

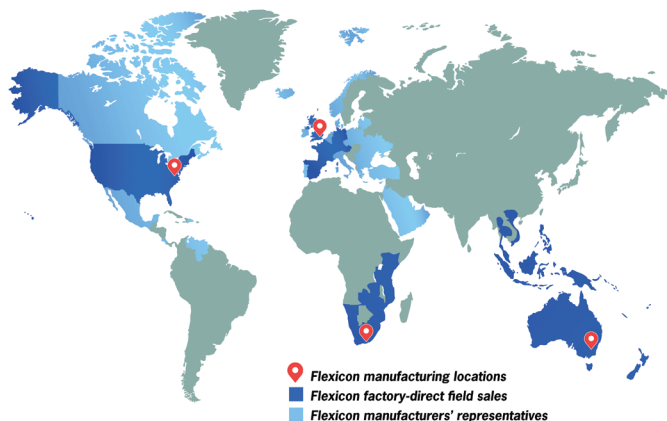
FLEXICON CASE STUDY



Chute between bulk container and 200 l (7 cu. ft.) hopper has access door so worker can pull material-flow outlet on underside of bulk bag through iris valve prior to discharge.

Lubricant producer triples capacity with bulk unloading/conveying system

T-0564



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Lubricant producer triples capacity with bulk unloading/conveying system

MANCHESTER, UK — M & I Materials Ltd. posted increases of up to 194% in throughput of a lubricant it manufactures for electrical transformers, due primarily to the addition of a bulk bag unloader and a flexible screw conveyor system from Flexicon Europe, Ltd., Herne, Kent, U.K.

Pre-installation throughput averaged 16 to 20 tonnes (35,264 to 44,080 lb.) per week of the lubricant, MIDEL 7131. Current production is 47 tonnes (103,588 lb.) per week. The 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.

M & I Materials manufactures industrial oils, greases, and powder metallurgy products. MIDEL 7131, a halogen-free synthetic ester-based fluid, 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.

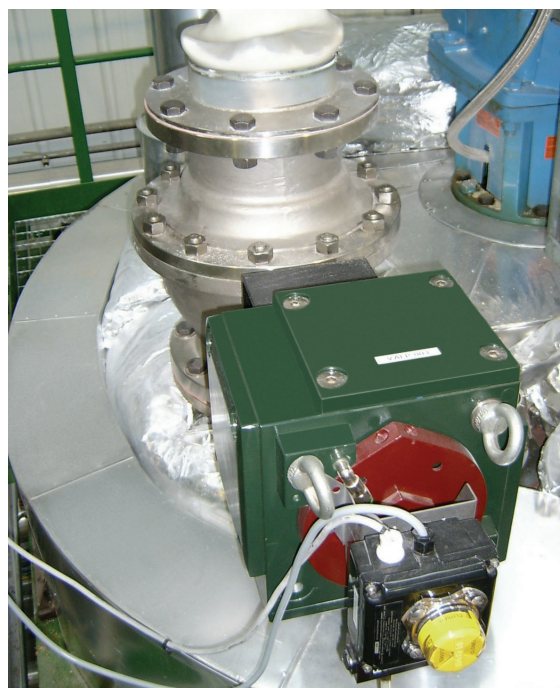
Manual handling of material affected throughput rate

Manufacturing the MIDEL lubricant involves blending raw material — monopentaerythritol ester, or “penta” — with various acids under heat and pressure in a reactor. Raw material was shipped to M & I in 25-kg. (55-lb.) sacks that were stored on a mezzanine, manually selected, and moved 5 meters (16.5 ft.) 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 225 kg. (495 lb.) of penta. After loading a batch into one of two 1-tonne-capacity (2204-lb.) reactors, processing took nine hours.

The process procedure had drawbacks. The use of 25-kg. sacks prevented M & I from achieving economies of scale by buying penta in bulk. Some product was lost during opening and loading of the raw material. Moisture contamination 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.



Flexible 6 m long (19.8 ft.) screw conveyor in polyethylene tube transports penta from hopper to the discharge-transition adapter, where it is gravity-fed into 5-tonne (11,020 lb.) reactor at M&I's Manchester UK plant.



Close up of discharge-transition adapter that feeds penta directly into reactor from the screw conveyor.

Flexicon (Europe) Ltd., worked with M & I engineers to design, install, and bring online a bulk-bag discharge and conveyor system that doubled output in the Old Trafford plant to 32 tonnes (70,528 lb.) per week. The system was engineered to handle 1-tonne loads of penta shipped in bulk bags (also known as flexible intermediate bulk containers or FIBCs). M & I was thus able to substitute 25-kg. sacks for more economical purchases of 20 bulk bags at a time.

The system consists of a 4-meter-high (13.2-ft.) bulk-bag frame equipped with motorized hoist and trolley, mounted on load cells for loss-in-weight metering accuracy; a 200-liter (7-cubic-ft.) hopper complete with mechanical agitators to provide an even flow of material into the throat of the conveyor; a 4-meter-long (13.2-ft.) flexible screw conveyor with high performance polymer tube, powered by a 2.2-kw. 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 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-deg. 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.

Bulk-handling system helped increase capacity, reduce cost

With the greater bulk-handling capacity of the Flexicon equipment, up to four 225-kg. (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 5 hours from 9 hours, 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 required slight modification because the company's engineers settled on a single 5-tonne (11,020-lb.) reactor in place of the 1-tonne reactors at Old Trafford. This eliminated the need for a pre-mix batch tank, since it accepted process batches of 900 kg. (1980 lb.) The new reactor can process 4.5 tonnes (9918 lb.) every 12 hours, or 47 tonnes 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 6 m. (19.8 ft.) from 4 m. and extend the conveyor 2 m. (6.6 ft.)



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