



THE WORLD LEADER IN
FRACTIONAL HORSEPOWER MOTOR LUBRICATION

PERMAWICK



visit us on the web at <http://www.permawick.com>

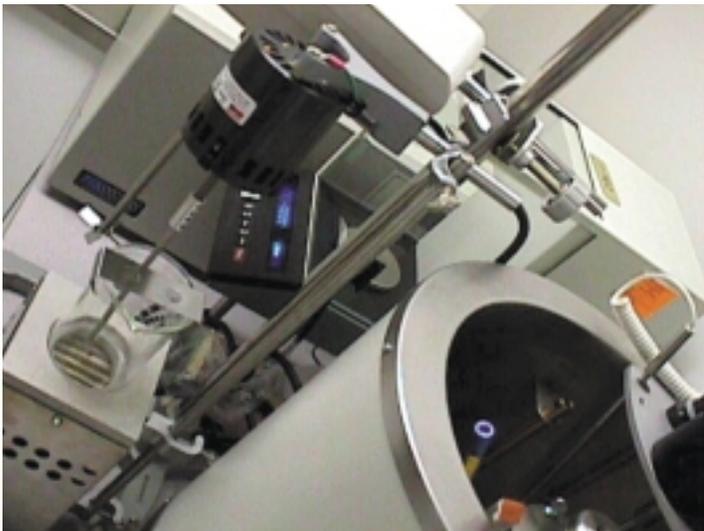
PERMAWICK BEARING LUBRICANTS

Formulated Oils for FHP Motor Bearings

- *Minerals*
- *Polyalphaolefins*
- *Esters*
- *Flourosilicones*

Impregnating Oils for Sintered Bearings

FHP electric motors typically use sintered metal bearings as an alternative to expensive and noisy roller bearings. Sintered bearings are porous metal, impregnated with oil to lubricate the shaft. An additional lubricant like Permawick or PermaGel is typically placed in a cavity around the bearing to provide added oil storage for longer life.



Ideally, a rotating shaft operates hydrodynamically, suspended on an oil film to avoid metal-to-metal contact. In sintered bearings, film strength is not supported because of the porous nature of the bearing material. The shaft will experience a "mixed film" condition- partially hydrodynamic, partially metal-to-metal. This condition is often referred to as "boundary lubrication."

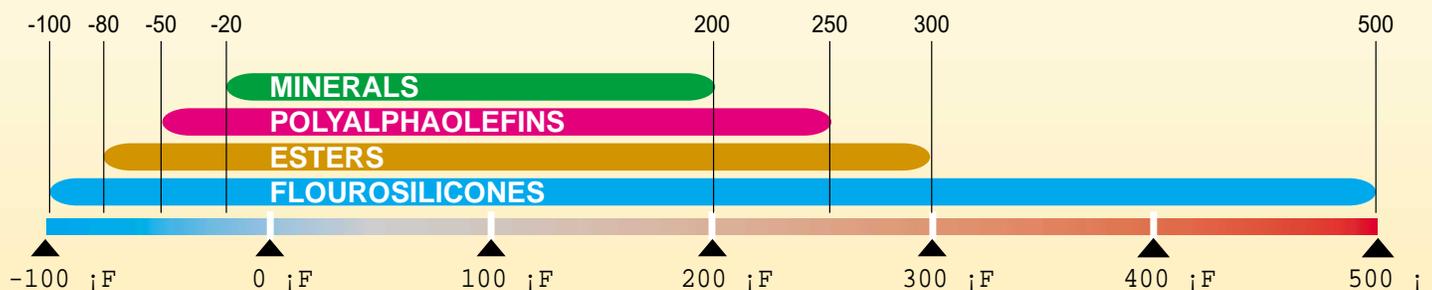
Lubricant selection is critical to ensure a long service life for the bearing. Bearing oils need to handle boundary lubrication conditions, as well as a variety of application conditions like load, speed, wear, oxidation, temperature extremes, frequent start-stops, torque, etc.



The Permawick Company maintains an extensive laboratory for the testing and development of bearing lubricants. Permawick oils are specially formulated for bearing lubrication, blended with polarizing agents to maximize bearing life in boundary film conditions. Our additive packages are engineered to perform in the demanding operating conditions common in sintered bearing applications.

Mineral and Synthetic Oils

Permawick offers a complete line of bearing oils. For economical performance, we blend a range of mineral oils, including hydrocracked base stocks. For high performance and long life, we have formulations that use synthetic base stocks - plastic compatible PAO's and Esters. If we don't have the oil you want, we would be happy to engineer custom oils for your requirements. Contact a Permawick Sales Engineer for assistance in selecting the right lubricant for your application.



PERMAWICK® WICKING MATERIAL

The Industry Standard For FHP Motor Lubrication

- **Increase Motor Life**
- **Increase Quality**
- **Reduce Cost**
- **Automate Production**

What is Permawick?

Permawick is a permanent wicking lubricant for sleeve or sintered bearings in Fractional Horsepower Electric Motors. Permawick is a blend of engineered fiber and formulated bearing oil that can be pressure injected into the bearing reservoir, contacting the bearing and efficiently metering oil through the bearing to the shaft. The Permawick oil delivery system is the industry standard for FHP motor lubrication.

- **Permawick costs less than felts.**
- **Permawick holds more oil than felts and gels.**
- **Permawick has a controlled release rate of oil.**

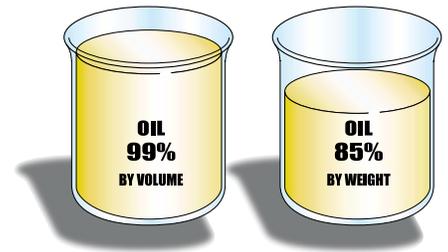
Permawick contains more oil and uses it more efficiently, greatly extending bearing service life for less money than the alternatives. Permawick is machine injectable and promotes design simplification and automated production. Permawick material is ideal for high performance recirculating bearing designs.

Why is Permawick Better?

The old way to lubricate motors employed messy, dry, die-cut felts soaked in oil. Solid felt wicks monopolize the bearing reservoir, leaving little room for oil. Felts tend to leak. Felt wicks inconsistently absorb and hold the oil, making it difficult to maintain tolerances for bearing lubrication. Felts act like sponges, absorbing humidity and are expensive and difficult to automate on the production floor.

Permawick fibers absorb and bond to the oil, forming a dense, oleophilic material. Permawick prefers oil to water and will resist humidity. Since the fibers absorb and trap oil, they take up no space in the bearing cavity. Permawick

is 85% oil by weight, but almost 100% oil by volume! It is almost impossible to pour more oil into a bearing cavity than the amount contained in Permawick.



Controlled Release Rate of Oil

The fiber to oil bond has another important benefit - a controlled release rate. Permawick is manufactured with an engineered fiber package to control the flow of oil to the bearing. The release rate is set to be slightly weaker than the capillary force exerted by the bearing. This allows the bearing to call for oil only as needed. The controlled release rate and increased oil storage capacity boost the life of Permawick lubricated motors 300% to 500% over felts and gels. Permawick also will re-absorb oil, allowing for very efficient use of stored oil through recirculation.

Permawick can be pressure injected into a bearing cavity and will hold its shape without movement or separation due to the strength of the fiber-oil bond. Using injection equipment manufactured by the Permawick Company, bearing assembly can be automated, saving labor. Permawick eliminates felts, sealers, and other component parts, so engineers can simplify their bearing designs, cutting costs.

How Do I Get Started?

Permawick engineers will guide you through the entire bearing development process: design, lubricant selection, sampling and testing, production equipment design, manufacture and service. We can save you time and money by optimizing your motors to use the Permawick Lubrication System. Our engineers have solved many design and production problems in motor bearing systems and would be glad to devote our years of experience to your project. Send us your endshield assemblies with prints, and we will fill them with Permawick and return them along with our design suggestions for your consideration at no charge. Check out our web site at <http://www.permawick.com> and contact your Permawick representative to get started!



“The fiber-oil bond in Permawick is the key to superior lubricant performance.”

PERMAWICK GELS

PermaGel Extends Bearing Performance

- **Longer Bearing Service Life**
- **Reduces Oil Leakage**
- **Simplifies Bearing Design**
- **Low per motor cost**

Supplemental Lubricant for Sintered Bearings

PermaGel is a plastic-like gel blended from Permawick FHP Motor Oils and thickening additives. PermaGel is deposited around the outer surface of sintered bearings and is absorbed into the bearing through capillary action and fed to the journal. The feed rate to the bearing is restricted, so oil leakage is reduced and bearing service life is improved. PermaGel provides an insurance policy



against dry or partially impregnated bearings at a low per motor cost. PermaGel does not require a bearing cavity or reservoir and does not leak or shift, so designers can eliminate parts and streamline assembly.

PermaGel adheres to the bearing wall and resists separation at elevated temperatures. PermaGel can be injected using inexpensive grease gun technology, so start-up costs are minimal.

Replace Expensive Ball Bearings

Using PermaGel, motor designers can eliminate ball bearings on the opposite shaft end in many applications. Opposite shaft end loads are typically 1/6 that of the loaded end. A sintered bearing with PermaGel in the opposite shaft end can greatly reduce cost and noise, while maintaining bearing performance.

PermaGel can simplify sintered bearing designs too. If re-circulation is not required, PermaGel is a good choice for many small shaft size applications. Simpler designs reduce cost and increase productivity. Many applications can compete more effectively by achieving far greater bearing service life for a low per motor cost, even without re-design.

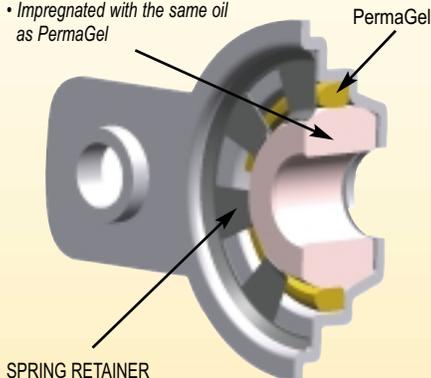
The Permawick Lubrication System

PermaGel

- Fewer parts required
- Reservoir downsizing saves material costs

SINTERED METAL BEARING

- Std. Porosity 18-22%
- Iron-Graphite or Bronze
- Impregnated with the same oil as PermaGel



- **SPRING RETAINER**
- Inject-through design
- Simultaneous injection and assembly
- No-back design

PERMAWICK

- Permawick injected above and below the spring
- Maximum amount of re-usable oil
- Enables oil recirculation

PERMAJECTOR NOZZLE TOOLING

- **OIL SLINGER**
- Light press-fit, rotates with shaft
- Recirculates oil through Permawick, back to bearing

- **COVER LIP**
- Helps recirculate oil in vertical shaft applications
- Helps hold Permawick fill in Cover

Permawick

- Replaces expensive ball bearings in opposite shaft ends.
- Replaces expensive ball bearings in loaded shaft ends for many 1/2" shaft or less motors.

STAMPED ENDSHIELD LIP

- Provides space for oil to puddle and recirculate
- O-ring optional

SPRING RETAINER

- Floating design reduces side-loads
- Inject-through design for easy assembly
- Odd numbered fingers eliminate radial location on assembly

SINTERED METAL BEARING

- Std. Porosity 18-22%
- Iron-Graphite or Bronze
- Impregnated with the same oil as Permawick

PERMAWICK MACHINES

Permawick Injection Equipment

- **Reduce Cost**
- **Increase Productivity**
- **Meet Quality Targets**
- **Control Shot Size**

Precise Metering of Permawick

The Permawick Company designs and manufactures a complete line of Permawick Injection Machines to meet your needs on the factory floor. With thousands of machines currently in service around the world, Permawick machines have earned their reputation for durability and dependability.



Permawick Injection Machines, called Permajectors, are self-contained, semi-automatic or fully automatic Permawick dispensers. Permajectors precisely meter a measured amount of Permawick into the bearing cavity and shape the fill to suit the bearing cavity. Permawick injection equipment can stand alone or be integrated into existing assembly lines.

Permajectors are available in several configurations, or can be custom built to suit customer requirements. The machines are shipped tooled for your parts, pre-tested and certified for production. The Permawick Company builds and tools our machines using state-of-the-art equipment to guarantee accuracy.

Permawick Engineering Support

Permawick engineers have years of experience solving bearing design problems. Put us to work for you. We will help you implement advanced designs using the Permawick Lubrication System, saving you time and money. To get started, simply send us a few unassembled motor ends and we will return them filled with Permawick or PermaGel, and our design suggestions. Contact your Permawick sales representative now and upgrade your motors to the Permawick Lubrication System.



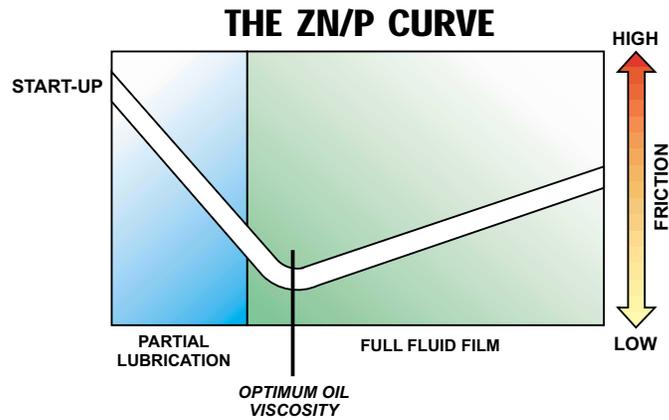
ST
*Heavy Duty,
semi-automatic
Permajector
capable of light
press-fit work
with inject*



MT
*Light Duty,
low cost
Permajector*

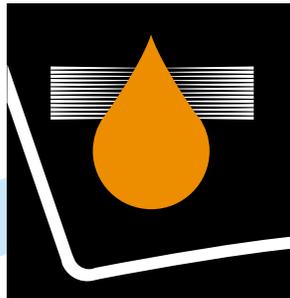


L1
*Heavy Duty,
automatic dial
index table.
Optional bowl
feeders for
faster cycle
times*



The ZN/P curve is the fundamental lubrication equation, illustrating the effects of the three variables - oil viscosity, load and speed on friction. It shows that at a given speed and load, viscosity lies at the optimum value, lubrication occurs under the conditions indicated near the bottom of the curve, where the coefficient of friction is the lowest. If the viscosity runs too high, you move upward on the curve, and friction increases. If the viscosity is too low, it becomes impossible to maintain a full fluid film and boundary lubrication occurs. Sintered bearings especially need products formulated for boundary lubrication, because they never reach full fluid film. Permawick engineers can help you select the right engineered product to put you at the optimum spot for your bearing lubrication needs.

***The Industry Standard
for Fractional Horsepower
Motor Lubrication***



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