



## **RESEARCH & TRIBOLOGY STUDIES**

**SGS**

# TRIBOLOGY STUDIES

Tribology is defined as, "The science of the mechanisms of friction, lubrication, and wear of interacting surfaces that are in relative motion." A great deal of tribological research is being conducted throughout the world in universities and in private, government, and industrial laboratories. Virtually unheard of ten years ago, there have been thousands of Tribology papers published since 1990 and the knowledge is disseminated through many technical societies. The reliability of machines steadily improves because of this research.

SGS Herguth Laboratories and our research associates are committed to maintaining our edge in tribology. Wear, or the undesirable removal of material due to relative motion, is a large consumer of materials, and shortens the life and reduces the reliability of machines. Friction and wear cost the economies of the world billions of dollars per year.

SGS Herguth Labs provides Tribological services as follows:

## WEAR ANALYSIS

- Determine mechanism of wear and solutions by examination of worn parts
- Analysis of Lubricants

## WEAR PARTICLE ANALYSIS PERFORMANCE TESTS

- "Pin-on-Disk" by ASTM G-99
- 4-ball tests by ASTM D-1583, ASTM D-2283 and ASTM D-4172 measure friction and wear of metal/lubricant combinations under boundary lubrication conditions
- "Pad-on-Disk"
- Friction
- Electrical contact under hydrodynamic conditions
- Ball bearing torque measurements
- Fretting Corrosion tests for metal/lubricant combinations

## APPLIED RESEARCH PROJECTS

SGS Herguth Labs takes an active leadership role in applying research to many specialized projects. Called upon by oil company giants, our personnel pursue each case with innovation and initiation, always focused on the ultimate solution.

Tribology studies represent another strength of SGS Herguth Labs. Our applied research team provides failure analysis for clients throughout the world. On a local front, Folsom Dam asked a SGS Herguth Labs research associate for help after the seizure of a huge bearing on a flood gate caused the loss of thousands of acre-feet of water. We resolved the problem of what lubricant to use in their large bearing to prevent this from happening again.

At the opposing end of the size chart, yet with cost consequences of equivalent value, we were asked by Seagate to analyze pencil-eraser size bearings, looking for a lubricating grease to maximize service life.

## UNDERSTANDING LUBRICATION

There are three lubrication operation modes or 'regimes', which are:

- Hydrodynamic Lubrication (HDL) - HDL conditions exist when a gas or liquid film completely separates moving surfaces and there is no solid-to-solid contact. Example: automotive main bearings.
- ElastoHydrodynamic Lubrication (EHL) In the EHL regime, a complete oil film remains between two surfaces in elastic deformation. High localized pressures cause the oil to 'solidify.' Examples: ball or roller bearings.
- Boundary Lubrication (BL) - Under conditions of high loads or temperatures, low sliding velocities and rough sliding surfaces, BL conditions prevail. Example: screw threads.

Each of these lubrication regimes imposes unique requirements on the lubricant. Understanding the interaction of the metallurgy, the nature of machined surfaces, wear mechanisms and the

lubricant in use is critical to answering complex tribological problems industry faces every day! If the lubrication in your system is mineral or synthetic oil, solid or gas, SGS Herguth Labs can help you with your tribology needs.

## FAILURE ANALYSIS OF LUBRICATED COMPONENTS

SGS Herguth Labs has complete resources available for Optical or Scanning Electron Microscopy, Photomicrography, Chemical Testing and Analysis by ICP, FT-IR, SEM/EDX, XRD or AES.

## HIGH QUALITY REPORTS AND SPECIFIC RECOMMENDATIONS TO HELP YOU SOLVE YOUR TRIBOLOGY PROBLEMS.

Beyond the oil company projects and our tribological studies, SGS Herguth Labs research and development arm is often called upon to set test programs to determine lubricant and grease specifications, including amounts of additives and other variables that have an operational impact on equipment and machinery. Our applied research team can set up and implement procedures to meet your specific requirements and program goals.

SGS is the world's leading inspection, verification, testing and certification company. Recognized as the global benchmark for quality and integrity, we employ over 80 000 people and operate a network of more than 1 650 offices and laboratories around the world.

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