

TEST BEFORE YOU LAUNCH

Nye's application testing services can provide you with data to help qualify your design for a successful mission. Life and compatibility testing using standard and custom test apparatus are a few of the ways Nye's engineers can assist in validating your design.





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NYE'S APPLICATION TESTING SERVICES FOR THE AEROSPACE INDUSTRY

Validating Your Design

Nye Lubricants is a recognized leader in innovative lubrication solutions, which are customized to our customer's applications. When selecting a lubricant for the Aerospace Industry, many factors such as material compatibility, operating conditions, and environmental conditions need to be considered.

The service provided by Nye does not end with providing a lubricant solution that is either custom or selected from our hundreds of existing formulations – it often begins here. A team of highly experienced test engineers in the Applications Development and Validation Testing Lab (ADVT) focus on developing a deeper understanding of lubricant applications and complex mechanical and electrical systems. Through Applied Tribology testing and targeted Component Testing/Simulation, the ADVT group provides a better understanding of how lubricants function in dynamic applications. This testing helps predict performance, wear, and lifetime more accurately so that we can supply you with the appropriate solution that best meets your requirements.

For many customers, actual application testing is often unfeasible as planning and executing simulated application tests in house are time consuming, costly and require experienced personnel and labs that may not be readily available. Nye's Application Engineers will work with you to design and build test equipment or tribological simulations to validate the lubricant for various mechanisms. We work with you on the initial design, prototyping, and final design to meet your specific needs. Through custom modification and a collaborative partnership, we can make sure you get exactly what is needed to ensure mission confidence for your application.

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FRICITION & WEAR

In Nye's Applied Science and Tribology Lab (ASTL), we have large variety of friction and wear test equipment to make sure that all your mission needs are met. Through the flexibility of the testing capabilities in the ASTL Lab, very complex tribological tests can be performed with a variety of metals, plastics and soft contacts. The knowledge and experience of Nye's Tribology and ADVT groups provides us with an expanded toolkit to simulate the contact mechanics of your applications and extend the mission life of your mechanism.



SRV Tribometer

The **SRV (Oscillating, Friction & Wear)** test rig can run custom tests with options that include: rotational and linear oscillatory motion, tests up to 2,000N load, 2,000RPM, and a maximum temperature of 180°C. Specimens include ball on disc, pin on disc, cylinder on disc, and custom geometries.

Mini Traction Machine (MTM)

The **Mini Traction Machine** measures friction in a mixture of rolling/sliding contacts to simulate applications, like rolling element bearings and gears. Unlike other tribological tests where speed is either measured as the amount of rotations during a period of time or the oscillatory frequency, the MTM allows for the speed element to be a combination of sliding and rolling speed to produce the entrainment speed. The MTM provides a very good testing method for scuffing and galling of metal surfaces by allowing for the ball and disc to be driven in different directions (contra-rotation). This produces a tribological test that can operate with high sliding/rolling speeds and low entrainment speed.



ENDURANCE & DURABILITY



ROF+ Bearing Tester

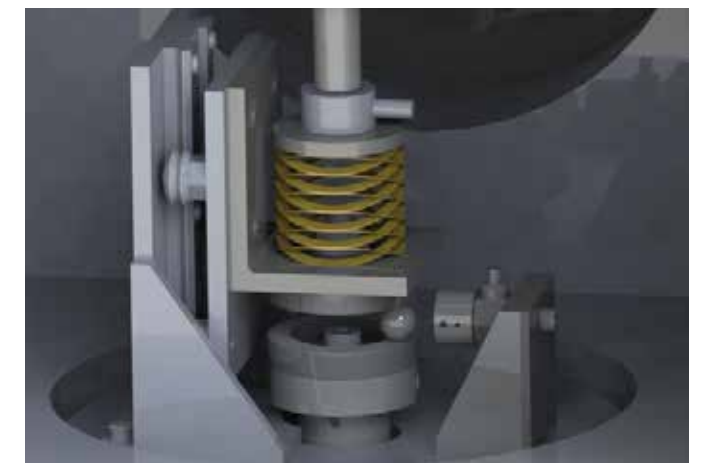
As lubricant life is critical to rolling element bearings, a tool is needed to evaluate lubricants for their efficacy. The **ROF+ Bearing Tester** uses a methodology to test the functionality and life of lubricating greases in rolling bearing applications at various conditions. The capabilities of the ROF+ allows Nye to test lubricating greases at speeds up to 25,000RPM (900,000dmN), temperatures up to 230°C, radial loads of 50-900N, and axial loads of 100-1,100N. The standard bearings are 6204 deep groove ball bearings or 7204 angular contact ball bearings, but other geometries including customer supplied can be utilized.

Through this testing, we will be able to estimate the grease life, temperature limits, and speed factor (dmN) for our products that are to be used in bearing applications.

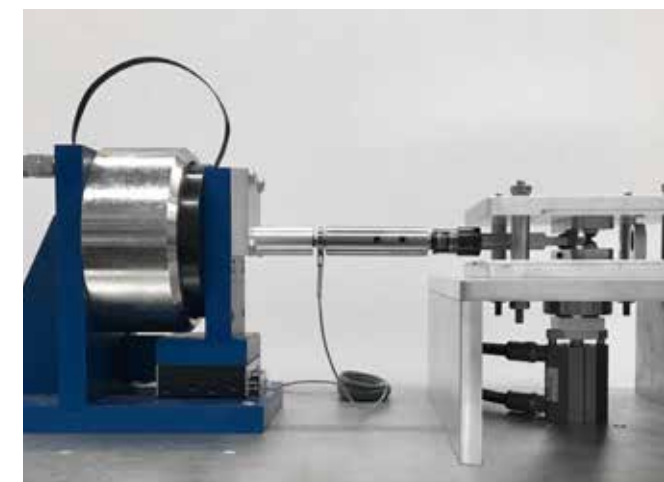
RELATIVE LIFE

Spiral Orbit Tribometer (SOT)

Combined with our capabilities in traditional Tribology and bearing testing, Nye has expanded into the Vacuum Tribology arena with the addition of a **Spiral Orbit Tribometer (SOT)**. This method of tribometry was developed at the NASA-Glenn Research Center. Using a SOT bridges the gap between the tribo-contact testing and the longer term (or accelerated) bearing tests. The SOT produces relative lifetime calculations based on the number of orbits made below a friction level which is normalized to the amount of lubricant on the ball bearing. The testing is a simulation of a thrust bearing and provides results that indicate the lubricant consumption, degradation, and life. As this test is done in ultra-high vacuum and the materials in contact can be customized, the SOT can provide a great deal of insight into the performance of mission critical lubricants.



VIBRATION



Fretting Test Rig

Fretting wear is the result of micromotion caused by vibration or thermal cycles. Wear and oxidation lead to increased friction, heat, degradation, and contact resistance, which will eventually lead to the failure of tribo-contacts. In Nye's modular fretting test rig or multi-terminal fretter, we can test a variety of components and geometries to ensure that the lubricant will outlast your mission life requirements. Standard geometries include cylinder on cylinder, ball on disc, and electrical terminals, but we can accept a wide variety of geometries and supplied components.

Using this methodology, we can validate the performance of a lubricant in a real world fretting environment. The durability of the system and life probabilities can then be determined to better understand the performance and life improvements made to the system. Life test specs are determined by the customer.

CLEANLINESS

With the ability to quantify cleanliness based on particle generation, you can now be confident that the lubricant you are using from Nye will not contaminate the clean environment with any more particles than it is rated for. With the additional Residual Gas Analysis (RGA), you will know exactly what is being produced into your environment.



Dynamic Particle Generator

The **Dynamic Particle Generator** is used to classify lubricant particle generation into ISO and Federal cleanliness levels for Aerospace, Cleanroom, and Semiconductor applications. It utilizes an ISO 3 clean air system, precision ball screw, and particle counter to characterize the number of particles down to 0.1 micron produced by various greases as the test is run. The ability to run RGA on the materials shed from the lubricant is also available. Test provides ISO and Federal cleanliness levels on your lubricant.

ASTM E595 Vacuum Stability

Nye outgassing testing (per **ASTM E595 Vacuum Stability**) is designed to screen materials for volatile contamination. This test provides percent TML (Total Mass Loss) and percent CVCM (Collected Volatile Condensable Materials) data for lubricants. We can modify the test to run at longer periods of time, different temperatures, and to collect the outgassing for Residual Gas Analysis (RGA).

Through this testing, you will get a better understanding of the stability of your materials in a static vacuum environment including what is coming off your material (custom). As well, you will learn how much of the outgassing is condensable to give an indication of the material suitability for sensitive mechanisms in a vacuum environment.



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