

# PRODUCT DATA

## HI-TEMP® 2409

For many years, it has been recognized that commonly available lubricants are not entirely adequate for certain applications where temperatures frequently exceed 400°F. One particularly tough application is lubrication of slow-moving kiln car wheel bearings where temperatures at the bearing can be anywhere from 350°F to over 700°F, depending on the condition of the insulation between the firing zone and the wheel. A very severe feature of this type of application is that the kiln cars move very slowly through the kiln and may actually be in the kiln for as long as a week. This means that the wheel bearings cannot be re-lubricated until the cars complete their firing cycle. In addition, the kiln car wheel bearings are not readily accessible for lubrication.

Our research laboratories and field engineers, therefore, initiated an extensive research program to develop a lubricant to fulfill the requirements of kiln car wheel bearing applications, which calls for effective lubricity at elevated temperatures, and reduction of the need for frequent lubrication.

Our field work in connection with this program indicated that a great variety of lubricants were being used in this and other high temperature applications:

- Kerosene
- Light Petroleum Oils
- Heavy Petroleum Oils
- Synthetic Oil, Polyglycol
- Synthetic Oil, Phosphate Ester
- Powdered graphite mixed with the above liquids
- Conventional Petroleum Greases



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The performance of these materials varied tremendously from one location to another. As far as we could determine, performance was directly related to wheel bearing temperatures. In locations where wheel bearing temperatures were below 350°F, almost any type of lubrication was "apparently" adequate. However, it was indicated in every case that reduction in the necessity of frequent lubrication was needed. In addition, wheel maintenance, which includes replacement of failed bearings and cleaning of deposits, was very high, even at temperatures below 350°F.

In locations where wheel bearing temperatures were very high; i.e., 400° to 700°F, wheel maintenance was a major problem. Locations were found where wheel bearings occasionally "locked" and kiln cars twisted in the tunnel kiln and damaged the tunnel wall. In one location, the customer replaced \$30,000 worth of bearings every year.

Many plants use a mixture of graphite and kerosene as a high temperature lubricant. With such "homemade" lubricants, you can never be sure of the quantity of graphite applied. As this mixture moves through lines, graphite will drop out and deposit itself. In **Hi-Temp 2409** we have developed a product which overcomes this difficulty. Bearings lubricated with **Hi-Temp 2409** will get complete and safe high temperature lubrication, even when the point of application is far removed from the equipment being lubricated.

### **FUNDAMENTAL APPROACH**

After a study of the performance of currently-used kiln car lubricant, it was concluded that the best possible lubricant at the extremely high temperatures encountered in kiln car lubrication was a special form of finely milled graphite. In addition, it was concluded that a liquid vehicle must be used to carry the special graphite into the bearing surfaces. It was also concluded that a grease-like consistency would be most practical since it would eliminate the need, in many cases, for oil delivery piping which can clog very easily under high temperature conditions.

### **LABORATORY RESEARCH PROGRAM**

In the laboratory, we utilized equipment which had proven valuable in our study of high temperature oils some years ago. This work was augmented by other test methods normally used in high temperature lubricant evaluation. As we have indicated, we searched the field both in the literature and by plant visits to give us the background necessary to develop a successful product. Early in 1958, we went into field testing at selected installations with **Hi-Temp 2409**. The results of this testing showed **Hi-Temp 2409** to be an excellent, economical lubricant over a wide temperature range.

### **FIELD TESTING**

1. In a large steel mill operation, **Hi-Temp 2409** was used to lubricate wheel roller bearings on large annealing cars. Bearings on these cars are not accessible to direct greasing, so 3/8" lines are utilized to carry lubricant. One of the problems in the past had been the blocking of these lines by oxidized greases. **Hi-Temp 2409** gave no evidence of blocking while providing good lubrication for monthly intervals. A rather interesting test was carried on at this plant. A piece of 3/8" pipe was filled with **Hi-Temp 2409** and capped, then wired to a car for one month. A 1/32" hole was drilled at one end. When this pipe section was removed and inspected, the interior was clear with no carbon build-up.
2. A manufacturer of flow meters utilizes cars for annealing glassware. This annealing is done at 1100°F, with no shielding at the wheels. Previous lubricants required daily application, with five men required at times to move cars. **Hi-Temp 2409** was placed in service and gave at least ten days service, with one man required to move cars. This plant utilized large fans to circulate air in their ovens. Previous greases gave poor results with extensive carbon formation. **Hi-Temp 2409** was applied to a cleaned fan bearing and now the lubrication cycle is at least two months. There is no evidence of sludge or carbon formation.

3. In a large brick plant, a competitive graphite high temperature lubricant gave good performance in kiln car bearings. However, this product plugged fittings and lines so that re-lubrication was not possible unless each car was jacked up and the blocking residue removed. Even high pressure air (1000 psi) could not clean the lines. **Hi-Temp 2409** was placed in service and gave good results with the roller bearings used. However, blockages did not occur in any portion of the system and re-lubrication was accomplished easily.

**TYPICAL PROPERTIES**

Penetration (worked at 77°F)	356
NLGI Grade	No. 1
Worked Penetration (10,000 Strokes at 77°F)	375
Flash Point	440°F
Oxidation Test - 100 hours at 210°F. (Norma-Hoffman Bomb Test)	No drop in pressure over time period indicated no reaction with U.S.P. oxygen and <b>Hi-Temp 2409</b> .
High Temperatures Bearing Test (24 hours at 350°F and 500°F)	Bearings run free with no deposits other than lubricating film of soft graphite
Thin Film Panel Test (24 hrs. at 350°F and 500°F)	Soft graphite films formed.
Low Temperature Pumpability (at - 35°F)	Handles easily in a hand operated grease gun.
Stability	Product is stable when kept in cool place. There is some slight bleeding to be expected at temperatures above 75°F.

**SHELL 4 BALL E. P. TEST RESULTS**

Mean Hertz Load	44.4
Weld Point	200 kg
Mean Specific Pressure at Incipient Seizure Point	426,000 psi

**DROPPING POINT**

We have not included a dropping point value on **Hi-Temp 2409** because this product does not behave as a grease at elevated temperatures. In the normal industrial grease, the lubricating value stems from the fluid or oil portion of the product. The soap serves to give the product body and fix the lubricant at point of application. In many high temperature installations, failures occur because the grease used remains a grease and does not flow into bearing clearances and surfaces.

**DROPPING POINT**

**Hi-Temp 2409** readily becomes a fluid at temperatures above 150°-200°F, and carries the graphite deep into close-fitting parts. Drillage can be a problem with greases possessing no dropping points or high dropping points when bearings are filled near capacity. This difficulty will not be experienced with **Hi-Temp 2409** since we will recommend the minimum quantity to be employed.

This "flowability" is a valuable property in applying **Hi-Temp 2409** through lines and piping. In every case, where piping was involved, **Hi-Temp 2409** demonstrated its ability to establish lubricating films at distances far removed from the point of application. Many competitive graphited products work well under high temperature-high load conditions. However, blocking and packing of the solid lubricant phase frequently occur requiring dismantling for cleaning. **Hi-Temp 2409** has been formulated to avoid this condition.

### **METHODS OF APPLYING HI-TEMP 2409**

**Hi-Temp 2409**, being a No. 1. grease, is readily dispensed with conventional equipment. It may be pumped, sprayed, or brushed. Companies doing small parts assembly of instruments, timers, and other precision equipment will be interested in the ease of handling **Hi-Temp 2409** for their applications. The high percentage of ultra-fine graphite in this product will require a minimum quantity to be used in many applications.

### **COMPOSITION**

**Hi-Temp 2409** is composed of very fine particle size graphite with a very clean burning synthetic fluid employed as a carrier. No petroleum, silicones, diesters, soaps, heavy metals, or solvents are utilized. Upon evaporation of the carrier (which occurs rapidly over 300°-400°F), soft graphite films are formed which lubricate at temperatures well over 1000°F. A rather convincing way of demonstrating this is to take a propane torch and a small quantity of **Hi-Temp 2409** in an aluminum or stainless steel measuring spoon. The **Hi-Temp 2409** may be taken up to a red heat and the residue will still have lubricating qualities. The residual lubricant is of such a nature that it will penetrate into the pores of metal and the excess will not pack or adhere to moving surfaces.

### **APPLICATION AND USES**

Every application for **Hi-Temp 2409** must be carefully studied. This is especially true with conveyor wheel applications employing closed bearings. **Hi-Temp 2409** yields soft films of graphite but considerable care must be exercised to prevent over-lubrication. The present condition of bearings is very important. If possible, a few test wheels should be pulled and opened for a closer look.

**USES**

The following is a brief list of high temperature applications which should be investigated for interest in **Hi-Temp 2409**.

Kiln Car Wheels	Soaking Pit Doors
Conveyors in Ovens	Tenter Frames
Coke Oven Door Latches	Pallet Wheels
Oven Damper Control Bearings	Dollies and Dogs of Hot Beds
Roller Chains	Stack Valves
Larry Car Journals	Ingot Buggy Tilt Bearings
Charging Cars	Bearings on Wire Drawing Machines
Furnace Table Bearings	Cement Mill Clinker Dryers
	Instruments, Timers, and Other
	Device Subjected to High
	Temperatures

**STORAGE/HANDLING/DISPOSABILITY**

No health or safety hazards exist when **Hi-Temp 2409** are stored, used and disposed of in accordance with instructions given on the Material Safety Data Sheet for this product.

**WARRANTY**

The information given here is considered to be correct and if offered for your consideration, investigation and verification. No warranties are expressed or implied since the use of our products is beyond our control. Statements concerning the use of Houghton products are not to be construed as recommending the infringement of any patent.

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