank 4-dispenser site could initially install three tank probes, three STP sump/annular sensors, four dispenser pan sensors and plan for additional tank monitoring sensors and dispenser pan sensors to be added in the future (in the event the site needs to expand its monitoring capabilities).

And it's not just the amount of wiring that is reduced—the amount of wire that is purchased but ultimately goes unused and the amount of conduit needed for installation are also reduced. Fuel site operators can save between 45 and 55 percent on these infrastructure costs by installing a tank gauge that supports an efficient wiring configuration.

Although modern tank gauges are being engineered with efficiency in mind, it doesn't mean they are sacrificing functionality for efficiency. In fact, today's tank monitoring systems offer feature sets that are more powerful than their predecessors. These features include remote management, user-friendly compliance management tools and comprehensive report packages. All of these tools help fuel site managers streamline their daily compliance procedures.

While there is a degree of nuance involved with installing a tank monitoring system for the particular needs of each site's application, the fundamental financial challenges associated with an installation remain fairly ubiquitous. A fuel site that is wired with efficiency in mind can realize substantial installation cost savings through reduced labor and wiring expenses. Compared to older model gauges that don't support a lean wiring configuration, today's state-of-the-art consoles can save U.S. fuel sites an average of 50 – 60 percent on installation costs. Consult with a qualified fuel equipment representative to review installation costs for your site and to identify potential cost-saving technologies that will likely reduce your capital expenditures.



State-of-the-art tank gauges streamline inventory management and compliance reporting through an easy-to-use interface.

Prepare for Future Compliance Needs Now

While investing in cost-saving technology innovations is certainly one way fuel sites can reduce their expenses, investing in fuel management equipment that supports an upgrade path effectively increases the service life of that equipment. In many cases, this approach provides a measure of flexibility that enables both existing and new fuel sites to comply with environmental regulations as they evolve.

For instance, some fuel management systems can easily be upgraded to leverage today's advanced fuel management software. This may allow a fuel site to automate and streamline reconciliation reporting procedures required by their state. Likewise, site operators who invest in an upgradeable tank gauge will be able to leverage more powerful monitoring capabilities with minimal interruption to operations.

In this era of environmental compliance, fuel site operators can expect that regulations will expand and become increasingly strict. Therefore, fuel site managers need to position their operations to meet today's compliance needs as well as those of the future. Deploying tank monitoring solutions that are engineered to streamline compliance management, reduce installation costs and provide flexibility for changing needs is a cost-effective approach. Fuel sites that align their operation with an equipment manufacturer who is vested in the fuel site's changing needs will find themselves leveraging their equipment investment over the long-term, ensuring they are optimized to meet compliance requirements for years to come. ■

Tank Gauging Technology for a Digital World

Modern tank monitoring systems feature user-friendly software that helps operators efficiently monitor their tanks and manage compliance reporting in the context of today's digital world. Hallmarks of these advanced systems include:

A Web-based user interface that enables remote management and training

A full-color, intuitive touchscreen that makes navigation quick and easy

A sensor status page that simplifies compliance reporting

A page that presents a timeline or calendar view of tank and sensor alerts, including deliveries, compliance, alarms and warnings that can be filtered by event and/or tank sensor

A comprehensive reports package including current inventory, delivery history, events in progress, event history and leak test

An address book of contacts for easy reporting configuration via email and short message service (SMS)

Bobby Hayes

Bobby is the Domestic Sales Manager at OPW Fuel Management Systems in Hodgkins, Illinois. He can be reached at 770.605.9611 or robert.hayes@opwglobal.com. OPW is a global leader in fully integrated fluid handling, management, monitoring and control solutions for the safe and efficient handling of critical petroleum-derived fluids from the refinery to the commercial and retail points of consumption. OPW is an operating company within the fluids segment of Dover Corporation. For more information about OPW, please visit www.opwglobal.com.

Today, most off-road natural gas vehicle activity is occurring in mining applications. The largest mine trucks can typically burn between 150,000 and 400,000 gallons of fuel annually. There are more than 28,000 large mine trucks (>100-ton capacity) worldwide, and up to 40 of these trucks can operate at a single mine.

Oil and gas production also falls into the off-road high horsepower (HHP) category, but typical applications in this segment apply to non-mobile applications, such as dual fuel (50% natural gas, 50% diesel), stationary generator sets, drill rigs, workover rigs and fracturing engines.

Source: NGVAmerica

Bottom Line

Mining operations consume huge amounts of motor fuel, both in direct mobile to vehicle and backyard bulk tank fueling operations.

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FLOWSERVE®

by Maura Keller

Fleet Card Programs: An Evolving Success Story

The fleet fueling industry originated in the late 1970s around private label fleet cards, which were primarily issued through petroleum marketers who owned bulk fueling locations and needed a method for dispensing fuel into commercial vehicles–other than through a dispenser attached to their bulk fueling station.

"The solution was found in the form of a technology called 'cardlock,'" said Shane Dyer, president of PowerUp Fleet. "This automated fueling system enabled a petroleum marketer to set up a fueling location, often directly attached to the bulk plant tanks, and issue cards that provided their customers with both security and control over their employees' purchases." PowerUp Fleet is a leading authority on commercial fleet fueling. They support over 100 clients nationwide in designing, marketing, and supporting their proprietary fleet card programs. Their expertise includes the evaluation, design and implementation of transaction processing systems, fleet fueling based accounting system implementation, sales force automation and customer relationship management specific to fleet fueling, and sales force training services.

As Dyer explains, in the mid to late 1980s, the petroleum marketers who owned these cardlock locations formed cardlock networks that allowed each other's customers to share the facilities under reciprocal agreements.

"These agreements ensured that the fuel purchased by the customer using a reciprocal location would be based on the wholesale cost and not a retail price," Dyer said. "This enabled the petroleum marketer to expand their footprint of locations whereby they could offer both a competitive price and enjoy the greatest margin possible." These networks were owned and managed by petroleum marketers who were mutually dependent upon the viability of the network.

On a concurrent path, owners of service stations had commercial customers buying fuel under house accounts. These were simply ledger cards that recorded the fuel purchased and subsequently were billed to the business.

"There was no security, control, or detail similar to the cardlock fueling option," Dyer said. "However, major oil companies recognized the need to assist their dealers in carrying the credit for

these accounts and began developing 'fleet credit cards.'" These cards were limited in functionality; however, they worked in every location that was branded by the major oil company. In time, these card processing services developed by the major oil companies morphed into what our industry now recognizes as universal cards.

These two parallel paths progressed separately until early 2000, when the industry began a consolidation and merger of the fleet card options. The reciprocal cardlock networks began integrating retail fueling locations under their model, and universal cards began integrating acceptance into the cardlock locations. As a result, there occurred a blending of two distinctly different fleet fueling experiences.

"Jumping forward to today, our industry has gone through a major consolidation of card processors whereby most fleet card options that petroleum marketers might consider engaging are limited to those offered by Fleetcor, WEX Inc., or Voyager—all multinational corporations focused on the growth of their transaction processing services," Dyer said. "In this transformation, the core value of proprietary cards treasured by the petroleum marketer and fleet customer alike is being diminished. Most important is a loss of control over their customer base and destiny. As a result, petroleum marketers are seeking proprietary card solutions that return control so that they can isolate and protect their hard earned customers."

Technological Advancements

Ramel Lindsay, U.S. Bank Fleet Product Manager, said data collection on today's fleet cards is more sophisticated and more comprehensive than ever, and that data is being integrated with information from other sources to help organizations operate their fleets more and more efficiently.

"As resources and time become more constrained, fleet managers find it very important to have systems in place that can pool all of their fleet-related data rather than have it reside in separate buckets," Lindsay said. "This integrated approach greatly improves financial forecasting, risk management and pricing, among other things."

In the case of the U.S. Bank Voyager Fleet Card, every card transaction captures 117 pieces of information. Whether you need a high level glimpse of operations or a microscope into specific activity, it's as easy as setting report parameters.

"Fleet managers can be more 'surgical' in their fleet management decisions because they can get specific real-time information on vehicle location, fuel usage, speed and mileage. They can compare reports month-to-month or year-to-year, going back as long as three years to detect patterns," Lindsay said.

> **"Petroleum marketers who secure fleet fueling customers are developing a clientele that they can directly control and influence over a long-term business relationship. This is in contrast to retail customers that can ebb and flow in and out of your site."**
>
> ***Shane Dyer, president of PowerUp Fleet***

More private label card programs also are now offering options for "cardless" purchases in emergencies or at times when purchasing with a card is not an option. For example, this year U.S. Bank launched U.S. Bank Fleet Virtual Pay. As Lindsay explained, when a driver is unable to use the Voyager card for an unexpected repair in an unexpected place, the service provider calls a toll-free number to get a unique, single-use account number for a cardless transaction.

"The number is generated by MasterCard, which effectively extends the Voyager Card's reach beyond the Voyager network of 230,000 locations to all MasterCard-accepting locations," Lindsay said. "At the same time, the transaction generates the detailed 'Level III' data, based on MasterCard Fleet prompting and capture, that our Voyager Network customers expect—information like odometer reading, fuel type selected, gallons pumped and price per gallon. This gives organizations greater visibility and control over driver spending."

Advantages Aplenty

According to a recent industry survey, the fleet market in the United States represents $235 billion annually, with only $85 billion currently being charged to a fleet card product.

"The opportunity for proprietary fleet cards is huge, and thus why the stocks of Fleetcor and WEX have been skyrocketing," Dyer said.

An overall fleet services approach typically encompasses vehicle leasing, maintenance, and logistics in addition to fuel. "Fuel is the No. 1 expense and priority for most fleets," Dyer said. While many companies are trying to bundle all of these components into a single service, most businesses are going to work with the fleet fueling provider who offers the best value.

That value is a composition of controls, efficient fueling environments, reporting, and competitive price.

"The truth of the matter is, there is no real value in bundling your fuel with a total service provider, and it often ends up costing you more than if you were to strategically work with a proprietary card issuer," Dyer said. "The concern of data integration is simple. As a proprietary fleet card issuer, you have to use billing systems capable of producing the data that can be imported into the Telematics or fleet maintenance systems."

"Petroleum marketers who secure fleet fueling customers are developing a clientele that they can directly control and influence over a long-term business relationship," Dyer said. "This is in contrast to retail customers that can ebb and flow in and out of your site."

As Dyer explains, with fleet customers, they are going to be bound to using your locations because you offer a controlled fueling environment that reduces or eliminates unauthorized purchases, expedites the fueling process to allow their employees to be more productive, and provides complete accountability over their fuel consumption.

"The most appropriate customer for a fleet card program is a business with employees driving vehicles where they are concerned about control and security," Dyer said. "A mom and pop operation is less likely to value the programs being offered. Petroleum marketers who invest in a proprietary fleet card program rather than partnering with a major card issuer enjoy better control and profitability as they don't have to share both valuable customer information and revenue."

S. David Padgett, sales and marketing executive of Davison Fuels, launched the Fuel Masters Fleet Card on the U.S. Bank Voyager Network a little over two years ago.

Embracing Successful Programs

"We did it because we had spoken to others in the industry who confirmed Voyager's reputation in the marketplace for being a quality partner to wholesale petroleum distributors like us," Padgett said. "The Voyager Network has nationwide acceptance and excellent online tools to help our customers manage their fleet programs."

Padgett said the main advantage of a co-branding relationship is that it allows you to build your own brand with the help of another well-respected company. Davison Fuels has experience with this kind of arrangement.

"For 25 years we have sold our 'Pride' brand of quality lubricants, which has been very successful," Padgett said. "So when we decided it was time to launch the Fuel Masters Fleet Card, it only made sense to take a similar approach, and it only made sense to go with Voyager, one of the most established and respected fleet networks in the marketplace."

Co-branded fleet cards are those cards issued by the major fleet card processing companies such as WEX, Fleetcor, or Voyager. As Dyer explains, the cards are programmatically the same as the issuer's card, and they carry the issuer's logo on the front. However they are co-branded with the marketing company's logo as well.

"The marketing company is paid a commission in most cases for marketing the card," Dyer said. "The card typically works in every location where the card is accepted. Therefore a petroleum company wanting to issue a card through one of these major processors, and have that card only work at their own sites, would not want to issue a co-branded card." Instead they would issue a "private label" card through the major processor. It's the same card programmatically, however it is restricted to the designated locations and doesn't carry the card issuer's logo on the card.

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Whether co-branding or going solo, industry experts agree that creating and implementing the proprietary card is the easiest part. Where most proprietary fleet card issuers fail is in successfully creating and following though on a marketing campaign that includes the hiring and training of effective salespeople.

"The old adage of 'build it and they will come' doesn't apply," Dyer said. "Also, a common mistake is the failure to recognize the importance of having a quality billing system capable of delivering the best value to the fleet customer. Billing systems are not all created equal when it comes to managing a proprietary fleet card, and they can spell the difference between success and failure."

Padgett said one of the U.S. Bank Voyager Network's biggest strengths is its internet-based program management tool, which they call Fleet Commander Online.

"It's a very user-friendly portal that helps end users in many different ways to organize their cards: setting up accounts, deleting them, setting up security, and accessing data that gives them what they need to manage their business," Padgett said. "Our customers have really benefitted from that."

But be careful, Padgett stresses that if you partner with an organization that does not live up to the quality and service expectations your customers are used to having from you, you can do great damage to your brand.

"Your name is on the front, you're the one they blame," Padgett said. "You need to choose your partners carefully. Our choice of U.S. Bank Voyager has been fantastic. They hold us, and all of their partners to high standards for creditworthiness and other key criteria. We were impressed with that."

Prior to jumping on the proverbial private fleet card program, you should consider if it can help you build your brand, and that the partner has the same high standards that you do.

"For us, teaming up with U.S. Bank and the Voyager Network is paying off," Padgett said. "We started from zero and are now doing millions in volume. It has pleasantly exceeded our growth expectations for two years running and we look forward to keeping it growing."

On the Horizon

Indeed, the future is bright for proprietary cards. Here's why: "As the industry continues to consolidate toward monopoly status, which I think we are already there in a couple of instances, the desire for fleets to have alternatives is going to increase," Dyer said. "The proprietary card issuers will be in a great position to capitalize on this." Dyer's prediction is that fees to the end user are going to increase through those monopolizing the industry. This, in turn, will drive demand back to the proprietary providers.

"There's a point when big becomes too big," Dyer said. "I believe we've reached that point in our industry."

Lindsay also points out that the technology around card programs is constantly advancing.

"We're also currently rolling out pump shut off technology to enforce adherence to fleet policy spending limits," Lindsay said. "It leaves nothing to chance; drivers cannot exceed established spending thresholds when purchasing fuel, maintenance or additives at participating locations." And next year U.S. Bank is planning to introduce a mobile fuel locator to help drivers find the lowest prices or the specific kind of fuel they need. This will give drivers and fleet managers a third way to locate merchants—the others being a web-based merchant locator and, of course, 24/7 access to our customer service representatives.

"Mobile solutions in general are the next major evolution in the fleet space," Lindsay said. "Some oil companies already use them for their rewards programs. Our own product development is focused on how to incorporate more of our solutions into the so-called mobile wallet."

Finally, EMV is on the way in the U.S. to provide an extra level of security for cardholders. EMV (Europay MasterCard VISA) cards are imbedded with a computer chip that generates a unique code for every transaction, thus greatly reducing fraud risk. ■

Safety and Security in Fleet Card Programs

There are several best practices that U.S. Bank Voyager recommends managers and drivers do to ensure success from an efficiency and security standpoint.

Fleet managers should

- **Review transaction reports frequently, between monthly billing statements.**
- **Be mindful of how card data is stored and destroyed.**
- **Keep driver account records current.**

Ask for and schedule fraud control reports from your card provider to verify that appropriate fraud controls are in place and that adjustments are being made as appropriate.

If a driver leaves the organization for any reason, ensure the card is returned to the fleet manager.

Drivers should

- **Store cards in a safe and secure location – never leave them out in the open.**
- **Store driver ID/contract information in a separate secure location and never in the same wallet as the card.**
- **Report lost or stolen cards immediately.**
- **Report any questionable transactions to fleet managers immediately.**
- **Never let an unauthorized person use the card.**
- **Never use fuel pumps that appear to have been tampered with.**
- **Watch cards carefully during in-store transactions and ensure they are returned promptly.**

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New and Interesting Product

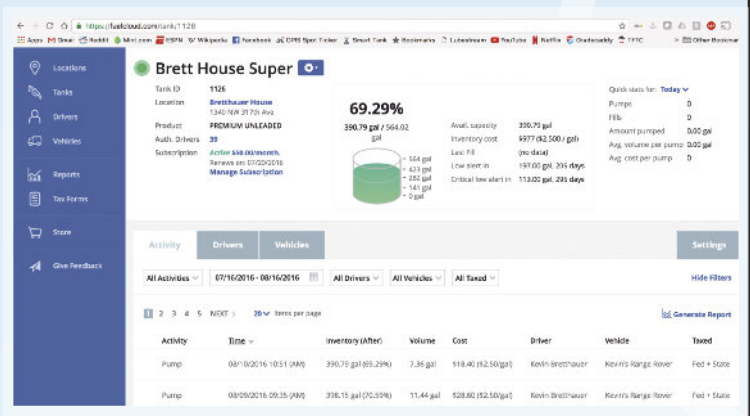
FUELCLOUD BRINGS CARDLOCK TO THE CLOUD

by Keith Reid

A new company has entered the fuel management space with an initial focus on commercial cardlock fueling. As the company states, "FuelCloud allows users to track and control every gallon in their on-site tanks for a fraction of the cost of traditional systems. Track inventory, run unlimited custom reports and even request tax refunds for off-road use with the click of a button."

Kevin Bretthauer and his sister, Alex Bretthauer, FuelCloud co-founders, have roots in the fourth generation family-owned-and-operated Bretthauer Oil Company. This Oregon-based fuel distributor has been in business since 1929. Based on their experience with cardlock fueling, they decided to use today's cloud-based technology to overcome some of the hurdles found with that service offering.

"The problem is that it's $10,000 or more to put in a full commercial system," said Kevin Bretthauer. "Then you have this software on the back end to run. Customers used to just be fine with an invoice. Now they have a service-based software program and accounting, and this is not just your big guys. On the reporting side, it got so bad we had to hire a full-time person just to handle the reports for our customers."

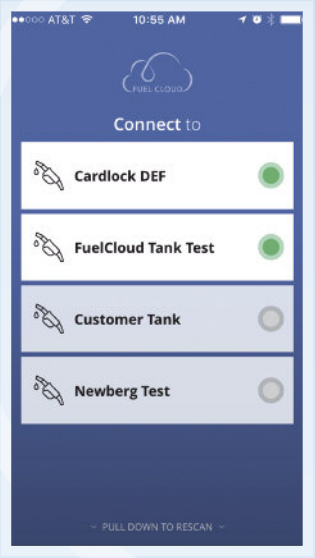


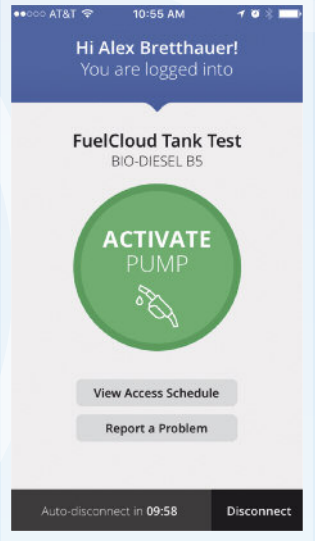
Two years ago, Kevin and Alex went to the drawing board to develop a system that met customer needs while reducing the overhead associated with those requirements. FuelCloud essentially has three components: a hardware controller box that connects to essentially any inline meter, a mobile app that communicates back up to the cloud and gives its authorization, and a web-based portal for managing the back end functions. Site connectivity is facilitated through wireless and Bluetooth technology.

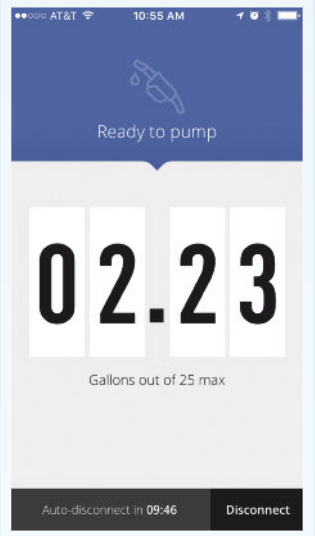
"If you're a new customer, you enter the driver of your vehicle and all of your technical information," said Bretthauer. "When a driver pulls up to a location, he uses the app and there's a tablet already on site permanently like a card reader, essentially. The driver will enter a pin code and the app calls back up to the website. It says okay, you're John Smith, I know who you are, and tells the hardware to turn the pump on. As the fueling begins, the meter will communicate back to the device, then through the app back to the cloud. The transaction is [recorded] immediately after you're done, so it's all completely in real time."

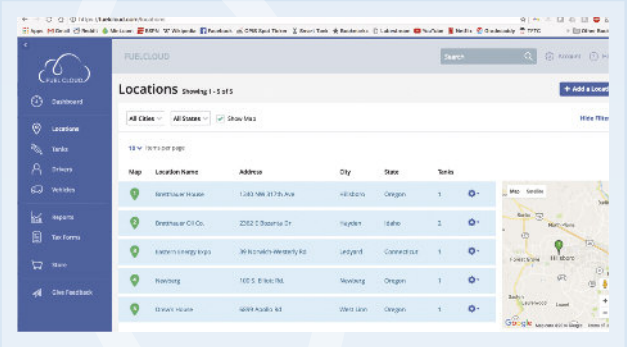
The management software is cloud-based, so there is no cost to the marketer for upgrades or support. Bretthauer claims that from a cost standpoint, his solution is 20 percent of the cost of conventional competitors. The fleet customer handles most of the routine maintenance—adding drivers, etc.—for its operation as well as running the required reports.

Where the reports and controls are concerned, the system facilitates such staples as controls on drivers, vehicles, locations and tanks on full restrictions, dollar amount, time of day, gallon amount per vehicle and more. It also allows full customer reporting including the creation of numerous custom fields. "You could ask a driver what his favorite color is every time he fuels," Bretthauer said.









FuelCloud also provides automatic tax refunding tools—for example, when a customer sets up a vehicle that can be a tax-exempt lawnmower or excavator. "Let's imagine you're a landscaper," Bretthauer said. "You have one on-road vehicle tank, so you have one gas tank. But you're also fueling all these lawn mowers. You'll set them all up as exempt vehicles in our system. Our tax module handles both state and federal taxes, and it will print out the tax and terms and fill in all the correct columns for the customer."

The system also integrates with tank gauges in a variety of ways, depending upon the type of gauge, to help facilitate fuel monitoring. "If we show a 100-gallon drop on a physical read from a tank monitor, we should show 100-gallons worth of transactions through the meter," Bretthauer said. "If there's ever a difference in that amount outside of whatever variance you set, it will automatically send an email and text inventory alert. You know the exact moment that something goes wrong."

The company's cloud-hosted database approach can also be used by customers for a higher degree of customization. "Because we have this application programming interface, an API is like a docking port on a space station. We put it up there, people know what it looks like and anyone who wants to build their own corresponding side can come and dock with us," noted Bretthauer. "We give you the documentation or we can write it for you, and you can push anything you want into our system or pull anything out. For example, if you're a big company and you already have a database internally where you track fuel transactions, every five minutes your little piece of code comes and pulls the transactions out of our website and puts it into your database." ■

Read More
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FuelCloud is designed to work with both the traditional marketers and fleets that manage their own in-house fueling operation. The company went through soft launch in July of this year, and it is actively selling units right now with 24 distributors across the United States and one in Canada. Contact FuelCloud on the Web at www.fuelcloud.com, or by phone at 503.538.2513.

HOW DO YOU VIEW YOUR **FUEL STORAGE**?

See how a fuel distributor benefited from rethinking about the fuel tanks they provided to their customers

The Kiesel Company, a fuel distributor located out of Missouri, needed to upgrade its customers' equipment to meet more demanding environmental requirements. They were using gravity-fed cylindrical above ground fuel tanks to refuel onsite trucking equipment for an international airport. Spanning around 800 acres of land, this airport served around 90 domestic and international locations. They were then told that their fuel tanks did not meet the airport's environmental requirements set for refueling equipment onsite.

It was time for the fuel distributor to completely rethink how they were providing fuel to their customers. They were in need of a compliant and innovative solution that answered their unique problems such as:

- How could they cut down on the maintenance costs of cleaning the rainwater from the secondary containment area?
- How could they be sure to meet airport's environmental requirements and other fueling compliance laws?
- How could they protect their fuel and equipment from theft and the elements?
- Could they find a fuel tank that would fit within a limited amount of space?
- Since the tanks will no longer be gravity fed, how would they dispense fuel without power?

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The FuelCube is a stationary above ground fuel tank with capacities ranging from 250 – 1,000 designed for onsite equipment refueling and backup fuel supply. The FuelCube solved the fuel distributor's problems of tank maintenance, environmental compliance, space optimization, security and onsite power.

The FuelCube features a built-in weatherproof containment berm that allows for 110% containment of the inner tank. This cut the cost of having to clean the secondary containment area of rainwater. The FuelCube was also fully compliant, meeting UL 142 and other environmental requirements set by the fuel distributor's customer.

The FuelCube also features a lockable equipment cabinet that is part of the main containment area. The fuel distributor could now keep their fuel and fueling equipment safe from theft and the elements. The cabinet also contains any drips, spills or overfills in the secondary containment area that could happen during refueling.

The FuelCube's compact, cube-like design allowed them to fit three 1,000 gallon FCP1000 fuel tanks easily within a limited amount of space. Western Global's in-house operations team was able to configure the FuelCubes with solar power panels to run the fuel pumping equipment, making the tanks self-powered. This allowed the fuel distributor to upgrade to auto-shut-off nozzles which helps reduce onsite fuel spills.

The fuel distributor found that Western Global's FuelCube proved to be an easy to use solution for their onsite refueling needs. The solution cut their maintenance costs, met UL 142 and other environmental requirements, fit 3,000 gallons of fuel within a smaller footprint than their previous fuel tanks, protected their fuel and equipment from theft and the elements, and was self-powered using solar-powered panels. By rethinking their fuel tanks, the fuel distributor was able to support their customer with compliant and easy-to-use refueling for their equipment.

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Light-Duty Diesel Keeps Trucking

by John Eichberger

It's possible I'm on an island all by myself for being bullish about the light-duty vehicle market for diesel engines. Some experts in the market have told me I am fooling myself, that the recent emissions scandals have scared off consumers and automakers, deflating the potential growth of this market.

I am not an ostrich with my head stuck in the sand—I know what has been going on and what the media is saying about the technology. But when everyone is telling me one thing, I have found it useful to look at additional information to form my own opinion and I continue to believe there is a viable market for light-duty diesel vehicles—provided the automakers put them on dealer lots.

What's the basis for my opinion? Vehicle sales data and consumer opinion research.

Immediately following the revelation that a certain automaker had installed emissions test defeat devices on some diesel-powered vehicles, the Fuels Institute fielded a survey to determine whether the news impacted consumer opinions about diesel. In September 2015, we asked consumers if their views of diesel had changed in the past three to six months. For the vast majority (73%), there had been no change. But 14% said their views had become more positive, and another 14% said their views had become more negative.

> **We asked those who would not consider diesel why, and only 8% said they were concerned about recent scandals, not an overwhelming or foundational issue for the market. A more significant number of consumers (48%) said diesel was too expensive.**

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A few months went by and we got curious again, so in February 2016 we asked a more robust series of questions. We found that of those who would buy a vehicle in the next couple of years, 45% would consider purchasing a diesel-powered vehicle. This was the highest level in three years, up from 42% and 41% in 2015 and 2014, respectively. When asked why, 51% cited better fuel economy.

We asked those who would not consider diesel why, and only 8% said they were concerned about recent scandals, not an overwhelming or foundational issue for the market. A more significant number of consumers (48%) said diesel was too expensive. The fuel price response is something we have tracked for years and has remained consistent, but what happened last year? Diesel and gasoline actually reached parity at the pump, helping to eliminate this hesitation in the consumer's mind and creating an opportunity for automakers. Under recent pricing conditions, it is not necessary to explain energy content and the miles per dollar calculation that makes diesel a better financial option, even when priced as a premium compared with gasoline.

But what consumers say and what they do is not always the same. Yes, 45% said they would "consider" a diesel-powered vehicle, but through May 2016, only 2.6% of all light-duty vehicles sold were equipped with a diesel engine. And the momentum for new diesel vehicle sales has slowed. Compared with the first five months of 2015, total light-duty diesel sales are down 16.2%. Is this indicative of a major issue?

Looking at the raw numbers, total diesel light-duty sales are off 31,447 units, according to WardsAuto. We know that Volkswagen is not permitted to sell any new diesel vehicles in the U.S. yet, resulting in a loss of 33,776 units. This means sales of "permitted" diesel vehicles are actually up over 2015.

The loss of VW diesel vehicles has significantly crippled the diesel car market, but the light truck market is doing very well. In fact, the improved fuel efficiency, power and durability of diesel-powered trucks play well with that target market, as indicated by sales figures. Of all Ram 1500 trucks sold through May 2016, 27% were equipped with a diesel engine. Ford F150s, Chevy Silverado and GMC Sierras came in with 14.3%, 11% and 16%, respectively. These sales figures are far above the national market share for light-duty diesel vehicles and indicate strong demand continues in this segment.

The loss of VW diesel vehicles has significantly crippled the diesel car market, but the light truck market is doing very well. In fact, the improved fuel efficiency, power and durability of diesel-powered trucks play well with that target market, as indicated by sales figures.

I argue further that the consumer interest in diesel vehicles, the price point relative to gasoline and the improved performance and efficiency of the technology give the market significant legs going forward. The scandals have resulted in a major reduction in U.S. diesel-powered cars sales, but that too will pass and I believe once these vehicles re-enter commerce, consumers will be ready and accepting. In fact, it could be a great opportunity for the industry to reintroduce diesel vehicles to the American consumer, perhaps in a market where diesel, on its face, is price competitive with gasoline at the pump—not just on an energy equivalency basis.

It will, of course, take some time to regain momentum, but in the meantime, America keeps on trucking and the diesel powertrain is chugging along just fine.

So, though I might be on an island, I am confident that it won't be long before my island starts getting crowded with those who also believe diesel has a future in the United States. Remember, stay focused on the facts and data that provide true indications of the market and where it might be heading—these factors often run at odds with common perceptions. ■

For more information about the Fuels Institute or how you can get involved, contact John Eichberger, executive director, at jeichberger@fuelsinstitute.org or 703.518.7971. The Fuels Institute is constantly monitoring and evaluating market developments. To join the conversation and share your insights, contact Director of Operations Donovan Woods (dwoods@fuelsinstitute.org) and sign up to receive our new monthly e-newsletter, Fuel for Thought.

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Six Best Practices for Use of Cruise Control in Commercial Transportation

by Michael Davis

In commercial motor vehicle fleets, single vehicle run-off-the-road crashes and overturn crashes continue to challenge safety professionals and risk managers. Rollovers and run-off-the-road events account for a small number of all crashes, but contribute to disproportionate costs for property damage and driver injuries.

Fatigue is frequently cited in many accident investigation reports as a contributing factor in vehicle crashes, often due to lack of rest stops or inadequate sleep. The use of cruise control may be adding to the effects of driver fatigue resulting in reduced vehicle control.

Situational Awareness While Using Cruise Control

Independent studies in the USA and France evaluated the impact of the use of cruise control on driving behaviors. The VINCI Autoroutes Foundation in France, in conjunction with the University of Strasbourg, evaluated the effect of conventional cruise control on driver behaviors. The Federal Highway Administration (FHWA) in the U.S. conducted a human factors study on the use of adaptive cruise control. These studies concluded that the use of these types of cruise control systems significantly increased reaction times and decreased situational awareness relating to five factors shown below.

- Delayed PERCEPTION of an event
- Delayed PROCESSING and interpreting of the event
- Delayed SELECTION of the response
- Delayed DECISION to take action
- Delayed INITIATION of the response

Conventional Cruise Control

The original design of conventional cruise control systems provided the driver with the ability to maintain a static speed for the vehicle under all operating conditions up to the vehicle's capabilities. The driver must intervene when road, traffic or weather conditions change and determine when it is safe to use or disengage the system.

Conventional cruise control systems have been in place on commercial motor vehicles for more than 40 years, and during this time, governments and public safety organizations have continued to investigate the risks and benefits of using these systems.

Adaptive Cruise Control

The next generation of cruise control is the "adaptive cruise control," which, under normal operating conditions, can slow the vehicle or warn the driver of an encroachment into the space cushion ahead. This system provides one level of warning; however, the driver must still decide when conditions change for the road, traffic or weather and determine when it is safe to use the system.

The FHWA's "Human Factors Analysis" study in 2013 evaluated the effects of using the more advanced type of cruise control—adaptive cruise control—on reaction time and situational awareness when driving. Adaptive cruise control was expected to enable drivers to spend more time watching for driving hazards; however, the study concluded that situational awareness and rapid response deteriorated due to drivers taking on additional non-driving related tasks inside the vehicle.

The May 2016 Freight Transportation Services Index (TSI) published by the U.S. Department of Transportation's (DOT's) Bureau of Transportation Statistics (BTS) shows continued sector weakness in the for-the-hire freight transportation sector into 2016.

According to BTI, the TSI-Freight Index, which is based on the amount of freight carried, rose 0.2 percent from April to 121.8 in May, reflecting continued weakness from the 2015 peak of 122.8 in October and the historical peak of 123.7 in December 2014.

BTS research has shown a clear relationship between economic cycles and the TSI, reflecting changes in production, personal income and consumption, imports of goods, employment and manufacturing growth.

Source: Joe Petrowski commentary

Bottom Line

Continues to reflect the U.S. economic weakness in place since 2014. Though this means less "gross" fuel spend for many fleet operations, the real goal is to lower the "net" procurement cost of fuel, and thus reduce overall fleet operating expenses to increase bottom line revenues.

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Effects of Conventional Cruise Control on Safe Driving Behaviors

The VINCI Autoroutes Foundation, in conjunction with the neurocognitive and neurophysiological research team at the University of Strasbourg in Strasbourg, France, conducted research involving 90 drivers. The study included an equal mix of men and women in three age groups to determine how the use of conventional cruise control affected safe driving behaviors in high-risk traffic as well as routine driving conditions. Some of the key measures used to evaluate driver performance included:

- **EEG brain wave measurements to determine fatigue and level of alertness/consciousness**
- **Reaction time to emergency conditions**
- **Vehicle stopping distances**
- **Ability to maintain a space cushion**
- **Ability to maintain lane position**
- **Self-assessment of fatigue/alertness**

The tests were performed with and without cruise control activated and included multiple scenarios such as an accident ahead, toll booth, overtaking, lane changes, construction and radar traps.

In all cases, the study found that driver performance and situational awareness were reduced, resulting in an increased response time when deactivating cruise control compared to drivers in full manual control of vehicle speed. The study concluded that drivers had:

- **Reduced alertness after just 30 minutes of cruise control use—a 25% increase in fatigue**
- **Reduced eye movement checking mirrors, instruments and roadway**
- **Reduced control over vehicle direction, resulting in a 33% increase in steering corrections for lane wandering**
- **Longer reaction times**
- **An increase in stopping distances of an average 131 feet while traveling at highway speeds**
- **Performed lane changes with at least 10% less cushion, on average**
- **Reduced ability to merge into traffic after passing due to continued engagement of cruise control**
- **Spent more time in the passing lane**

> **Adaptive cruise control decreases situational awareness and response times due to drivers taking on additional non-driving related tasks inside the vehicle.**

Pros of Using Cruise Control:

- Reduced strain on the right leg
- More consistent speed control and less likely to inadvertently drive above the speed limit
- Less speed fluctuation improves fuel mileage

Cons of Using Cruise Control:

- Reduced situational awareness
- Decrease in EEG brain wave activity
- Increased driver fatigue
- Reduction in eye movement
- Increase in distracted driving
- Reduced reaction time
- Increased stopping distances
- Reduced directional control
- Reduced space cushion
- Increased risk of hydroplaning on wet pavement, snow or ice
- Speed modulation ability is reduced

Vehicle Crash Rate

For drivers using cruise control, there is an increased risk of fatigue, reduced alertness and delay in hazard recognition, which can lead to driving errors and the following types of crashes:

- Run-off-the-road crashes due to increased lane wandering. Narrow roads increase the risk.
- Rear-end collisions caused by delayed perception and application of vehicle brakes.
- Side swiping during lane change caused by reduced space cushion.

To determine if your organization's vehicle crash rate is affected by the inappropriate use of cruise control, a thorough analysis of all crash data for a period of at least three years should be completed.

> In all cases, the study found that driver performance and situational awareness were reduced, resulting in an increased response time when deactivating cruise control compared to drivers in full manual control of vehicle speed.

Analyzing Crash Rate

Ask Questions

- What type of crash occurred and how long from the last rest stop did the crash happen?
- How many on-duty hours preceded the crash?
- Did the crash result from running off the road (on a straight away or curve), being rear-ended or changing lanes?

Document Road Factors

- Note contributing environmental factors such as rain, ice, snow, traffic and road conditions.
- Document other factors, particularly if the cruise control was in use. Cruise control increases the risk of crashes in slippery conditions, on narrow roads or in heavy traffic, especially after more than one hour of continuous use.

Review Driver's Logs

- Review the driver's logs—specifically, rest stops, on-duty time and the timing associated with the crash—along with the traffic, weather and road conditions. This data should be available in the driver's logs and crash investigation reports.

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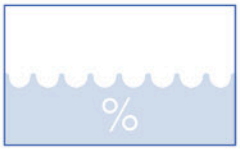

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6 Six Best Practices for Using Cruise Control

Below is a summary of the safe practices for the use of cruise control in commercial vehicles recommended by transportation safety associations and government transportation safety agencies.

1 Use cruise control when on the open highway in clear weather.

2 Limit the time cruise control is active to no more than 30 minutes.

3 Do not activate cruise control in heavy traffic or while driving in adverse weather, such as rain, fog, ice or snow.

4 Keep your feet on the floor in a position to easily activate the brake and accelerator pedal.

5 Maintain a high level of alertness.

6 Stop more frequently to reduce increased mental fatigue caused by the use of cruise control.

> The use of cruise control on commercial vehicles is not recommended during any type of weather event or in city driving with heavy traffic.

Conclusions

The use of the cruise control on commercial vehicles is an effective short-term method to provide a break from right leg fatigue during long-term application of the accelerator pedal. The risks of prolonged usage of cruise control increases the risk of rear-end collisions, collisions during lane changes and run-off-the-road accidents resulting from increased mental fatigue, reduced situational awareness and increased reaction times.

Drivers who are already fatigued are at risk of further reductions in alertness when using cruise control. The use of cruise control is not recommended during any type of weather event or in city driving with heavy traffic. Many transportation safety organizations, including the National Highway Traffic Safety Administration (NHTSA), American Society of Safety Engineers (ASSE), American Trucking Association (ATA) and all the vehicle manufacturers, have issued cautionary statements in the use of cruise control. ■

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Michael Davis

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Currently we have 137 operating refineries in the U.S. with a capacity of 18.9 million barrels per day (mbpd). But only 90 of those refineries have a capacity in excess of 50,000 b/d, leaving almost 50 refineries that could be classified as "Tea Kettles" or "Stills."

With domestic gasoline consumption closing in on 8.5 mbpd and distillate on 2.5 million bpd, the domestic "pull" is closing in on 13 mbpd by 2025 (lubes, jet, kerosene and other chemicals making up the rest). We should see 20 of those 47 smaller refineries shut down, taking 600,000 b/d of capacity off the market.

Survivors will be the large East Coast and Gulf Coast refineries, and a few in California and Chicago. The collapsed WTI-Brent spread, and increased pipeline capacity and tighter railroad shipping rules will likely doom small interior tea kettles.

Even with only 18.3 mbpd of capacity and total demand for products at 14 mbpd, a 76% capacity utilization should leave both cracks in their historical ranges.

Bottom Line

With the small marginal refiners gone, the survivors will have more pricing power. The function of the market in the next three years will be to show the small, simple, undercapitalized and out of position refiners the door. After this shakeout we will see a new "golden age of refining" that will not be tempered by new construction or capital improvement. As the French like to say about industry shakeouts, "Après les morts. Rolle bon temps" (after the deaths, let the good times roll).

Source: Joe Petrowski commentary

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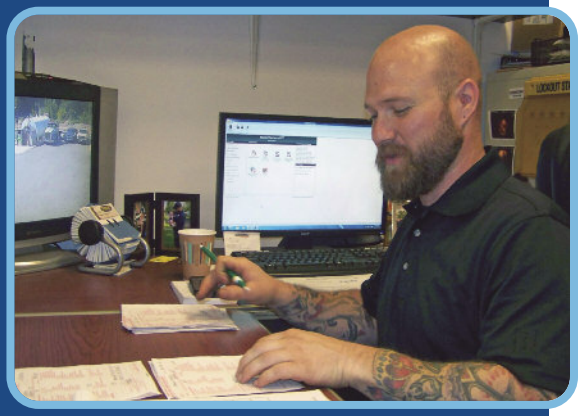
> "A lot of times we find bad seals in the vapor recovery system and we replace entire pieces rather than just rebuild and reseal." Overall, this approach enables Coastal Carriers to acquire, and put into service, a tank trailer for approximately half to three-quarters of the cost of purchasing a new tank trailer.
>
> David Slason

Attention to Detail

Coastal Carriers Follows a Well-Defined Maintenance Program



by Stephen Bennett

David Slason was prepared. The bulleted items he had typed up and printed out lay on his tidy desk—points that Slason, the maintenance supervisor for Coastal Carriers in Ansonia, Connecticut, wanted to make during a conversation on the subject of "best practices" in tractor-trailer maintenance. The first item on the list—"on time and through pm schedule"—would likely strike anyone in the business as obvious, but subsequent entries illustrated his approach: methodical and consistent regarding the fundamentals, collaborative and creative when it comes to problem solving. The preventive maintenance schedule that Slason and the mechanics in his charge now follow, for example, was fine-tuned with the collaboration of engineers from tractor OEM Freightliner Trucks, a division of Daimler Trucks North America (Portland, Oregon), and filter makers Donaldson Co. (Minneapolis) and DAVCO Technology (Saline, Michigan).

Partway down Slason's list, an entry describes the fruits of that collaboration: "DPFs and DEF filters are changed out at 300,000 miles regardless, with new or remanufactured units," as opposed to just cleaning the existing filters, referring to diesel particulate filters (DPFs) and diesel exhaust fluid (DEF) filters. "This has greatly reduced problems and downtime associated with after-treatment systems."

Coastal Carriers, established in 2004, is owned by business partners John Pruchnicki and Donald Schmidt. Pruchnicki serves as president and managing partner. The company headquarters in Ansonia include the maintenance facility where Slason, full-time mechanic Mike Nowak and a part-time mechanic work on tractors and tank trailers. A second maintenance facility in Newburgh, New York—a "mirror" of the one in Ansonia—is staffed by a full-time and a part-time mechanic who both report to Slason. The company has a third location in Bloomfield, Connecticut where trucks are domiciled, but there is not a maintenance shop there.

> **Automated transmissions on the tractors are popular not only with the drivers, but with the maintenance department too.**

The trailer side of the maintenance operation involves a different set of safety regulations particular to transporting petroleum products, which are designated hazardous materials. Trailers are purchased used and then overhauled before being put into service. The overhaul includes new brake lines, brakes and drums, slack adjusters, cams and the vapor recovery system.

Coastal Carriers's fleet numbers 27 tractors—another four are on order—and approximately 34 tank trailers. The company specs Freightliner Cascadia tractors. Among the benefits of that choice is after-treatment technology that, over time, is providing a return on investment that more than compensates for the initial outlay for the tractors. By performing full after-treatment service at or slightly before the 300,000-mile mark, the carrier has been able to virtually eliminate "D-rating." Drivers are important to the maintenance of the after-treatment system and to the fleet's maintenance in general. Drivers are relied upon to notify the maintenance department immediately if the "Check Engine" light comes on, but the Cascadia tractors also include Freightliner's "Virtual Technician," which generates an email alert with a basic diagnostic code to tell the maintenance department what is prompting the "Check Engine" alert to light up. The maintenance staff can then get a head start on why it is lighting up. "We can figure out what's wrong with the truck before it gets here," Slason said. If the cause doesn't require immediate attention, the maintenance department can advise the driver that he can "finish his day."

On August 16, a truck's check engine light came on and the driver called in right away. Slason was able to refer to the email generated by Virtual Technician to see that the truck's coolant level was low. After pausing to top it up, the driver was able to continue.

The maintenance staff performs an "A" service—filters and fluids—at 20,000-mile intervals, and a "B" service—inspection and greasing of the chassis—at 10,000-mile intervals. Coastal Carriers uses Mobil Delvac engine oil. Samples of used oil are sent to ALS Tribology in Atlanta for analysis.

Automated transmissions on the tractors are popular not only with the drivers, but with the maintenance department too. "If you have a driver who is not too good with a standard, it saves wear and tear," said Slason. The tractors are equipped with "full mitigation" driver assistance technology, including lane departure warning and forward collision avoidance. The latter can bring a truck to a full stop in the event a driver fails to recognize the need to stop or is unable to.

"A lot of times we find bad seals in the vapor recovery system and we replace entire pieces rather than just rebuild and reseal," Slason said. Overall, this approach enables Coastal Carriers to acquire, and put into service, a tank trailer for approximately half to three-quarters of the cost of purchasing a new tank trailer.

Previously, testing of the vapor venting systems on newly acquired used tank trailers was farmed out, but the cost of an annual test was about $700 – $800. To avoid that outlay, Slason became certified to conduct the test himself. Additionally, he fashioned a way of hooking, or connecting, the manometer to a vapor recovery port in order to obtain the manometer reading. Another DOT-mandated test, conducted at five-year intervals, requires going into the tank and is still outsourced, he notes.

The tank trailers are a mix of four-compartment and five-compartment units. In Connecticut, Coastal Carriers transports a maximum of 9,200 gallons, but in New York State the carrier pays for permits allowing it to transport larger, heavier loads at 12,000 gallons. To move those bigger loads in New York State, the carrier uses a bigger barrel and tri-axles on the tank trailers.

Once the tank trailers are in regular service, they undergo daily inspection. A part-time mechanic works during each day's shift change, greasing the trailer and inspecting the brakes, brake lines and undercarriage, among other items, while tractors are being refueled.

The "razor-thin" margins in the business drive certain specification imperatives, including optimal gearing and smaller motors than might be expected. The Detroit Diesel engines in the trucks used in Connecticut are 13-liter units, while those in New York State, which have more weight to move, are 15 liters.

Slason insists on a clean shop. "Everything is easier when it's clean," he said. ■

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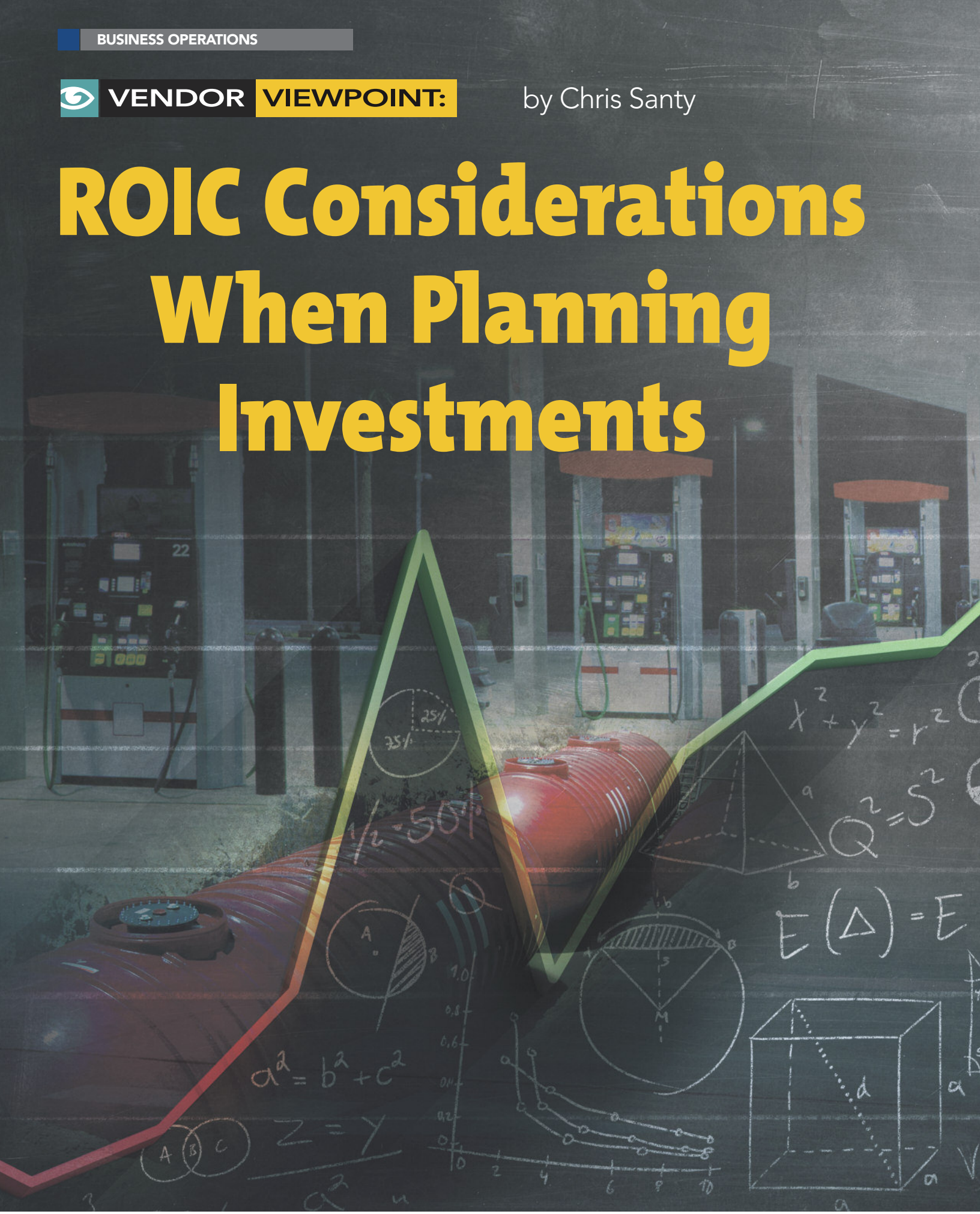
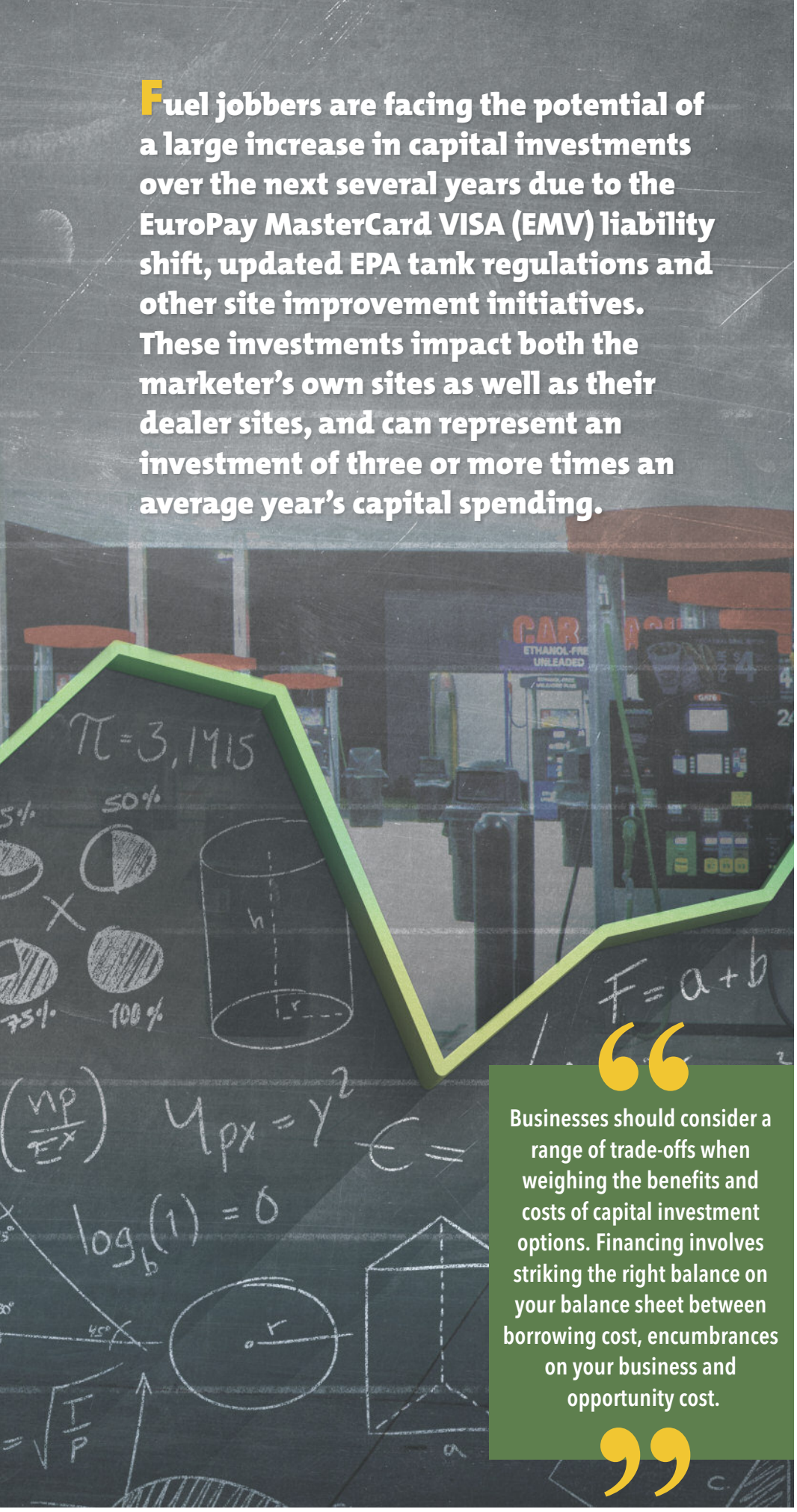
VENDOR VIEWPOINT:

by Chris Santy

ROIC Considerations When Planning Investments



Fuel jobbers are facing the potential of a large increase in capital investments over the next several years due to the EuroPay MasterCard VISA (EMV) liability shift, updated EPA tank regulations and other site improvement initiatives. These investments impact both the marketer's own sites as well as their dealer sites, and can represent an investment of three or more times an average year's capital spending.



> **Businesses should consider a range of trade-offs when weighing the benefits and costs of capital investment options. Financing involves striking the right balance on your balance sheet between borrowing cost, encumbrances on your business and opportunity cost.**

In thinking about these investments, it's important to step back and consider what options exist to pay for this equipment, and what trade-offs exist.

A company's capital stack usually consists of four elements: cash on hand, senior lending lines of credit, equipment financing and cash generated by portfolio optimization. While people often think about the cost of each of these options as being the interest rate paid, there is another, often greater cost—the opportunity cost of the profit that could be gained by using a resource in a different manner.

In considering financing options, it's important to break out assets into strategic and tactical. Strategic use of capital includes buying land, existing c-stores and competitors that are for sale. These investments are in assets that generally appreciate over time, provide the potential to make a profit from ongoing operations plus offer additional profit when they are sold at a later date. Tactical uses of capital cover the costs of purchasing depreciating equipment. Although this type of equipment helps generate income, it has a defined life and generally depreciates over time.

"Focusing on a balanced capital stack generally enables owners to achieve higher valuations," said John C. Flippen, Jr. of PetroCapRE.com.

Here's a simple example of what this could look like. Assume you had $100 and I offered to pay you 8% interest on this. In today's low-interest-rate environment, you may think that's a good deal and make the investment. If I then told you that you could invest in my new store and earn 20%, you may be inclined to make that investment. The incremental 12% that you would earn with the second investment is an example of the opportunity cost that exists in making financing decisions.

The Four Financing Options

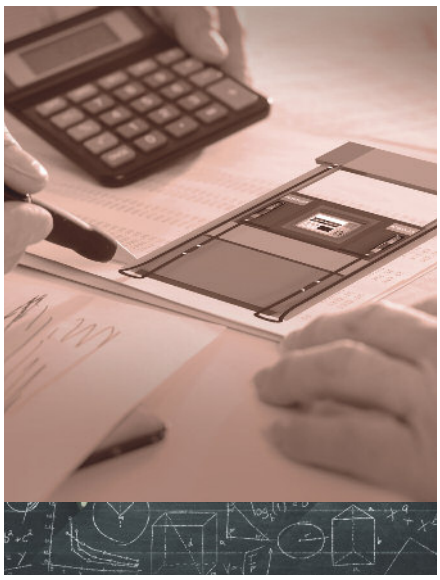
Businesses should consider a range of trade-offs when weighing the benefits and costs of capital investment options. Financing involves striking the right balance on your balance sheet between borrowing cost, encumbrances on your business and opportunity cost. Here are some factors to think about to obtain the best return on capital for your business.

1. Cash

Many businesses maintain a strong cash position. Using cash on hand has the benefit of having no interest to pay and investments can be made as fast as the need arises. The downside of using cash on hand to fund capital investments is that once the cash is spent, it's gone—and not available for strategic investments that might arise. Having cash on hand provides flexibility to invest in higher-return assets, such as additional sites or land that becomes available at an attractive price. If you are investing cash in equipment installed on a dealer's site, equipment ownership could be in question in the case of a dispute. The old adage "cash is king" is worth heeding in considering the trade-off of using cash for depreciating equipment investments.

2. Bank Lines of Credit

While accessing a bank line of credit to fund capital investments could be a relatively low-cost method of capitalization, it results in borrowing against appreciating strategic assets to fund depreciating tactical equipment. If a line of credit is collateralized by real estate or other assets, this type of financing could sub-optimize your ability to borrow for strategic purposes. Simply put, once an asset is pledged as security, it is very hard to borrow additional funds against it. Generally, lines of credit have variable interest rates, introducing risk to your long-term borrowing costs.



3. Specialized Equipment Financing

Although the interest rate to finance EMV gas pumps or a storage tank upgrade may be slightly higher than a bank loan, equipment financing offers a fixed interest rate and no additional collateral requirements. Typically, equipment financing is fast and efficient. Funding can cover both equipment and installation costs, things that other forms of financing may not fully fund. Because the equipment is used as collateral, there are no liens on land or other assets, which preserves capital and real estate for strategic growth investments.

4. Asset Portfolio Review

Many business owners are remiss in regularly reviewing their portfolio of assets to identify and cull underperformers. One way to attack this is to develop a specific plan and timetable for reviewing each site's performance and reviewing the bottom performing 10 percent of your assets once each quarter. If a particular site still is underperforming after an improvement plan has been implemented, or a site is determined to be undeserving of an improvement plan, it may be time to divest to obtain capital for investment in better-performing assets.

"Actively discussing capital structure, and not just profit, is a trait we see from our top performers," reports Jed Brewer, Vice President of Study Groups.

It's also a good idea for a jobber with "all their eggs in one basket" to consider diversifying investments in different types of businesses, such as hotels, motels or self-storage units, or to expand to another geographic region. This portfolio approach to asset management optimizes risk through diversity in assets.

Finally, one thing that is often overlooked is the value of management time. Consider whether multiple hours spent trying to fix an underperforming site might be better used working on opportunities offered by better-performing locations. This is another example of ensuring that you consider opportunity cost in your activities.

Find the Right Mix of Growth Investment and Return

A key metric for shareholders is return on invested capital (ROIC). That's why Fortune 500 companies borrow—to strike the right mix of growth investment and return. For example, a return on investment (ROI) of 10% is achieved through the purchase of one c-store for $1 million that earns $100,000 a year. Twice as much income can be generated by investing $1 million cash and borrowing $1 million to purchase two stores. When each store generates $100,000 a year, the ROI increases to 20%. Even when considering interest, the ROI will still be almost double that of a single store purchased with cash.

To Borrow or Not to Borrow?

The National Association of Convenience Stores (NACS) State of the Industry analysis reports that the convenience store industry has an ROIC of around 15%. Using this as a base marker, investors need to consider that spending less than 15% in interest and fees to obtain capital financing will result in a net gain in ROIC. Considering this data, how high is the opportunity cost of spending cash on hand that could be spent on an investment with higher ROIC?

Bottom Line: Good Financial Balance is Essential

A well-thought-out capital investment strategy involves trade-offs between cash, senior bank borrowing, equipment financing and asset management. All four of these considerations need to be addressed to maximize a company's ROIC, and paying cash may not always be the best option. ■

Chris Santy

Chris Santy, President of Patriot Capital (powered by State Bank & Trust Company) has more than 15 years of equipment finance and leasing experience focused solely on the retail and commercial petroleum industry. Patriot Capital Corp. is recognized as the "Best in U.S." in equipment financing by Petroleum Marketers Association of America (PMAA).

Low-Cost Equity and Debt for Growth:

Accessing EB-5

Billions of dollars from foreign investors have been utilized by U.S. businesses through this program.

The Immigrant Investor Program, commonly known as EB-5, was created by the Immigration Act of 1990, but has only recently become a viable capital source, providing billions of dollars of foreign investment in U.S. businesses.

I have been approached by (i) convenience and gas retailers and petroleum marketers wanting to access EB-5 capital, (ii) borrowers who are U.S. citizens originally from other countries who have contacts in their country of origin who want to utilize the program and invest in U.S. projects and (iii) law firms with international clients interested in EB-5 investment in downstream petroleum projects.

by Corey Henriksen

EB-5 Investor Visa Program Basics

EB-5 allows non-U.S. persons to invest in U.S. businesses in exchange for conditional permanent residency, which may ultimately culminate in U.S. citizenship for the investor, spouse and unmarried children under the age of 21.

The foreign investor must invest $1 million, which is lowered to $500,000 under certain conditions.

EB-5 is fundamentally a job-creation program. The EB-5 investment must create at least 10 new permanent jobs per EB-5 investor. Under the Regional Center program, the jobs can be directly or indirectly created (yielding a higher job count and more investors); whereas, under the direct investment program, the jobs must be directly created.

EB-5 is best utilized for the development of new projects by U.S. operators since the key concept is new jobs being created. EB-5 is generally not used for buying existing businesses because existing jobs cannot be included under the job creation requirement. However, there is an exception for an existing "troubled business."

Please note that, in spite of not yet being permanent, the EB-5 program has been consistently reauthorized. This basic discussion is provided purely for information purposes for our industry. Be sure to check with EB-5 professionals for your specific situation since there are strict program procedures and technical requirements.

Borrower/Project Developer Perspective

Access to low-cost equity or debt through EB-5 leverages the capabilities of an experienced U.S. operator to grow and expand.

However, EB-5 should not be viewed as a quick fix for securing extra equity or debt. The bureaucratic process requires substantial advance planning and detailed follow-up.

Since primary investor motivation is immigration and not rate of return, lower rates for equity and debt are attainable. As long as there are a sufficient number of new jobs created per EB-5 investor, any amount of EB-5 equity or debt can be raised for a project through pooling EB-5 investors.

The initial question is: Who is going to fund the EB-5 investment of the project? If foreign investors are lined up, then you are ahead of the game. But if you are going to compete with other EB-5 projects for unknown foreign investors obtained by migration brokers, your EB-5 project better be attractive.

The next question is how many EB-5 investment dollars can be raised for the project? The answer is based on the number of new jobs generated, which determines the maximum number of investors that can be pooled for the project. This then translates to the total dollar amount that can be raised through the EB-5 program.

Will the investment be structured as debt or equity? This will impact other sources of funding in the project as well as the investor's perception of exit strategy. If structured as debt, the funding can be senior or subordinate; secured or unsecured; etc.

General guidelines apply. Is the project developer a seasoned operator who has a history of success in similar projects? Is this a proven business model? Have commitments for other pieces of the capital stack been put in place for the entire project cost? Is the project collateralized—real estate is strongly preferred. Is there a job count cushion in order to cover unexpected shortfalls?

Immigrant Investor Perspective

Far more critical than percentage return on investment is the project fulfilling EB-5 requirements. The investor is primarily motivated by the desire to live in the United States. Noncompliance equals no visa—the investor and his entire family could be deported.

Repayment of investment and predictability of exit strategy come next. Investors want their money back with some return and they want a clear exit strategy after the investment period is over. This is typically a purchase of the investor's interest after a five-year term. If funds are provided as equity, the project developer will distribute the proceeds after the project sale or arrange for the sale of the investor's interest. If funds are provided as a loan, principal repayment at the end of the term is accomplished through refinance of the EB-5 loan or project sale.

Conclusion

The EB-5 program has become a viable capital source for U.S. business projects that create new jobs.

Access to low-cost capital enables an experienced U.S. operator to grow and expand.

Expect another strong year of EB-5 investment because the U.S. still presents the most stable commercial investment environment for foreign investors seeking to insulate their investments from global volatility. ■

Corey Henriksen

Corey Henriksen is Managing Director of Acquisition and Refinance Capital, Inc., a firm founded for the sole purpose of obtaining numerous capital alternatives for wholesale and retail owners and operators in the petroleum industry.

Corey is a member of NACS, SIGMA, CIOMA and WPMA and is a regular speaker on financing for petroleum retailers and wholesalers. Corey can be reached at 949.481.8500 or www.AcqRefCap.com.

Fleet fuel cards increasingly empower fleet management to monitor and control fuel purchasing in the field. Spotting irregularities directly impacts operating profitability. The keys to effective monitoring of fuel card use include:

- Making sure the drivers know they are being actively monitored with incentives for compliance and cost management.
- Taking advantage of fuel card monitoring controls. This includes setting limits, such as the number of gallons purchased in one transaction, fuel type and type of spend, as well as controls, such as per day, per week and time of day limits.
- Having reporting capabilities that are easy to generate, read and understand. Within this reporting layout, it is helpful to have the ability to set limits and alerts.
- Working with a fuel card company that is proactive toward your fuel budget goals.

Bottom Line

Fuel cards are the right tool for the fleet manager when properly used.

industry news

OPW Celebrates 20 Years of Flexible Piping Success with Arkema

OPW, a Dover company and a global leader in fluid handling solutions, announced that it is kicking off the 20th anniversary of manufacturing flexible fuel transfer pipe for the retail petroleum industry. OPW and Arkema teamed up in 2006 to create the PISCES piping solution that was released for commercial use in early 2007.

PISCES was born out of the need for a more environmentally-secure pipe solution. For obvious reasons, in the late '80s, the fueling industry had transitioned from burying steel pipe underground to using fiber-reinforced plastic (FRP) pipe. Rigid fiberglass pipe emerged as a potential replacement solution but suffered design and installation challenges due to the need for multiple glued joints that presented potential leak points and extensive labor to install. Flex pipe offered a unique jointless solution. This led to the introduction of PISCES by OPW. Then, in 2007, as new requirements were issued by Underwriters Laboratories (UL) for flexible fuel pipe and as technology in thermoplastics advanced, OPW moved its pipe manufacturing to Smithfield, North Carolina, and launched its Next Generation flexible fuel pipe called FlexWorks.

Both PISCES and FlexWorks combined the engineering and manufacturing expertise of OPW with the science, chemistry and advanced plastics knowledge of Arkema. Arkema is a leading provider of polymer-based solutions such as Kynar® PVDF, a key ingredient at the heart of FlexWorks and PISCES. Kynar PVDF has a proven 50-year track record of successfully handling the most demanding chemical applications. ■

REG Reaches New Sales Milestone with 50 Million Gallons of Biomass-Based Diesel Sold in a Month

Renewable Energy Group, Inc. (REG) announced today that the company sold more than 50 million gallons of biomass-based diesel during the month of August 2016. The sales volume created a new milestone for REG and was a first in the company's history.

REG's lower carbon intensity, advanced biofuel producing fleet of plants and international supply chain footprint helped the company break through the operations-intensive 50-million gallon mark.

The biomass-based diesel sold by REG in August is estimated to have displaced greenhouse gas (GHG) emissions equal to approximately 35 million gallons of petroleum-based diesel and more than 360,000 metric tons of CO2 emissions. Over the first half of 2016, REG biomass-based diesel, on average, is estimated to have reduced lifecycle GHG emissions by approximately 72 percent compared to petroleum-based diesel.

REG sold approximately 50.9 million gallons of biodiesel and renewable hydrocarbon during the month. The figure does not include sales from Petrotec, the German biodiesel producer in which REG has majority ownership. ■

Pinnacle Concludes Summit 2016 Conference with Record Attendance

The Pinnacle Corporation, a leading supplier of technology automation solutions for retail convenience stores and fuel inventory management, completed

Summit 2016 on September 15, their annual client conference. With record attendance, including Pinnacle clients, respected partners and Pinnacle team members from across the country, this three-day event offered 36 individualized training sessions and valuable industry general sessions to keep up-to-date on the changes and opportunities within the convenience store and petroleum sectors.

Led by valued Pinnacle client and Master of Ceremonies Butch Egan of Western Oil, and situated on the rolling hills of the Westin Stonebriar Resort and Golf Club, Summit 2016 offered clients and industry professionals the opportunity to gain not only software expertise, but best-business practices in an often volatile market.

Expanding on client collaboration, Pinnacle's client-led Advisory Council and Summit Steering committees played integral parts in not only ensuring the success of Summit planning, but also participating in education sessions and client panels. Summit participants enjoyed peer networking opportunities each evening and during breaks and mealtimes as well. Evening Sponsor Showcase cocktail hours allowed partners and attendees to learn new advances in hardware/software and how Pinnacle works with industry leaders to make their technologies the most adaptable in the market. Afterward, nights were packed with fun, including tropical poolside parties, a casino night extravaganza and the Summit 2016 grand finale on the rooftop of TopGolf in The Colony. ■

NCR Brings EMV, Customer Loyalty to Fuel Pump for Rutter's Farm Stores

Today, most convenience store patrons simply fuel their cars and go. While retailers generate a large percentage of revenue from fuel sales, they remain diligent in their efforts to better engage fuel-and-go consumers. Rutter's Farm Stores is relying on NCR OPTIC—a new outdoor payment terminal—to reach this ever-growing customer base.

Rutter's, which offers petroleum and food service at its 65 sites, has been an NCR partner for more than 10 years. The Pennsylvania-based retailer had early interest in the outdoor payment terminal (OPTIC) solution when NCR unveiled the technology at the 2015 National Association of Convenience Stores (NACS) Show.

NCR OPTIC is a modular, self-service solution that accepts a range of payment options in its standard configuration, including EuroPay MasterCard VISA (EMV) and magnetic stripe, contactless (including mobile phones) and mobile wallet and 2D barcode scanner.

OPTIC comes in two sizes, a 5" terminal for use with older dispensers and a 12" widescreen—one of the largest and most powerful retrofit options on the market today. OPTIC was engineered to retrofit most brands of fuel dispensers,

allowing retailers to easily upgrade their at-the-pump engagements. Rutter's and NCR will launch the first OPTIC solution in early Q4 of 2016. ■

Quantum Fuel Systems Receives DOT Special Permit on VP-650™ Trailer

Quantum Fuel Systems announced that it has received a special permit from the Department of Transportation (DOT) for its new VP-650™ virtual pipeline trailer, which will have the highest capacity available in the industry at approximately 650,000 standard cubic feet (SCF). The trailer is available for immediate sale and deliveries are expected to begin over the next 30 days.

The VP-650™ "virtual pipeline" trailer is capable of moving a significant amount of compressed natural gas (CNG) and utilizes Quantum's Q-Lite® CNG storage cylinders, which are the lightest weight per unit fuel stored. The tanks in the VP-650™ are capable of storing gas at up to 5,000 psi service pressure. This combination of lighter weight and more fuel has enabled Quantum to provide the new VP-650™ virtual pipeline trailer with an industry-leading capacity of 650,000 SCF.

The trailer design and integration will house other unique features that will set this product apart from existing trailers, including push button shut-offs, independent lock-off features and other technology to ensure a full fill is achieved every time.

Quantum's VP-650™ is mounted in a 45' hi-cube shipping container and has also been designed for sea transport. Short to medium distance shipping of CNG can be much more cost effective than shipping LNG and other clean fuels. Products such as Quantum's VP-650™ can open up a much broader group of both domestic and international industrial users of energy to operate on low cost natural gas. ■

VST Announces New Low Permeation Vacuum Assist Hoses for California's Enhanced Vapor Recovery Market

The release of Executive Orders VR-201 and VR-202—Revision U announces California Air Resources Board (CARB) certification of Vapor Systems Technologies's (VST's) newest Enhanced Vapor Recovery Product: ENVIRO-LOC™ Vacuum Assist Low Permeation Hoses, Model V34EV.

VST's solution strategy broadens the product offering while simultaneously integrating our proven technology of Lip Seal Swivel Couplings for easy swivel action and fewer leak points.

The ENVIRO-LOC™ Vacuum Assist Low Permeation Hose is a highly-engineered fuel delivery product designed to exceed the stringent UL 330 requirements with less than 10 grams/M2/day of permeation. Model V34EV construction includes a high grade nitrile tube for maximum fuel resistance, 2-textile braid with dual helix wire reinforcement layer for excellent kink resistance, premium barrier layer for reduction of permeating volatile organic compounds (VOC) and a chlorinated polyethylene rubber cover, which offers superior fuel, ozone and abrasion resistance.

Additionally, VST offers a variety of whip hose coupling options to accommodate all dispenser outlet ports. ■

in history

100 years ago, John D. Rockefeller became a billionaire following a good day for Standard Oil on Wall Street. Rockefeller, who revolutionized and dominated the oil industry in the late nineteenth and early twentieth century, had a net worth measuring $1.4 trillion (in today's dollars) at the time of his death on May 23, 1937.

PDQ and Dover Foundation Donate $10,000 to Make-A-Wish® Foundation

As part of its ongoing campaign to support the charitable work of organizations that serve local residents, PDQ Manufacturing, Inc., an industry-leading manufacturer of in-bay automatic vehicle wash systems, has made a $5,000 donation to the Make-A-Wish® Foundation of Wisconsin. The amount was equaled through a matching-grant initiative created by the Dover Foundation, which is the philanthropic arm of PDQ's parent company, Dover Corporation, for a total donation of $10,000. The Dover Foundation was created in 2011 as a way to help support not-for-profit organizations, causes and/or projects that benefit the local communities in which its operating companies are located.

This marks the fifth consecutive year that PDQ and the Dover Foundation have made a donation to Make-A-Wish of Wisconsin, which grants the wishes of children who have been diagnosed with life-threatening medical conditions. This year's donations helped make the wishes of two ill Wisconsin children come true.

Emily, a 12-year-old diagnosed with medullary thyroid cancer, received her wish when a bakery kitchen was installed in her home. Her wish will allow her to focus on the joy she finds in baking and help her escape the rigors of her medical condition.

Payton, an 11-year-old diagnosed with Hodgkin's lymphoma, had her wish come true by traveling with her family to Hawaii to spend time together at Disney's famous Aulani Resort & Spa in Oahu. ■

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ACE Debuts Online E15 and Flex Fuel Roadmap for Gasoline Retailers

A new tool developed by the American Coalition for Ethanol (ACE) for gasoline and ethanol retailers is available online.

The website, an interactive version of ACE's recently-released E15 and Flex Fuel Retailer Roadmap features an interactive calculator that retailers can use to compare current sales and revenue to results achieved by their peers currently offering higher blends of ethanol, says ACE Senior Vice President Ron Lamberty.

"Our Roadmap website is similar to the guide we've just published for retailers, since both provide state-by-state laws, programs, statistics and 'back-of-the-napkin' examples of the profit potential of selling higher ethanol blends for an average retail store in their state. Those examples aren't predictions, they simply show what a fictional 'average' store in that state could do if its sales increased at the level of current mid-tier or top-performing E15 and Flex Fuel retailers," said Lamberty. "The Roadmap isn't meant to be a 'how-to,' it's more of a 'maybe you can.' On this website, we've added a feature that station owners or managers can use to plug in their own numbers—actual current gasoline volume, and different fuel and inside sales margins—to see the potential of higher blends, and help them decide if they want to take a closer look at offering their customers some new fuel choices."

Lamberty notes that the website's state-by-state profiles feature important stats for c-store owners and operators, including the number of flex-fuel stations, flex-fuel and total vehicles registered in the state and a comparison of those numbers to show the potential demand per state for E15 and E85 volume and stations. ■

Also Visit:

FuelRetailerMagazine.com

PDI Acquires Intellifuel

PDI, a leading provider of enterprise-class automation software systems to the convenience retail and wholesale petroleum industries, announced it has completed the acquisition of Intellifuel Systems, Inc., a leading provider of fuel management and logistics solutions for downstream and midstream participants in the fuel supply chain. Financial terms of the transaction were not disclosed.

Intellifuel provides solutions across the fuel supply chain market. Downstream, the company helps petroleum marketers automate the entire order life cycle. Midstream, they provide terminal automation systems, custody transfer, terminal and railcar scheduling, inventory position management and customer/stockholder portal solutions. Founded in 2001, Intellifuel's headquarters are located in Titusville, Florida. ■

Wayne Standardizes Offering for All North American Retail Fuel Dispensers to E25

Wayne Fueling Systems, a global provider of fuel dispensing, payment, automation and control technologies for retail and commercial fuel stations, announces that all Wayne North American retail fuel dispensers will be supplied as compatible and UL-Listed to E25 (25% ethanol and 75% petroleum) as a standard feature. The shift from the standard UL Listing of E10 to E25 is effective immediately for Wayne Ovation™ fuel dispensers, and by year-end for the Wayne Helix™ family of dispensers.

With the potential shift to higher ethanol blends necessary to meet future fuel requirements brought about by more stringent CAFE standards and GHG reductions by 2025, this move is an expression of Wayne's continued intent of supplying its customers with the most flexible, reliable and future-proof equipment options. This follows the same thinking that led to the development of Wayne's dual blending series, which enabled the maximum number of fuel grade selections to support mid-level ethanol blends.

At this time, 90% of dispensers in the industry are only certified to dispense E10 fuel. ■

D&H United Fueling Services and Leighton O'Brien Expand Strategic Partnership

D&H United Fueling Solutions, known for fuel system installation, service and equipment distribution throughout Texas and the Southwest region of the U.S., and leading fuel analytics and field technologies company Leighton O'Brien, announced an expansion of its strategic partnership whereby D&H United Fueling Solutions will acquire Leighton O'Brien's existing Texas business and the state of Texas territory.

The partnership will include Leighton O'Brien Vice President of Operations Mike Thornton joining the D&H United team. Thornton will continue to manage the existing Leighton O'Brien, and now D&H United's, tank and fuel cleaning business in Texas, and be an integral part of D&H United's tank and fuel cleaning expansion throughout the Southwest U.S. Leighton O'Brien's Texas-based tank and fuel cleaning technicians will also join D&H United.

The partnership will enable D&H United Fueling Solutions to further deliver Leighton O'Brien's tank and fuel cleaning and polishing technology to existing and new clients. The service will be conducted by fully-trained fuel cleaning technicians and safety helpers. ■

Propel Launches ProShop, Connecting California's Low Carbon Fuel Culture

Propel Fuels announces the launch of the Propel ProShop (www.propelpro-shop.com), an online store for customers to purchase apparel and accessories. In addition to the ProShop, Propel has launched its Hi-Octane Society (Flex Fuel E85) and Diesel Pro (Renewable Diesel HPR) aficionado clubs, providing unique social forums for customers to share photos, videos and experiences about their use of high-performance, low-carbon fuels.

The Propel ProShop offers a variety of custom Propel hats, t-shirts, mugs, vehicle decals and chrome badges. Propel holds weekly ProShop-branded apparel giveaway contests on Facebook and Instagram, including the current "Relax With Your Horsepower" photo contest for fans to share a favorite summertime activity using Propel E85 or Diesel HPR on social media using the hashtag #RelaxWithYourHorsepower.

This year, Propel's Silicon Valley Workshop released a consumer study based on low-carbon fuel user behavior in California. The study found consumers are extremely loyal to low-carbon fuels, both Flex Fuel E85 and Diesel HPR. The user base for low-carbon fuels in California is extremely diverse, representing the broad-based socioeconomic demographics of the state. Because today's low-carbon fuels are affordable to mainstream consumers and can run in a variety of vehicles, everyone can afford to use cleaner fuel options.

Propel is a leading retailer of low-carbon fuels. Propel operates retail stations across California, and provides commercial and bulk delivery for business and government fleets. ■

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U.S. Bank and TravelCenters of America Deepen Ties via New Single Voyager® Fleet Card Solution

TravelCenters of America, operator of the TA® and Petro Stopping Centers® brands and Minit Mart® convenience stores, is expanding its relationship with U.S. Bank by accepting a new single Voyager Fleet Card solution at all of its truck stop and convenience store locations. The new single Voyager Fleet Card combines the robust fleet control functionality needed by heavy-duty commercial rigs at truck stops with the comprehensive data capture capabilities required by smaller vehicle fleets at retail locations. For the first time, all fleet classes can be managed through one card, one network and one program management platform.

The Voyager Network, owned and operated by U.S. Bank, includes thousands of participating fueling, maintenance and service locations nationwide, including TA, Petro and Minit Mart outlets. Drivers and fleet managers can find card-accepting locations with the Voyager Mobile App or the merchant locator within U.S. Bank Fleet Commander® Online. ■

Ryder Becomes First Commercial Fleet Provider to Surpass 100 Million Natural Gas Vehicle Miles

Ryder System, Inc., a leader in commercial fleet management, dedicated transportation and supply chain solutions, announced its fleet of natural gas vehicles have surpassed 100 million miles of operations, making it the first commercial fleet outsourcing provider to reach this significant milestone. Through this achievement, Ryder has gained substantial insight into the natural gas vehicle (NGV) industry and how to optimize this solution for customers looking to reduce costs and emissions.

Ryder closely tracks emerging fleet technologies, incentive programs and government rebates to deliver competitive lease and rental rates for customers interested in NGV solutions. ■

McLane Rolls Out Robust Suite of Store-Level Management Applications for Mobile Devices

McLane Company Inc., a leading supply chain services company providing grocery and foodservice supply chain solutions, announced the rollout of its popular Premium Order Management Suite (POMS) applications for Android and Apple iOS mobile devices. The POMS applications for c-store and grocery retailers give customers the benefit of executing their ordering, receiving, inventory, reclamation and delivery management at 10 times the previous rate and lower cost, as well as increased profitability over time.

Since Grocery Mobile launched in May, numerous retail chains and independent McLane customers representing 1,500 stores have adopted the platform. Deon Johnson, McLane's Vice President of Customer Technology, estimates another 2,000 downloads of the software will occur by the end of the year and 3,000 additional devices will be rolled out per year over next three years. Johnson said one reason customers have been quick to embrace Grocery Mobile is because they can download it directly from Google Play or the Apple App Store and get the software up and running in a matter of minutes. McLane has also added AirWatch® mobility management software that controls which apps are downloaded to each customer device. Just like any other cell phone-based program, software updates are automatically communicated to the user's device, meaning you always have the latest features and version. ■

Hough Petroleum Selects PriceAdvantage Fuel Pricing Software to Accelerate Fuel Pricing Process

PriceAdvantage, a fuel price management software company and division of Skyline Products, announced that Hough Petroleum has chosen PriceAdvantage software to streamline store-specific fuel pricing strategies at their owned and operated locations throughout New Jersey. Hough Petroleum selected PriceAdvantage based on the software's ability to centralize critical fuel pricing data and present it in a strategic format as well as create automated prices changes—with price change confirmation—from a mobile device.

Hough selected the PriceAdvantage software as a service (SaaS) solution to leverage the benefits of a cloud service model, including the low upfront cost, ease of implementation and the maintenance and infrastructure cost benefits. They also selected the mobile component that allows them to make price determinations anywhere, anytime from a mobile device. ■

FleetCor Acquires Travelcard, a Universal Fuel Card Issuer in the Netherlands

FleetCor Technologies, Inc., a global provider of fuel cards and workforce payment products to businesses, announced it has acquired Travelcard Nederland B.V., a leading universal fuel card issuer in the Netherlands, from LeasePlan Corporation N.V.

Travelcard, founded in 1986 by LeasePlan, issues fuel cards and provides complementary services to its customers to pay for other mobility-related services. Travelcard's industry-leading products serve the needs of fleet operators and a variety of other businesses in the Netherlands, including some of the country's largest leasing companies. The company operates its proprietary universal network throughout the Netherlands at nearly all fueling stations as well as significant portions of Belgium and Luxembourg. Travelcard has close to 300,000 active fuel cards in the market. ■

Next-Generation Cree CPY LED Canopy Luminaire Delivers Category-Leading Efficiency

Cree, Inc.'s best-selling CPY 13,000 lumen LED canopy luminaire delivers efficiency of up to 136 lumens per watt (LPW). This new 13,000 lumen Cree® canopy luminaire offers superior illumination and industry-leading efficiency, as well as easy installation and lower total cost of ownership for better light experiences. Already a favorite with canopy owners for its uniform, clean white light, the 13,000 lumen CPY luminaire boosts efficacy by 20 percent, lowering operating costs while enhancing roadside visibility and appeal at service stations, convenience stores, drive-through restaurants or banking locations.

The improved luminaire is DesignLights Consortium® Premium qualified for maximum utility rebates and now generates added energy savings of $12 a year per luminaire, totaling cost reductions of more than $34,000 over 10 years for a typical petroleum retrofit installation. It is also Class I, Division 2 hazardous-location rated for direct mount applications, with an expanded range of options for areas where flammable liquids and gasses are present.

Replacing metal halide luminaires with the CPY Series canopy luminaire is quick and simple with a slim, low-profile design that eliminates the need to cut into the canopy deck, and a seamless direct mount that provides a water-tight seal in virtually any canopy or soffit for easy installation.

The entire CPY Series is also available at 4000K, and comes with Cree's 10-year limited warranty. There are two optics choices, a flat or prismatic drop lens to meet the visual, as well as the vertical and horizontal illumination performance needs of a typical canopy application. The integrated driver within the canopy housing further simplifies installation, reducing installation time and cost. ■

RDM Industrial Electronics, Inc. Acquires 3M™ Wired Communication Systems Assets

RDM Industrial Electronics, Inc. has acquired assets of the 3M™ Wired Communication Systems business. This includes the existing inventory for the Performance and Classic Series intercoms and their accessories. RDM's Nebo, North Carolina, location will offer intercoms and accessories for sale to customers beginning August 2016. The wired intercom products and systems manufactured by RDM will be sold under the RDM brand. ■

CarrierLists Launches New Tools for 3PLs and Shippers to Source Hazmat Trucking Companies

OTR Advisors, LLC announced the launch of its first CarrierLists sourcing products, North American Hazmat Carriers and North American Heavy Haulers.

Each sourcing tool is built and designed to meet the specific needs of third party logistics (3PLs) and shippers to help locate and hire highly-specialized carriers operating in the hazmat and heavy haul categories.

Each carrier profile includes both public and non-public information

collected via telephone interviews with each carrier. This information can be easily filtered based on specific criteria, including carrier home location, trailer types, preferred lanes and specializations, such as team drivers, hotshots and certifications to name a few. ■

International Truck First OEM to Make Collision Mitigation Standard

International Truck has announced that the soon-to-be-launched LT™ Series on-highway Class 8 tractor will come standard with an advanced driver assistance safety system, which includes a powerful combination of collision mitigation and full stability technologies.

This standard technology offering on the new LT Series signifies assured driver safety, ultimately reducing collision repair costs and resulting in uptime efficiencies for heavy-duty fleets.

The standard solution featured on the new International® LT Series, Bendix® Wingman® Advanced™, gives drivers following distance and stationary object alerts, and brings together adaptive cruise control with collision mitigation braking technology and the full-stability technology—Bendix ESP®—providing fleets with a system that can help drivers avoid collisions, roll-overs and loss-of-control situations. In addition, the system can provide data to help keep fleet owners and operators in the know about what's happening out on the road. Wingman Advanced, with millions of on-road miles and radar-based collision mitigation technology, has been helping fleets mitigate rear-end collisions since 2011. ■

Navistar's SuperTruck Exceeds Department of Energy's Freight Efficiency Goal

Navistar unveiled its innovative SuperTruck demonstration vehicle, CatalIST, which has achieved a freight efficiency improvement of 104% compared to the control vehicle, exceeding the improvement goal set by the U.S. Department of Energy (DOE) for the SuperTruck program.

In addition, the Navistar vehicle has achieved fuel efficiency of 13 miles per gallon, and demonstrated 50.3% Brake Thermal Efficiency (BTE) and a path toward 55% BTE.

The last three letters of the vehicle's name, the CatalIST, stand for

Did You Know ?

A diesel engine can be 40% efficient or higher. That means 40% of the fuel actually moves the vehicle, and the rest is lost to friction, noise or engine functions, or it goes out as heat in the exhaust. However, compare this to gasoline, which is 20% efficient. That is why diesel engines are so popular for moving heavy vehicles like trucks, where extra fuel really starts to get expensive.

At high altitudes, diesel engines get better power than gasoline. Gasoline engines operate at a very specific ratio of fuel and air. At high altitudes, the air is thinner—literally: there are fewer molecules of air per cubic foot. That means that in the mountains, gasoline engines have to add less fuel to keep the ratio perfect, which affects performance. Diesel engines have turbochargers, which pump more air into the combustion chambers at high altitudes, helping them perform better.

Diesel engines get their best performance below 65 miles per hour. They get peak power when the engine revolutions per minute (RPM) are low, generally at speeds below 65 miles per hour. Gasoline engines, in contrast, get to peak power by running the engine fast and high and the RPM at 5,000 (i.e., with the pedal to the metal).

Diesel fuel is not that dirty. The EPA now requires diesel engines to meet the same pollution criteria as gasoline engines. Carmakers added a device called a diesel particulate filter, which removes visible smoke. "If you're buying a diesel car from 2007 or later, it's no dirtier than a gasoline-powered vehicle," says Argonne Mechanical Engineer Steve Ciatti. ■

Source: Argonne National Laboratory

"International SuperTruck," referencing the company's International® commercial truck brand. The "CatalIST" concept underscores the company's conviction that the innovations achieved through the program will serve as the catalyst for significant improvements in future commercial vehicles.

Navistar's predictive cruise control technology is one example of a significant technical innovation the company achieved through the program. Predictive cruise control looks ahead of the vehicle, recognizes the terrain and continuously calculates the most efficient speed and gear for optimal fuel economy in real time. Unlike conventional predictive cruise technology, the company's predictive cruise control uses preinstalled GPS maps and the latest commercial route data to make adjustments to cruising speed without the need to pre-drive the route.

The DOE's SuperTruck program, a five-year-long research and development initiative, focused on improving freight efficiency, a measure of the payload carried while burning less fuel, versus 2009 base model trucks. Its objective was to develop and demonstrate a 50 percent improvement in overall freight efficiency on a heavy-duty Class 8 tractor-trailer vehicle as measured in ton-miles per gallon of diesel fuel. ■

GROWMARK to Purchase Suncor's Share of UPI

GROWMARK and Suncor have reached an agreement in which GROWMARK will purchase Suncor's 50% interest in UPI, Inc. in Ontario, Canada. UPI, Inc. provides energy products including refined fuels, propane and lubricants throughout Ontario. The transaction, subject to conditions including regulatory approvals, brings GROWMARK's ownership of UPI to 100%. Terms of the transaction were not disclosed.

Suncor and GROWMARK have also entered into long-term supply agreements for GROWMARK's petroleum needs in Ontario. ■

Conexxus Releases Mobile Payments Standards Version 2.0

Conexxus, the convenience and fuel retailing industry's standards non-profit group, announced the ratification and immediate release of its Mobile Payments Standard, v2.0.

The new standard allows tightly coordinated interaction between mobile payment and loyalty applications, helping to create a more consumer-centric mobile commerce environment. An additional feature is the ability to operate loyalty both in cloud or local environments, independent of how the mobile payment is transacted, which allows for multiple use cases that link myriad payment and loyalty schemes into a single, standardized data exchange platform. ■

Caltex Renews Its Long-Term Fleet Fuel Card Processing Solution with WEX

WEX Inc., a leading provider of corporate payment solutions, announced that WEX Australia has entered into a multi-year fuel card system processing contract with Caltex. Caltex, Australia's only ASX listed transport fuel supplier and leading commercial fuel card program operator, has selected WEX Australia to process all of its fuel card payments for the next three years. Through this agreement, WEX Australia will continue to provide payment processing services to Caltex fleet card customers and Caltex retailers representing more than 1,900 branded retail locations. ■

Gilbarco Veeder-Root Launches HD Meter

Gilbarco Veeder-Root recently launched the HD Meter™–a new fuel meter to accompany their Encore Series fuel dispensers. It was designed to minimize drift while providing long–term performance and minimal maintenance–even with abrasive fuels. The design of the HD Meter provides superior handling of abrasive fuels, the ability to cut drift by 50% and durability that is double that of traditional piston meters. It is engineered to exceed industry standards through the precision finish of the valve seat, long-lasting rotary valve and premium end covers. The HD Meter design features are configured to deliver consistent fuel flow, quickly recover from abrasive contaminants, better control the sealing surfaces, minimize fuel over-delivery and reduce calibrations. ■

in history

Oil production technology has certainly changed over a century, but the innovation, drive and skill inherent in mining our black gold and natural gas remain the same.

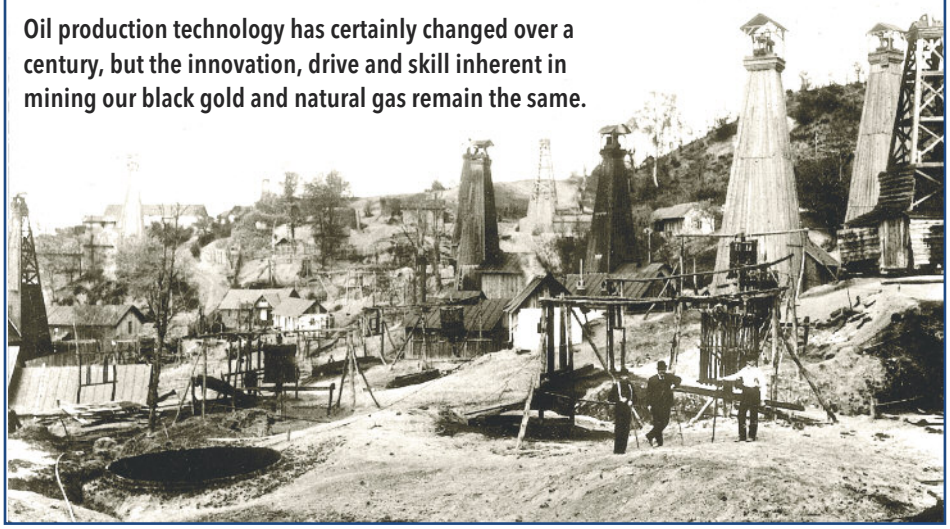

Photo source: US Dept. of Energy

What Does That Mean ?

Test Your Acumen

The list below represents acronyms used in this issue of *Commercial Fuel Buyer*.

ANS	Alaska North Slope
API	American Petroleum Institute
API	Application Programming Interface
ASSE	American Society of Safety Engineers
AST	Aboveground Storage Tank
ASTM	American Society for Testing Materials
ATA	American Trucking Association
ATG	Automatic Tank Gauge
bbl/d or bpd	Barrels per Day
BRICS	Brazil, Russia, India, China, South Africa
BTU	British Thermal Unit
CAFE	Corporate Average Fuel Economy
CDFA	Clean Diesel Fuel Alliance
CIOMA	California Independent Oil Marketers Association
CO2	Carbon Dioxide
COP21	United Nations Paris Climate Conference 2015
CRC	Coordinating Research Council
DEF	Diesel Exhaust Fluid
DOC	Diesel Oxidation Catalyst
DOT	Department of Transportation
DPF	Diesel Particulate Filter
EEC	European Economic Community
EIA	U.S. Energy Information Administration
EMV	EuroPay MasterCard VISA
EPA	U.S. Environmental Protection Agency
EU	European Union
EV	Electric Vehicle
FHWA	Federal Highway Administration
GDP	Gross Domestic Product
kbpd	Thousand Barrels Per Day
kWh	Kilowatt Hours
LNG	Liquefied Natural Gas
LTO	Light Tight Oil
MIC	Microbiologically-Influenced Corrosion
MMbpd	Million Barrels Per Day
NACS	National Association of Convenience Stores
NCWM	National Conference on Weights and Measures
NHTSA	National Highway Traffic Safety Administration
NOx	Nitrogen Oxide
OEM	Original Equipment Manufacturer
OPEC	Organization of the Petroleum Exporting Countries
ORD	Office of Research and Development
PADD	Petroleum Administration for Defense District
PEI	Petroleum Equipment Institute
PEMEX	Petroleos Mexicanos
PMAA	Petroleum Marketers Association of America
ppm	Parts Per Million
psi	Pounds Per Square Inch
ROI	Return on Investment
ROIC	Return On Invested Capital
SCR	Selective Catalytic Reduction
SIGMA	Society of Independent Gasoline Marketers of America
SMS	Short Message Service
SOX	Oxides of Sulfur
STP	Submersible Turbine Pump
TAPS	Trans-Alaska Pipeline System
UK	United Kingdom
UKIP	United Kingdom Independence Party
ULSD	Ultra-Low-Sulfur Diesel
UN	United Nations
UST	Underground Storage Tank
WPMA	Western Petroleum Marketers Association

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