Edited by Elisabeth Eitel

The RIGHT TOUCH

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New components made of special polymers hold and dispense oil to lubricate sliding and rotating applications. These microporous materials can be cast, extruded, and even injection molded into a variety of application-specific shapes.

Lubrication reduces friction and fights corrosion on power-transmission components. However, keeping oil in critical areas is problematic. *Microporous polymeric lubricant* (MPL) components address some lubrication challenges. These solid forms are comprised of two major elements: a sponge-like polymer with a continuous microporous network, and oil contained within its pores. When an MPL component contacts another motion system component, oil migrates by capillary action to the MPL's surface, where it transfers onto mating areas for lubrication. As an example, MPLs can lubricate ball and roller bearings. (Dr. Heckler has detailed this in two articles. One was published in 2002, titled "*Lubed-for-life: using microporous polymeric lubricants*" in Machinery Lubrication, Vol. 2, No. 5, by Noria Publishing, p. 48 to 52. Another article describing this is his March 2004 *Bearings lubed-for-life* in Plant Engineering.) In these applications, the bearings are *filled* with the microporous polymeric lubricant. Because they do not require relubrication, maintenance costs are reduced. Another benefit: Since the microporous polymeric lubricant also acts as a sponge, it reabsorbs oil and prevents dripping. This improves housekeeping and plant safety.

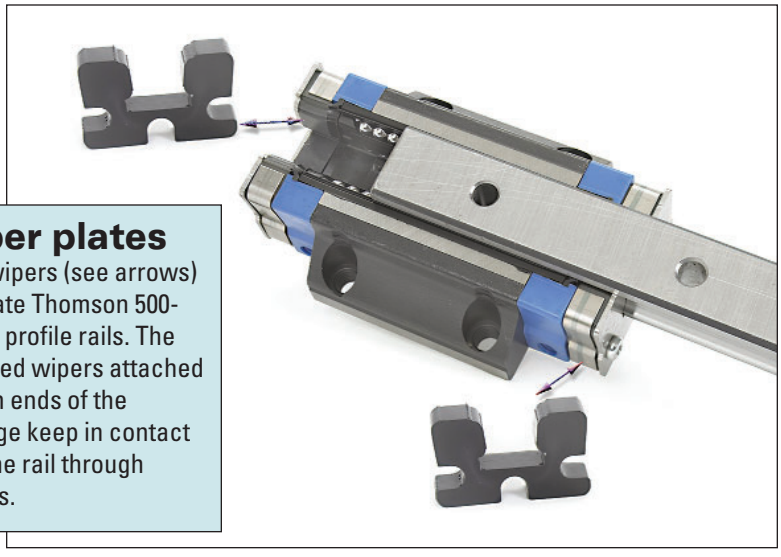
As mentioned, MPL systems can also be cast, injection molded, and extruded into solid profiles. Now we'll discuss these profiles and ways they lubricate machine parts for reduced friction, decreased maintenance costs, housekeeping elimination, and safety. We'll also discuss several applications and describe how microporous components improve their lubrication.

Linear bearings

The redesigned Thomson 500-Series profile rail by Danaher Motion (Radford, Va.) includes a permanent MPL lubrication system. Microporous wipers are extruded, attached at each carriage end, and kept in contact with the rail by springs. As the carriage moves along, they transfer a thin oil film to the rail, which transfers to the carriage's rolling elements. Thus, the MPL wipers eliminate expensive lubricating systems and the environmental pollution associated with conventional oil lubri-

Extruded profiles

Solid microporous polymeric lubricant profiles can be extruded, as shown here. Then the bars can be machined for specific applications. Alternatively, microporous polymeric lubricants can also be cast and injection molded.



Wiper plates

MPL wipers (see arrows) lubricate Thomson 500-Series profile rails. The extruded wipers attached to both ends of the carriage keep in contact with the rail through springs.

cation processes. The self-lubricating pieces also help bearings achieve their theoretical L10 lives. After about 30,000 km of travel, it *is* recommended that the self-lubricating wipers be replaced. However, this replacement is easily made onsite.

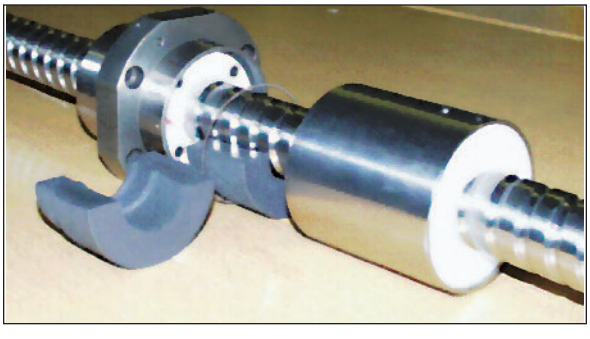
Ball screws

Danaher Motion also uses MPL components in their self-lubricating ballscrews. Extruded, round bars are machined into a lubrication element contained in the ball nut. It works like this: As the ball nut moves along the screw, oil transfers from the MPL element to the screw. Conventional ballscrews require oil replenishment every 800 to 1,000 hours, but this type performs well for over 10,000 hours of continuous operation. (It is recommended the element be replaced after 10,000 hours.)

Chain lubrication

Microporous polymeric lubricants also oil chains. Several applicator types exist. For example, one sprocket consists of a central hub with microporous polymeric lubricant cast around it to form sprocket teeth. This sprocket then acts as an idler, transferring oil from its microporous-polymeric-lubricant surface to the chain as they roll through mesh. In one actual application, a double #40-sized chain in a sheet-metal processing plant originally used a manual oil spraying lubrication system. This caused oil drip, requiring pans to collect excess oil. Because of the safety hazard this created, the pans had to be cleaned before the equipment could be serviced. Microp-

In a nutshell



MPL inserts are used on Danaher Motion's self-lubricating ball screws. Extruded, round bars are machined into a lubrication element contained in the ball nut.

Sprockets that oil

MPL sprockets can lubricate chains. One such sprocket is shown here; it consists of a central hub with microporous polymeric lubricant cast around it. The microporous sprocket acts as an idler sprocket and transfers oil from the MPL to the chain.

Divide and conquer

Larger lubricating sprockets can be manufactured out of microporous segments.

Lubrication sandwich

Another method used to lubricate chains is with microporous blocks. The blocks are extruded or machined to shape, and pressed against the chain by an applicator.

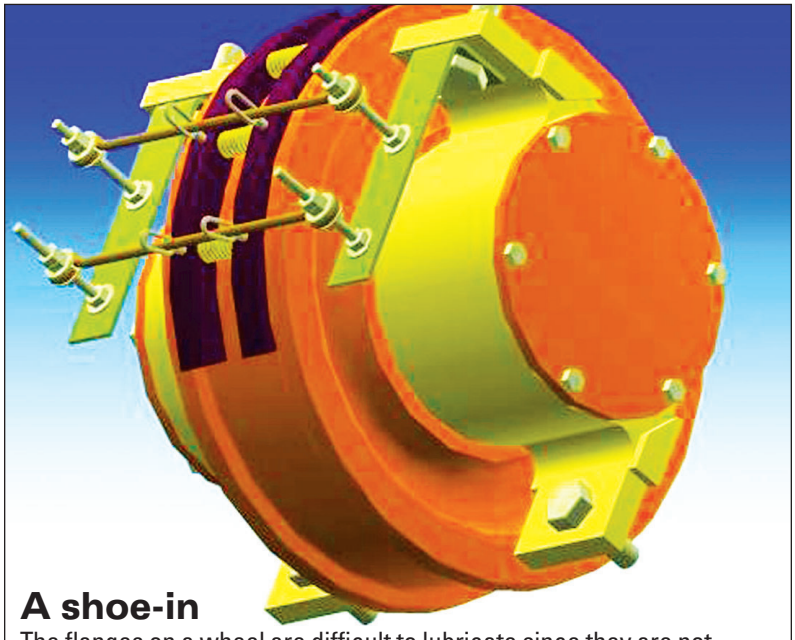
orous sprockets eliminate these safety hazards and increase chain life. Larger sprockets can also be manufactured by casting MPL segments; the difference is that these segments are held together using bolts to fasten them to a hub.

There's another method to lubricate chains with MPLs: using blocks of it. MPL blocks are extruded or machined to a desired shape and pressed against the chain by applicators. As the chain rubs against these microporous blocks, oil is transferred to the chain. For example, one particular furniture-manufacturing conveyor system that carries 8,000 to 16,000 lb. pallets and required monthly lubrication with molybdenum disulphide grease. Problems arose when excess grease dripped, staining the furniture lumber and creating safety hazards and housekeeping problems. Simple 1 x 2 x 18-in. MPL grooved blocks have been in operation for over six years without replacement and have eliminated the problems caused by dripping grease.

Slides and bushings

Slides and bushings are usually lubricated by injecting grease into holes or grooves; this requires significant maintenance time. An alternative is employing plugs made from extruded MPL rods. These provide adequate lubrication to slides and bushings, while greatly reducing maintenance. Plugs cut from rods are installed in drilled and tapped holes; oil from the MPL then spreads over the surface, providing a film of lubrication.

To illustrate, the lubrication holes and grooves in a forging machine's slide can clog, resulting in inadequate lubrication of slide surfaces. Then disassembly and rebuilding of the machine is required every several months. The installation of microporous plugs in these slides increases the dis-



A shoe-in
The flanges on a wheel are difficult to lubricate since they are not readily accessible, and missed during routine maintenance. Cast MPL blocks lubricate the flanges consistently.

assembly/rebuilding interval — even to a couple years.

Along the same lines, bronze bushings are sometimes employed on robotic automation machines and are lubricated using graphite plugs. However, graphite can be incompatible with coolant in these systems, and failure can occur prematurely — in other words, within the desired warranty period. Incorporating microporous plugs in place of graphite can help manufacturers meet warranty periods.

Crane wheels

Inadequate lubrication of overhead crane wheel flanges leads to excessive wear and premature failure of the wheels. Since they are not readily accessible, the flanges are difficult to lubricate and are frequently missed during routine maintenance. Cast MPL blocks can lubricate the flanges by employing specially designed applicators. Applicators keep the microporous blocks in contact with the flange; oil from the MPL then flows onto the flange for adequate lubrication. With such a system, the service life of crane wheels increases three to four-fold and cuts costs.

Shaft lubrication

Small, MPL parts can also be extruded and cut to length by spring loaded and pressed onto shafts. Oil from these MPL elements then coats the shaft, providing the required lubrication. These kinds of parts are still in the testing stage, but this example demonstrates that complicated parts can be manufactured from microporous polymeric lubricant pieces to solve specific lubrication issues.

Gear lubrication

Gears manufactured from microporous elements can be used to lubricate mating gears. An MPL gear transfers oil to the operating gears, thus providing lubrication. Where might this arrangement be useful? Gears in an overhead steelmill crane are not readily accessible and are therefore extremely difficult to lubricate. The gears fail and need replacement (in one particular case this was required every 35 to 40 days) due to inadequate lubrication. A gear made from MPL material and installed to contact an operating gear helps continue operation for years. **MSD**

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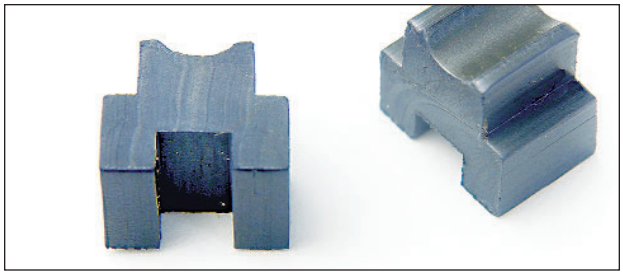
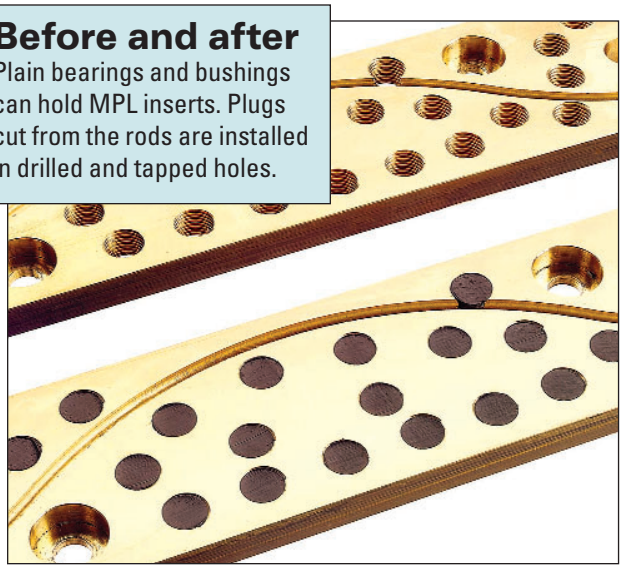
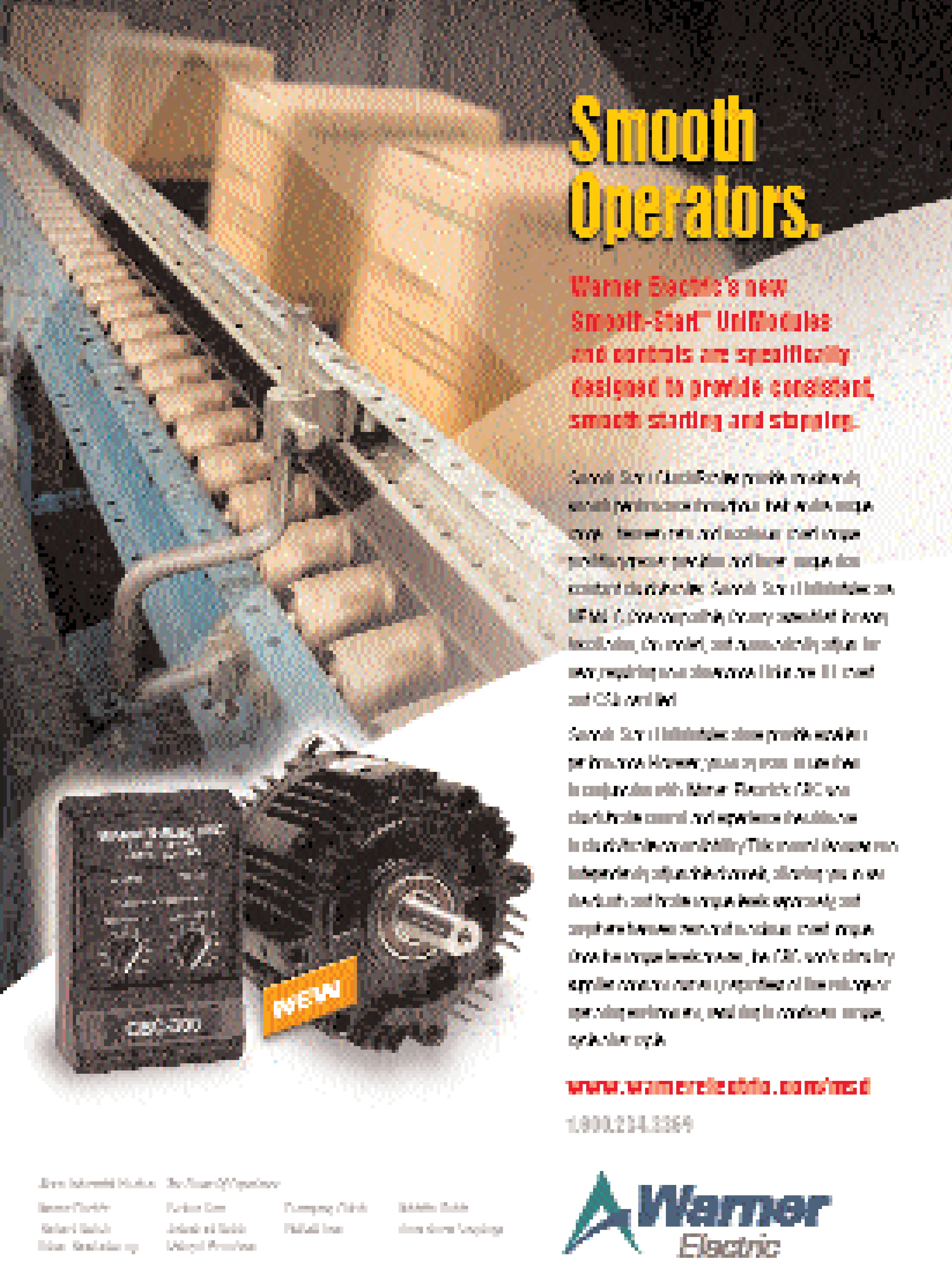
For lubricating shafts



The small part shown is extruded and cut to length. This part is then spring loaded and pressed onto the shaft.

Before and after
Plain bearings and bushings can hold MPL inserts. Plugs cut from the rods are installed in drilled and tapped holes.

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