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LUBES'N'GREASES

A photograph of a row of fuel pumps at a gas station. The pumps are in the foreground, slightly out of focus, with a red car parked at one of them. The background shows more pumps and a blurred green area, possibly trees or a building.

**Engine Oils'
Exhausting
Dilemma**

**Rethinking
Hydraulic Fluid**

material gains

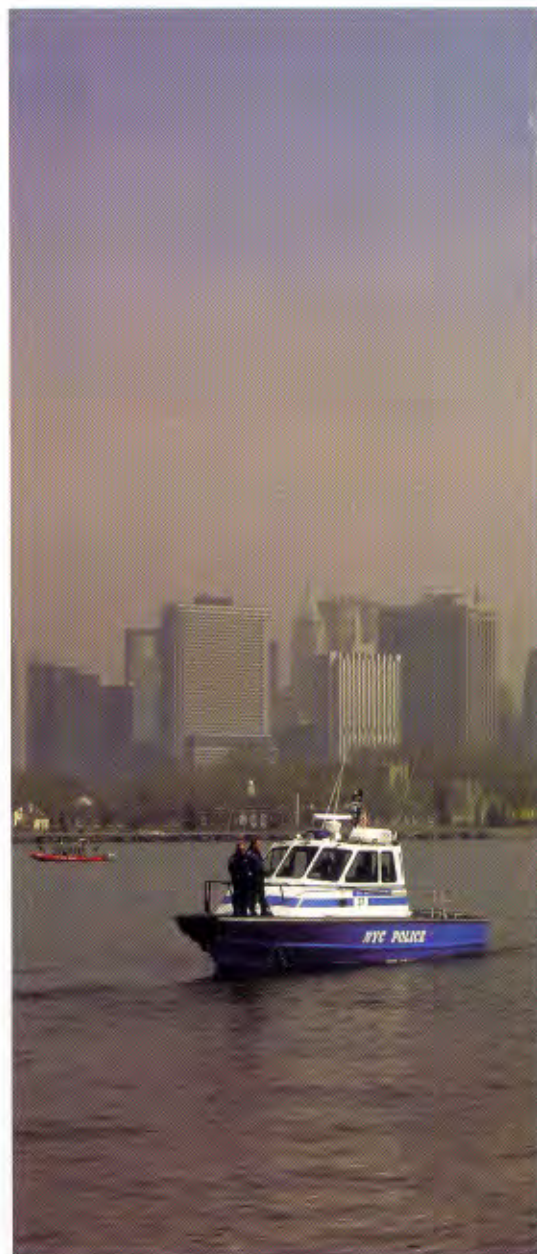
mANCHESTER, U.K. — M & I Materials Ltd. here more than doubled its throughput of a high-tech lubricant it manufactures for electrical transformers, due primarily to the addition of a bulk bag unloader and a flexible screw conveyor system. Capacity then took another leap when the company moved to a new plant that takes full advantage of the handling system's capabilities.

The specialty lubricant is a high-value transformer fluid based on polyol ester, a fire-resistant alternative to mineral oil based fluids that also is readily biodegradable and nontoxic.

Although expensive (polyol ester costs up to eight times the cost of conventional mineral oil, according to the Austrian transformer manufacturer VA Technologie) — the product has been embraced in locations where fire safety and long, reliable operation is a top concern. Among the users of this unique fluid are the Queen Mary II — the world's largest cruise ship — the venerable British Library, Euro Disney, Heathrow Airport, the U.K. Royal Navy's T45 destroyer, and passenger rail systems from Amtrak to the London Underground, Deutsche Bahn and Hong Kong Mass Transit. Trains through the Channel Tunnel use it, as do wind power plants and offshore oil rigs operated by BP and Shell.

Prior to the installation of the new equipment, throughput of this high-value fluid, sold as Midel 7131, averaged 17.6 tons to 22 tons per week. Current production is 52 tons per week.

This 200 percent gain in productivity, and attendant benefits of improved worker safety, product quality and higher profitability were the result of two installations and a plant relocation. M & I doubled the production of Midel lubricant with the first installation of Flexicon equipment at its former plant in Old Trafford, U.K., and effectively tripled throughput after the move to Manchester and specification of a larger process reactor.



CAPACITY TRIPLES
AS SYNTHETIC OIL
MAKER "BULKS UP"



Photo: Wikipedia/Erak048

M & I's polyol ester transformer oil is used where fire safety is paramount — including on the Queen Mary II, the world's largest cruise ship.

M & I Materials manufactures industrial oils, greases and powder metallurgy products. Midel 7131, a halogen-free synthetic ester based fluid introduced in 1978, is one of its best-known products. Demand for the lubricant is growing because of its efficiency as an insulator and its biodegradability and nontoxic composition, which suit it for use in environmentally sensitive applications and facilitate disposal.

Handwork a Hindrance Manufacturing the Midel lubricant involves blending raw material — monopentaerythritol ester, or “penta” — with various acids under heat and pressure in a reactor vessel. Raw material was shipped to M & I in 55-pound sacks that were stored on a mezzanine, manually selected, and moved 16.5 feet to one of two process reactors. There the bags were slit open by workers and gravity-fed through a hatch into a pre-mix batch tank that was already loaded with acids. Each batch required the addition of 495 lbs. of penta, or nine sacks. After loading a batch into one of two 1.1-ton capacity reactors, processing took nine hours.

This procedure had drawbacks. The use of 55-lb. sacks prevented M & I from achieving economies of scale which it might have gained by buying penta in bulk. Some product was lost during opening and loading of the raw material. Moisture contamination

BY DAVID BOGER

caused some of the penta to solidify into chunks, which affected discharge and could damage process equipment. Manual handling posed risk of injury to workers — and there were inhalation dangers, even though plant personnel had safety equipment and a vacuum was installed on the reactor to contain dust. The empty penta sacks, moreover, generated waste-disposal costs. As demand for the product grew, so did the need for a way to increase productivity and workplace safety.

Flexicon (Europe) Ltd., based in Herne, Kent, U.K., worked with M & I's engineers to design, install and bring online a bulk-bag discharge and conveyor system that doubled output in the Old Trafford plant to 35 tons per week. The system was engineered to handle 1.1-ton loads of penta shipped in bulk bags (also known as flexible intermediate bulk containers or FIBCs). M & I thus was able to replace 55-lb. sacks with more economical purchases of bulk bags, 20 at a time.



Pentaerythritol powder needed to make Midel 7131 polyol ester transformer fluid is pulled from the hopper to the discharge-transition adapter via a flexible, 20-ft.-long screw conveyor in this polyethylene tube. Next it is gravity-fed into the new 5.5-ton reactor at M & I's plant in Manchester, U.K.

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- A 7-cubic-foot hopper complete with mechanical agitators to provide an even flow of material into the throat of the conveyor.
- A 13-foot-long flexible screw conveyor with high performance polymer tube, powered by a 3-horsepower gear drive.
- A discharge-transition adapter that channels material into a pre-mix batch tank.
- And a control panel.

Loading begins with a forklift moving a bulk container of penta to the staging area. The bulk bag is attached at four corners to a hoist lifting cradle, and positioned in the bulk bag frame above the hopper via the integral motorized hoist and trolley. Through a door in the chute between the

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ANNOUNCING THE SECOND INTERNATIONAL CONFERENCE **LUBRICANTS RUSSIA 2006**

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frame and the hopper, a worker pulls the material-flow outlet on the underside of the bulk bag through an iris valve, which then closes to prevent spillage as the container's discharge ties are opened. (The iris valve is usually opened completely to permit full discharge of penta into the hopper. The valve can, however, be opened in varying degrees to regulate material flow.)

Once in the hopper, penta is gravity-fed to the conveyor, which carries it up at a 45-degree angle into the pre-mix batch tank. The system's load cells allow the penta to be accurately weighed as the material is discharged into the batch tank.



Close-up of the discharge-transition adapter that feeds bulk penta directly into M & I's reactor from the screw conveyor.

Bulking Up and Cutting Costs With the greater bulk-handling capacity of the Flexicon equipment, up to four 495-lb. batches could be blended with acids in the pre-mix batch tank, which increased production. M & I engineers also installed an acid-stripping tank next to the pre-mix batch tank. The acid-stripping tank removed excess acids from the batch by esterification. This was previously done in the reactors. The pre-mix batch tank and the acid-stripping tank were engineered with a shared heat-exchange system, which reduced process time to five hours from nine hours, and further increasing the amount of material that could be blended. Following esterification, the blend was transferred to one of the two reactors.

When M & I moved its plant to Manchester, the Flexicon Bulk Bag Discharge and Conveyor System came along. It required slight modification because the company's engineers settled on a single 5.5-ton reactor to make Midel 7131, in place of the 1.1-ton reactors at Old Trafford. This eliminated the need for a pre-mix batch tank, since it accepted process batches of 1,980 pounds.

The new reactor can process about 5 tons every 12 hours, or 52 tons per work week. To meet the material needs of the new reactor, Flexicon only had to increase the height of the bulk bag discharger frame to 20 feet (from its original 13 feet), and extend the conveyor 6.6 feet. ■

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