This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.

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Standard Practice for Obtaining In-Service Samples of Lubricating Grease[1]

This standard is issued under the fixed designation D7718; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This practice covers the method to obtain a trendable in-service lubricating grease sample from the following configurations including motor-operated valves, gearboxes, pillow-block bearings, electric motors, exposed bearings, open gears, or failed grease-lubricated components.

1.2 In some cases, it may be necessary to take more than one sample from a piece of equipment to obtain more trendable results. Examples of this could be a large bearing that does not fully rotate, such as a slew bearing, or one in which sufficient mixing does not otherwise occur.

1.3 Samples taken in the above manner may need to be mixed to form a more homogeneous sample. This may also be true of other samples such as those taken from open face bearings.

1.4 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only. The exception to this is a standard English units thread for which there is no metric equivalent.

NOTE 1—The standard pipe thread referred to is the national pipe thread tapered thread.

1.5 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.6 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D217 Test Methods for Cone Penetration of Lubricating Grease

D4057 Practice for Manual Sampling of Petroleum and Petroleum Products

2.2 *ANSI/ASME Standard:*[3]

B1.20.1 Pipe Threads, General Purpose (Inch)

3. Terminology

3.1 *Definitions:*

3.1.1 *active grease-sampling device, n*—device designed to take an active sample of a lubricating grease from a bearing, gear, or drive shaft located in a grease-lubricated component.

3.1.2 *active sampling, v*—to use a sampling device to actively gather an in-service lubricating grease sample from a grease-lubricated component.

3.1.3 *actuate, v*—to hold the interior cylinder of the active grease-sampling device while pushing the exterior cylinder forward toward the grease-lubricated component that is being sampled allowing lubricating grease to fill the sampling device.

3.1.4 *extension rod, n*—tool used to extend the depth at which a sample is taken with an active grease-sampling device.

3.1.4.1 *Discussion*—The extension rod may also be used to remotely actuate an active grease-sampling device.

3.1.5 *in-service lubricating grease, n*—lubricating grease that has been applied as a lubricant to a gear, bearing, or drive screw for any period of time.

3.1.6 *lubricating grease, n*—semi-fluid to solid product of a dispersion of a thickener in a liquid lubricant.

3.1.6.1 *Discussion*—The dispersion of the thickener forms a two-phase system and immobilizes the liquid lubricant by

[1] This practice is under the jurisdiction of ASTM Committee D02 on Petroleum Products, Liquid Fuels, and Lubricants and is the direct responsibility of Subcommittee D02.96.04 on Guidelines for In-Services Lubricants Analysis.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, http://www.ansi.org.

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surface tension and other physical forces. Other ingredients are commonly included to impart special properties. D217

3.1.7 *passive grease-sampling device, n*—device designed to gather a sample from the equipment by being attached to the grease reservoir at the purge point.

3.1.7.1 *Discussion*—This device has also been designed to contain a lubricating grease sample that has been gathered with other methods.

3.1.8 *passive sampling, v*—to use a passive grease-sampling device to collect a purged sample of in-service lubricating grease from a purge path.

3.1.9 *trendable, adj*—sample of in-service lubricating grease used to trend the physical properties, wear levels, and contaminants in a grease-lubricated component.

4. Significance and Use

4.1 This practice is typically used to obtain in-service lubricating grease samples from machinery.

4.2 In this practice, a consistent and repeatable method is outlined for obtaining trendable samples from the following applications including motor-operated valves, gearboxes, pillow-block bearings, electric motors, exposed bearings, open gears, or failed grease-lubricated components. This allows for analysis and inspection of in-service lubricating grease that aids in predicting the life and condition of the grease-lubricated component. This information can be combined with other technologies such as infrared imaging, vibration analysis, and ultrasonic vibration analysis to predict when a machine may fail. The knowledge gained by the aforementioned analyses, in addition to the knowledge gained from the in-service lubricating grease analysis and inspection, may allow for more overall uptime by aiding in the prediction of grease-lubricated component failures as part of a predictive maintenance schedule. The prediction of a failing grease-lubricated component will also improve the level of safety of all who work around the component.

5. Apparatus

5.1 *Sample Containers*—Commercially available in many shapes, sizes, materials, and configurations. The appropriate sample container can only be selected once the operator knows the specific application for the sample being taken. The operator shall be sure that the material of the container will not interact with the material being sampled. The operator shall also ensure that the proper size container is selected so it can house enough material so all of the intended subsequent laboratory analysis and inspections can be run on the sample.

5.1.1 *Bottles (Plastic)*—Use a plastic crushproof bottle with a screw-on cap so the sample contained cannot leak out. All plastic containers shall be visually inspected for dust, dirt, and other contaminants that could affect subsequent analysis results. The plastic container shall also be made out of a nonplasticized plastic such as high-density polyethylene or ultra-high molecular-weight polyethylene.

5.1.2 *Bottles (Glass)*—Use a glass bottle with a screw-on cap so that the sample contained cannot leak out. One also has to take special care in dealing with a glass container because it can be quite fragile if dropped. All glass containers shall be visually inspected for dust, dirt, and other contaminants that could affect subsequent analysis results.

5.1.3 *Metal Cans*—A metal sample container may be used, but reactions can occur between the sample and the container. The most common reaction is oxidation (rusting) of the container. If a metal container is to be used, make sure that it will not react with the sample and will not easily oxidize (rust). An example of such a container would be a stainless steel container. All metal cans shall be visually inspected for dust, dirt, and other contaminants that could affect subsequent analysis results.

5.2 *Sampling Devices*—The sampling devices for each procedure are described in detail in each specific procedure. In general, all sampling devices shall be clean, dry, and free of any dirt, dust, or other contaminants that could affect the results of subsequent analysis.

6. Hazards

6.1 When sampling from any component, it is up to the staff of the facility to determine the safest possible way to obtain the sample.

6.2 Unless sampling from a purge path, a sampling device should not be put into or onto a grease-lubricated component while it is running. This could cause both the component and the sampling device to be damaged.

6.3 It is assumed that the person who is taking the sample is trained in all of the necessary safety precautions for working with the equipment.

6.4 It is important the person who is obtaining the samples follows all cleanliness guidelines outlined by the facility. The operator should wear any required personal protection equipment (PPE). In addition, the operator should also wear latex or nitrile gloves unless the current PPE requirements meet or exceed this requirement. Gloves worn should be clean at the time that the sample is taken.

7. General Sampling Procedures, Limitations, and Considerations

7.1 *Equipment Cleanliness*—The area around the access port of all components to be sampled shall first be cleansed of dust, dirt, and other contaminants. The sampling devices and containers shall also be clean, dry, and free of any dust, dirt, and other contaminants that can affect the results of any subsequent analysis performed on the sample.

7.2 *Homogeneity of Samples*—When sampling lubricating greases, it is important to keep in mind that the quality and trendability of the sample relies a great deal on the sampling location's proximity to the component. This is because lubricating grease does not freely flow and distribute wear particles, oxidation, and other tested parameters.

7.2.1 If the lubricating grease inside of a component is not observably homogenous, it is up to the operator to determine if it is of value to obtain one or multiple samples. If it is determined that it is of value to obtain different samples from the same component as a result of an observable physical difference in the sample, the operator shall collect the samples

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separately and ensure that they are identified by the sampling location and physical appearance characteristics that differentiate them.

7.3 *Sample-Mixing Systems*—If a sample is to be mixed before the testing of subsamples, it is important to keep this in mind when selecting a sample container.

7.4 *Sample Container Uniformity*—It is also important to keep in mind that sample container uniformity is important to the individual or laboratory responsible for performing analysis or inspections. It allows for the individual or laboratory responsible to streamline their processes, which allows them to lower their operating costs. For this reason, the operator should consult the responsible individual or laboratory for their suggestions on the sample container size, type, and material.

7.5 *Physical and Chemical Property Tests*—The tests to be run on the samples will dictate the amount of sample required and possibly the type of sample container. The amount of sample required can vary greatly for grease analysis. It is recommended that the operator contact the responsible individual or laboratory who will perform the tests to ensure that they send the required amount of sample.

7.6 *Operator Training*—In order to ensure that the sample integrity is upheld and that the sample is as trendable as possible the operator shall be trained on how to properly take the sample. This includes an in depth knowledge of the internal layout of the component, locations of desired sampling points, instruction on how to properly use the selected sampling devices, and how to properly clean the locations prior to sampling.

7.7 *General Sampling Procedure*—The following procedures should be followed regardless of which of the below methods are being used to obtain the sample.

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Sample Handling

7.8 *In-Service Lubricating Grease Samples*—The sample container or the grease-sampling device should always be capped or sealed to prevent contamination. If the in-service lubricating grease sample is being shipped to a laboratory, it should meet all of the hazardous materials requirements of the facility, the shipping company, and the laboratory. The sample container or grease-sampling device should be placed in an appropriate crushproof shipping tube. In the case of the grease-sampling device, a good example of this would be a centrifuge tube. There should only be one sample per crushproof container to prevent cross contamination during the shipping process.

7.9 *Sample Labeling*—The sample should be labeled as soon as it is taken. The label should be marked with water- and solvent-resistant ink or a hard pencil that can dent the label. Other pencils and inks may be dissolved off of the label. The label should include the following information: Practice D7718.

7.9.1 Sample date and time (the time at which the sampling device was removed from the machine).

7.9.2 Equipment description (facility number and equipment name or number).

7.9.3 Name of the person responsible for the sample (operator).

7.9.4 Name of baseline lubricating grease.

7.9.5 Sample point identification.

7.9.6 Run hours of the grease lubricated component at the time the sample is taken provided the component has a run-hours meter.

8. Procedure for Active Sampling of a Grease-Lubricated Component

8.1 *Using a Sampling Device:*

8.1.1 *Application*—Obtaining an in service sample from a motor-operated valve, gearbox, electric motor, or other body of lubricating grease by use of an active grease sampling device.

NOTE 2—When following this procedure, "electric motor" refers to any electric motor that has a drain plug or access port large enough to allow an active grease-sampling device into the lubricating grease reservoir and adjacent to the bearing.

NOTE 3—Various configurations and styles of active grease-sampling devices are possible and can be inserted into the grease reservoir. This specific procedure addresses a commercially available unit, the Grease Thief Type II,[4] which has been designed to optimize the process.

8.1.2 *Apparatus*—An active grease-sampling device attached to an extension rod is used to obtain a trendable in-service lubricating grease sample from a grease-lubricated component.

8.1.2.1 *Active Grease-Sampling Device*—Use a cylinder with a ⅛ in. national pipe thread at either end of a precision bore cylinder. There should be a pair of relief holes at one end of the cylinder to allow for purging of excess lubricating grease. Inside of the cylinder is a precision molded piston with a stinger probe the length of the cylinder minus the length of the piston. Also, the piston should have a handle that extends out the opposite end of the cylinder that allows the piston and probe assembly to be attached to an active grease-sampling device extension rod. The steps outlined in 8.2.3 cover the use of the device in Fig. 1 (ANSI/ASME B1.20.1).

8.1.2.2 *Extension Rod (Active Grease-Sampling Device)*—Use a thin, hollow cylinder approximately 457 mm (18 in.), or other length, containing a tee handle at one end, which the operator holds. The other end contains a female ⅛ in. national pipe thread. Inside the hollow cylinder is a smaller diameter, solid cylinder that is approximately 25 mm (1 in.) longer than the hollow rod. One end contains a tee handle that is controlled by the operator. The other end contains a socket that attaches to the rod of the active sampling device. The extension rod attached to the active grease-sampling device is depicted in Fig. 2.

8.1.3 *Procedure:*

8.1.3.1 Obtain a new clean active grease-sampling device and a clean extension rod.

[4] The Grease Thief, Type II is described in a patent application, International Application No.: PCT/US2009/031416. Interested parties are invited to submit information regarding the identification of an alternative(s) to this patented item to the ASTM International Headquarters. The sole source of the Grease Thief, Type II known to the committee is York Laboratories, 2101 Pennsylvania Ave., Suite 22, York, PA 17404. If you are aware of alternative suppliers, please provide this information to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee,[1] which you may attend.