

STILL SELLING SMOOTH STARTS

Kold-Ban International evolves product line, broadens focus; newest ultracapacitor systems offer enhanced starting capabilities, long cycle life

By Mike Brezonick

From the beginning of internal combustion engine technology, the first order of business has always come down to getting started. And while the diesel engine's ability to start in cold temperatures has improved with the introduction of advanced fuel injection and engine control systems, there remain some instances where a little help in the form of some type of starting aid is required.

Throughout its 35-year history, Kold-Ban International (KBi) has specialized in products and systems designed to help diesel engines get going in cold weather. Starting initially with basic ether systems, the company has evolved through the years and more recently, has developed a range of advanced systems designed to ensure that engines can be started quickly and effectively, no matter the ambient temperatures.

"Engines are easier to start these days, no question," said James O. Burke, vice president of the Lake In The Hills, Ill., company and son of KBi founder James W. Burke. "But no matter what they do with the diesel, with compression ignition, there is going to always be a need for some ether systems in some applications.

"It's not just 'no starts' we're trying to address. It's cold-start characteristics that we can improve dramatically for relatively little costs.

"Electronic engines are much easier to start. You can have a truck sit-



ting over the weekend at 5° and if you crank it long enough, eventually, it will start on its own.

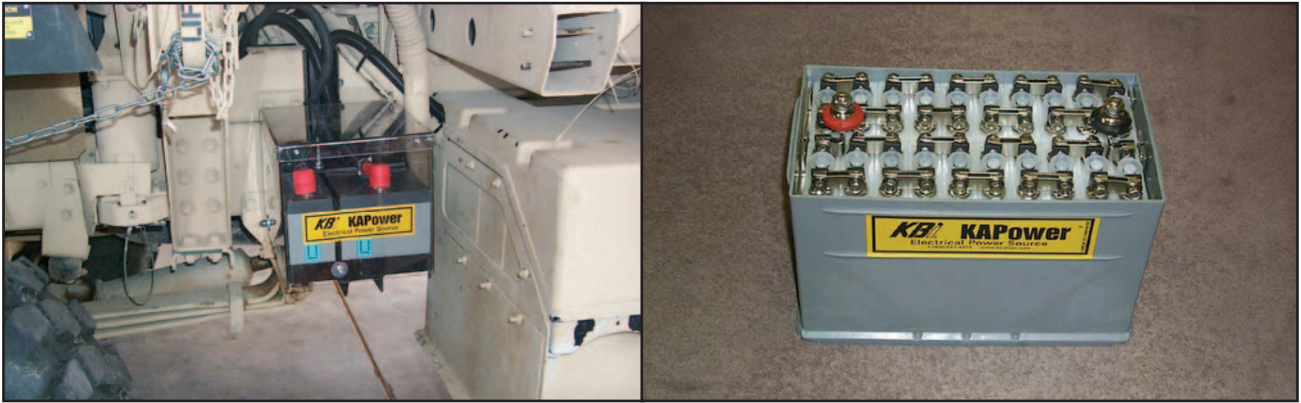
"But what will happen is that it will be billowing white smoke until it finally hits on a couple of cylinders and it lopes along until it's running normally. In the meantime, unburned diesel fuel is affecting the engine in many ways, vibration is excessive because of the uneven firing of the cylinders and the batteries have been maxed out or deep cycled. Is that a good start? Aside from the fact that emissions are such a major concern these days, there is also the wear and tear on things such as starters. And if the user has to, he may resort to the dreaded aerosol can of ether to spray down the air cleaner and hope for the best.



Kold-Ban International (KBi) offers two primary product lines designed to aid in cold weather diesel engine starting. The Dieselmatic NVT (left) is an ether starting system designed to work with the engine's electronic control module to precisely meter ether injection. More recently much of KBi's focus has been on continuing the development of applications for its range of electrochemical double layer capacitors (EDLCs). The company markets its EDLC ultracapacitors under its KAPower brand name.

"To the savvy maintenance manager who looks at his cold weather operating costs and realizes that the cost of one of these systems can be less than one no-start, it's cheap insurance."

Much of KBi's activities have involved the development and sales of increasingly sophisticated ether injection systems. The newest is the Dieselmatic NVT (New Valve Technology), which directly integrates the control of ether injection with the standard OE engine control module. "NVT was conceived and



KBi's KAPower ultracapacitors are similar to conventional batteries in that they can be charged with a standard alternator system, but unlike normal batteries, they deliver their current load at once, enabling extremely high power — two to three times as high as conventional systems — for engine starting. They have been widely used on military vehicles.

designed from the ground up," said Burke. "KBi worked directly with all the major North American heavy-duty diesel engine manufacturers to ensure that the proper ECM controls are in place to effect a perfect cold engine start every time."

More recently, much of KBi's focus has been on continuing the development of applications for its range of electrochemical double-layer capacitors (EDLCs). The company markets its EDLC ultracapacitors under its KAPower brand name.

"We were introduced to ultracapacitors in two ways," said Burke. "Back in the '90s, we developed an electronic ether system for the Marine Corps. and one of the performance specs for this particular vehicle said they did not want to rely on lead acid batteries for starting. The technical demonstrator was built by NATC (Nevada Automotive Test Center) and it included an air starter.

"When they were done with it, they sent it to a couple of prime contractors, and neither wanted to proceed with the air-start systems, but pursued capacitor start systems. That was our first introduction to capacitor systems.

"We had been looking for another product to enhance our ether injection products, but it had to be the right fit. We know diesel engines — we didn't want to take on mud flaps or heated windshield wipers. We wanted something that fit the core,

and capacitors seemed like it might be that."

KBi began working with a Russian company, ECONDO, which had developed an improved form of EDLC capacitor. "We had tested some in our cold room and they were extremely impressive," Burke recalled. "It was kind of ugly at the time — it looked like a coffee can with a couple of posts on the end of it. But we took one with no charge, and were able to charge it up to 12.5 V using four 3 V lithium ion photo cells about the size of my thumb. We took it out, hooked it up to my truck and started my truck off of it."

While impressed with the technology, several issues, particularly quality control, kept KBi from getting too involved. But that changed a couple of years later thanks to a chance meeting. "We were in one of our agricultural OEM's cold rooms," Burke said. "We were there supporting the ether valve product, and as I'm walking out of the door of the cold cell, these fellows are trying to get in the door and I hear them speaking Russian.

"The cold room technician said you guys should talk. You make the best ether system, and the capacitor technology these guys have cranks over engines like none we've ever seen and the quality is superior to anything we've seen."

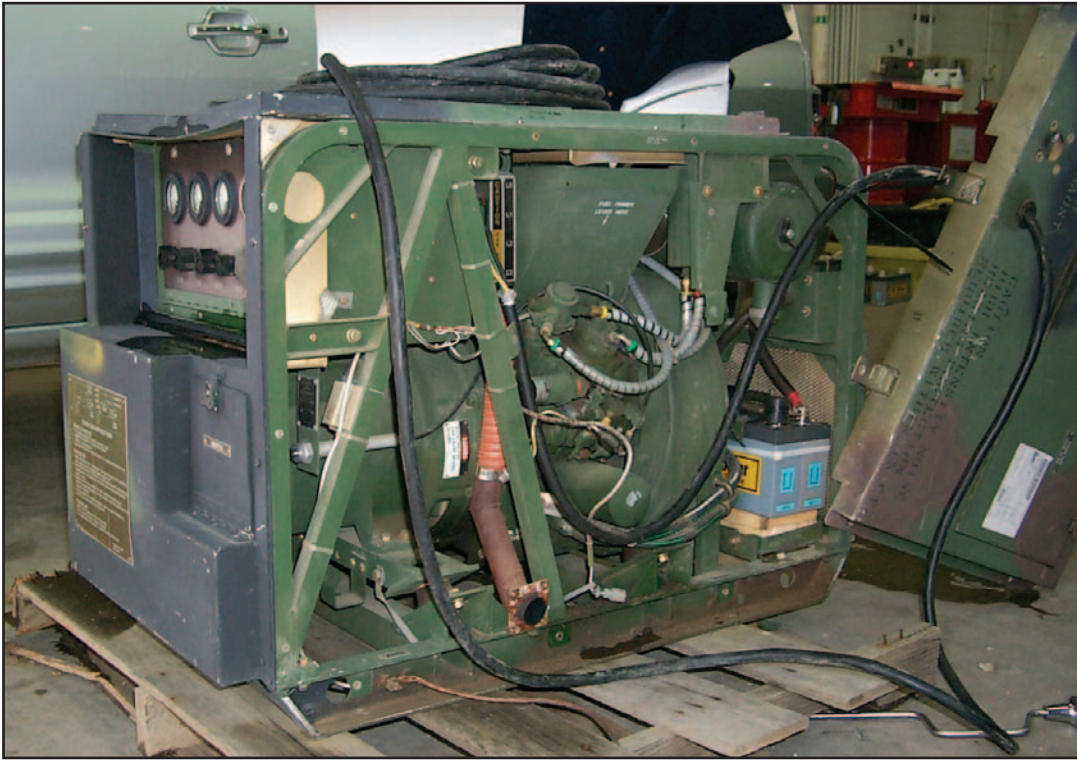
The Russians were from another manufacturer called ESMA and after

brief discussions, the companies agreed to collaborate. "What was interesting with this company was that their technology was completely different from the other technology we had seen," Burke said. "They were still electrochemical double-layer capacitors, but they were using an asymmetric design and they didn't rely on carbon-carbon electrodes in the capacitor, which was really why the prior devices proved to be inferior.

"ESMA had patented a device where they used a nickel electrode on the positive side and carbon electrode on the negative side and their energy density values made the older style ultracaps look like antiques."

The newest KAPower EDLCs have the outward appearance and rough dimensions of a conventional battery — 13.7 in. long x 7.68 in. wide x 9.96 in. high with an installed weight of 57.27 lb. Operating voltage is 8 to 29 V for 24 V units and 4 to 14.5 for 12 V systems and maximum power is up to 35 kW. Many different sizes and power ratings are available for different applications, Burke noted.

The KAPower units are similar to conventional batteries in that they can be charged with a standard alternator system, but unlike normal batteries, they deliver their current load at once, enabling extremely high power — two to three times as high as conventional systems — for engine starting. Once discharged it can be fully recharged in minutes and its



Along with trucks and mobile vehicles, the KBi KAPower ultracapacitors can also be used for engine starting on equipment such as generator sets.

chemical processes are virtually unaffected by temperature, meaning they are efficient at extremely low temperatures. “The low ESR (equivalent series resistance) is what makes the difference,” Burke said. “Batteries just can’t compare.

“It’s a no-brainer for engine start,” Burke added. “The technology has proven itself and we have installed capacitors in numerous military vehicles and heavy-duty fleets. From a technical standpoint, there have been no obstacles.”

As with any technology being commercialized, the primary challenge is economic. Currently, EDLCs are significantly more expensive than standard battery systems, with a typical installation in a heavy-duty truck in the neighborhood of \$1500. “The first arguments were ‘You’ve got to be kidding — we’re buying a battery for \$60 and you want to sell me a capacitor for \$800?’” Burke said. “But some people, particularly the military, have realized that the 6TL lead acid battery costs them \$60, what they call the logistical footprint costs them thousands.

“I believe batteries are number three on the list behind fuel and tires. They have to ship them, they have to store them and they have to dispose of them and it’s a logistical nightmare. I understand they have football fields of used batteries piled up in Iraq.

“The life of an ultracap is beyond the vehicle. When we started, we certified them to 100,000 charge-discharge cycles. Now we’re up to 300,000 cycles and they’re still running them beyond 500,000 cycles in the lab and they haven’t found the cycle duty life yet.”

Beyond touting its long life, Burke said ultracapacitor systems would become more economical as their scope of application was expanded. “We have identified several markets, such as commercial trucks, military and power gen as industries where engine starting is critical,” he said. “In the case of a heavy-duty truck, using ultracaps would allow you to use fewer batteries and downsize them to the point where you’d only need them to handle the creature comfort loads. You wouldn’t need high CCA batteries because the ultracapacitors would handle the engine starting.

“An isolated capacitor start system will ensure that enough power is available to start the engine, regardless of the condition of the batteries. And the applications seem endless. If engine starting power is an issue, capacitors can help resolve it.”

KBi can also offer a system that combines the EDLC and ether injection systems into an integrated engine starting package, he added.

The economics of the ultracapacitors may also possibly be improved by a new joint venture that may bring EDLC manufacturing to the U.S. Though tentative, KBi has been working with ESMA in seeking out a joint venture partner to establish an operation in North America that would reduce some logistical costs.

“We’ve got the market identified that can crack the nut, so that volumes go up and costs go down,” said Burke. “If we can find the right partner and the JV happens, that will help. There’s no doubt in my mind that there is an industry that is going to take off eventually and we’re going to be there.” ★

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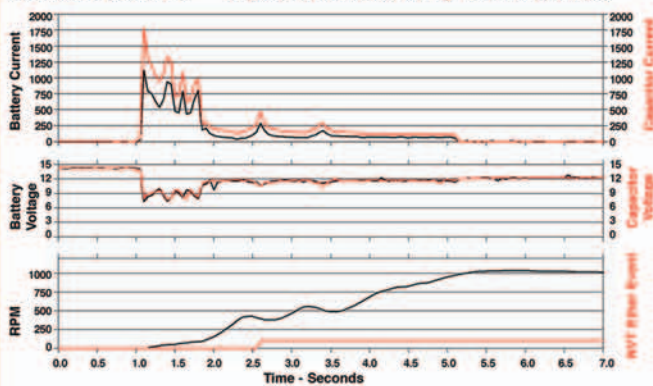
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