



Lube in the Groove

Afton Chemical has rolled out a promising high-performance lubricant that can keep heavy machinery moving faster and lifting heavier loads.

by Peter Galuszka

Not long ago, operators of heavy-duty equipment using hydraulic pumps and lifts had a problem. As the pumps increased performance, they operated at higher temperatures and pressures. Under added stress, the pumps malfunctioned more often because the common motor oil routinely used to lubricate them broke down.

That was bad news for owners of machinery who depend on pumps and lifts such as dump trucks, land excavators, garbage trucks, drag lines and elevators. And it was a major concern for customers of Richmond-based Afton Chemical Corporation, which makes specialty chemicals for lubricants and fuels.

About 18 months ago, a team of 10 engineers and technicians got to work at Afton's sleek research building in the shadow of Richmond's downtown expressway. Their result, a new product called HiTEC 5785 PMA, was launched on Aug. 16.

So far the results seem promising. HiTEC 5785 PMA prevents such problems as a loss of viscosity, water corrosion and polymer shearing inside pumps. "The industry needed a polymer that doesn't break down," says

Ian Macpherson, Afton's marketing manager for industrial additives who holds a doctorate degree in chemistry. "Since water is almost always present when the pumps operated, we needed something that can counteract hydrolysis that can cause corrosion and acidity."

HiTEC 5785 PMA is one of many breakthrough products produced in the Richmond labs since Afton's former parent firm, Ethyl Corporation, reorganized as New Market Corporation in June 2004.

Ethyl, which moved to Richmond in 1961, is a venerable brand name in the chemical and energy industries, known for its antiknock lead compounds used in fuel among other products. The company was forced to rethink its business strategy in the 1970s when tetra ethyl lead was phased out from use in gasoline in the United States after the introduction of catalytic converters for cars.

Under the new arrangement, New Market has two primary subsidiaries: Ethyl, which continues to market tetra ethyl lead and manufacture specialty chemicals, and Afton Chemical, formerly known as Ethyl Petroleum Additives, Inc. Afton makes fuel and lubricant additives and other specialty chemicals. Among its better known brand names are HiTEC Petro-

leum Additives, GREENBURN Combustion Technology, a petroleum additive that reduces emissions, and TecGARD Metalworking Additives.

On revenues of \$894 million last year, New Market generated \$33 million in net income. Petroleum additives revenues continue to grow this, achieving 2nd quarter sales of \$269 million, an increase of 23 percent over the same quarter the year before.

Innovation at Afton Chemical is critical to New Market's long-term success. The Afton division accounted for all the company's R&D spending: \$65 million in 2004, up from \$58 million the previous year. Much of that sum is spent in Richmond, where Afton alone has 200 research workers along with another R&D operation a few miles away in Ashland. Rounding out the R&D are facilities in Bracknell, England, and Tsukuba, Japan. New Market has racked up more than 1,000 patents over the years.

"Outsiders would be surprised to see that Richmond has the wealth of chemical research that it does," says Macpherson, who was raised in England and has worked at the Richmond facility for 13 years. "You'd expect something like this down on the Gulf Coast."

Gene Winter, senior vice president with the Greater Richmond Partnership, the Richmond region's economic development organization, concurs. "Richmond may be the nation's best kept secret in chemical R&D," he says.

DuPont conducts much of its research on high-performance polymers like Kevlar and Nomex at its Spruance plant, while Honeywell, developer of Spectra fiber, maintains an R&D center in the region, and Magellan Systems performs research on its M5 super fiber in Richmond.

Boehringer Ingelheim, a German pharmaceutical giant, also staffs a Richmond laboratory that concentrates on developing more efficient chemical processes for the manufacture of complex organic compounds at its Petersburg plant. Underpinning the local chemical industry is a strong and growing department of chemical engineering at Virginia Commonwealth University. Says Winter: "Richmond is a significant center of innovation."

The dominant compound in HiTEC 5785 PMA is polymethacrylate, a commonly used viscosity index improver. The chemical protects the surfaces of pump cylinders so they will move smoothly. A challenge for Afton's researchers, Macpherson says, is to develop pumps that can perform in conditions of extreme cold and heat. Oil rigs, for example, may need hydraulic pumps that can operate equally well in sub-zero Arctic conditions as well as torrid deserts.

Compounding the challenge, the lubricants must be able to keep working in pumps designed to work at higher, more stressful levels of performance. Customers and machinery makers have found that as temperatures and pressures increase, lubricant function tends to break down.

Viscosity is one problem. To work well, moving parts in pumps need to be coated with a lubricant film of the correct thickness. Another problem is "polymer shear." In this phenomenon, high heat and pres-

sure tend to make polymers – the long string of chemicals in lubricants – physically "shear" or break apart. A third difficulty is dealing with water. Higher pressure tends to increase the chances of hydrolysis in the pump, leading to problems with corrosion and acidity.

Afton scientists experimented with chemical solutions to all three problems and then worked with pump makers for field testing. In one case, they coordinated with a French pump maker owned by Cleveland-based Parker-Hannifin Corporation, a leading control-and-motion technology firm. After a pump in France worked with the solution for 600 straight hours, Parker-Hannifin approved the new product. Macpherson says that HiTEC 5785 PMA can work with pump pressures that can range as high as 7,000 pounds per square inch. The new product is produced at an Afton facility in Port Arthur, Tex.

The new additive seems to be well-regarded in the industry. Robert Degennaro, a Houston-based consultant with years of experience in the lubricant industry, says that HiTEC 5785 PMA appears to represent a good step forward.

For years, Degennaro says, heavy equipment operators used common motor oil to lubricate hydraulic pumps. But companies became concerned that workers might mistakenly cross contaminate oils in the equipment, leading to costly repairs. Moreover, the oils broke down when higher performance pumps operating at higher temperatures and pressures were introduced.

"This [Afton] product may not be totally unique," he says, "but with the evolution of higher pressures in pumps, it's the best thing out there now. If anything,

more products like it will be needed because companies are bringing out more [pump] systems for even higher performance."

That's good news for Afton and Richmond. "Afton Chemical is a technology-driven company, and R&D spending and resources are closely tied to business growth," says Macpherson. "As this industry grows, and as our market share grows, we plan to proportionately increase the R&D investment in Richmond."

-- September 14, 2005

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