

Introduction

The Water Washout test, which conforms to ASTM test method D1264, is a method for measuring the ability of a grease to remain intact to a bearing when the sample is either submerged or sprayed with a water jet. The results obtained from the water washout test are applied to the selection process of grease in order to enhance the life of a machine by allowing outdoor machinery to require less frequent replacement and repair. Koehler Instrument Company's K19201 Digital Water Washout Tester finds the percentage of grease washed out from a ball bearing within an hour when under constant pressure from a water stream.

The Significance of the Water Washout Test and its Applications

The Water Washout Test measures the percent of grease removal within a specified period of time. The results obtained from the test are applied to the selection process of grease in order to enhance the life of a machine by allowing outdoor machinery to require less frequent replacement and repair. When bearings are exposed to water, mechanical failures occur at an increased rate through corrosion, oxidation, rust, or bearing failure. These mechanical failures can be partially avoided with water-resistant grease, which adheres better to surfaces and can prevent certain corrosion and rust.



Figure 1:
Machine
Featuring
No Weather
Damage.



Figure 1:
Machine
Featuring
Severe Weather
Damage.

Water-Resistance Grease' Effect on Machine Longevity

Water-resistance grease improves machine longevity by preventing water contamination, therefore causing the machine to require less frequent repairs. Greases which are more ideal for machinery are ones with high viscosity base oil which reduces the loss of volume when testing through the water washout method. Additionally the addition of polymer to a grease can drastically improve its performance in the water washout test. Within figure 1, four base greases are shown, along with two polymer versions of each grease, with the values of percent lost during a water washout test. The polymers lost less than half the amount of grease than the base, with the calcium sulfonate complex having the least amount of loss over all testing. The addition of polymers to grease can improve the performance, and prevent water damage to the grease.

Grease Type	Grease Consistency 60X (NGLI 2)	Base Oil Vis. @40°C (cSt)	Water Washout ASTM D1264 79°C % loss		
			Base	Polymer 1	Polymer 2
Simple Lithium Soap	274	320	12%	5%	5%
Lithium/Calcium Mixed Soap	276	320	10%	2%	2.10%
Lithium Complex	275	320	10%	4.40%	4.50%
Calcium Sulfonate Complex	278	320	6.80%	1.97%	2.10%

Figure 1: Water Washout Test Results on Base Grease and Polymers

Testing Procedure

- Remove and disassemble the bearing housing and bearing shaft from the instrument.
- Pack the test bearing with grease and assemble the test bearing housing.
- Insert the bearing shaft into the bearing assembly, make sure all screws are secure.
- Fill the water bath to the maximum water level with distilled water. Do not let the water level go below the minimum marking to avoid the heater burning out.
- Turn on the Water Washout Test and adjust the temperature controller until it is set to the desired temperature. Adjust the Flow Rate Control Knob to the desired speed.
- Flip the spray switch up to the Start Test position, this will begin the timer along with the motor.
- After the test is completed, place a container under the drain to remove the water. Allow all the water to drain out through the valve.

Data Analysis

The Koehler Instrument Company's K19201 Digital Water Washout Tester determine the water resistance of a lubricant through the ASTM D1264 and D4950 test methods. The ASTM D1264 test method is defined as the resistance of grease to water washout when a ball bearing is rotated at 600 ± 30 rpm with a jet of water at 38°C or 79°C is sprayed at a rate of 5 ± 0.5 mL/s, within 60 ± 1 min. The ASTM D4950 is a classification system for automotive service greases with the prefixes of L and G, denoting either a chassis grease (L), or intended for a service lubrication of wheel bearings (G). This categorization is further broken down into A,B, and C categories, which used to describe if the lubricant is for mild duty, moderate duty, or high duty. This classification system allows for simple classification, and when combined with the D1264 test method, allows the sample grease to be accurately labeled. The data and classifications allow for greases that are not easily contaminated by water to be selected for machinery. Figure 2 shows the importance of the test with the effects of water contamination in calcium sulfonate grease shown.

Figure 2: Grease with 0% water (left), 1% water (middle left), 10% water (middle right), and 50% water (right).



Conclusion

The Koehler Instrument Company's K19201 Digital Water Washout Tester features a user friendly, all inclusive system, allowing for easy testing of the water-resistance in greases. The machine allows for the ASTM D1264 and D4950 testing standards to be met through the use of an independent pump operation moving the water, and the circulation system allow a controlled jet of water, and a constant velocity of the ball bearing gear pump. The instrument provides accurate and useful results which can be applied to machine longevity and prevent substantial internal damage.

Koehler Instrument Company's K19201 Digital Water Washout Tester

The Koehler Instrument Company's K19201 Digital Water Washout Tester, manufactured by Koehler Instrument Company, Inc. uses ASTM testing specification in order to measure the amount of grease remaining intact on a sample when exposed to water. The instrument has a ball bearing which rotates at 600 rpm inside of a bearing/housing assembly with a water jet aimed at the bearing set to a specified flow rate and temperature. The water reservoir has a cartridge heater, thermoregulator, and thermometer port for accurate temperatures of 100°F and 175°F or 38°C and 79°C . Within the machine, the circulation system moves the carbon ball bearing gear pumps at a constant velocity, and allows for valves and flow meters to direct the water flow at the same time. The two-pulley system within the machine allows for the water to circulate while being heated in order to accurately test the temperature.

References

- "Operations and Instructions Manual - Koehler Instrument Company, Inc.". *Koehler Instrument Company, Inc.*, Accessed 4 March 2022.
- Gurt, A., & Khonsari, M. (2020). An Overview of Grease Water Resistance. *Lubricants* ASTM D1264-18, Standard Test Method for Determining the Water Washout Characteristics of Lubricating Greases, ASTM International, West Conshohocken, PA, 2018
- ASTM D4950-08, Standard Classification and Specification for Automotive Service Greases, ASTM International, West Conshohocken, PA, 2018
- B S Nagarkoti, Water Resistance Property of greases – An Outlook, GreaseTech India, Vol XIII No. 2, Oct- Dec, 2010.