LaserNet Fines-C

Features

- Provides ISO Code 4406 (1999) for particles >4, >6 and >14 µm
- Algorithms to perform shape analysis, wear particle identification and machine condition assessment
- Large particles are classed by a neural network as "cutting, fatigue, severe sliding, nonmetallic, free water droplets or fibers"
- Provides image maps of all particles greater than 20 µm
- Can handle particle concentrations over 1,000,000 particles/ml
- Automatic adjustment for fluid darkness. Sees through black diesel lubricating oils
- Can handle fluid viscosities up to 150 ISO grade without dilution
- Built-in data-base for machine condition trending
- Data outputs include particle type identification, image maps, size trends and NAS, NAVAIR and ISO cleanliness codes
- Magnification is set at factory. Recalibration is never required

"The LaserNet Fines-C (LNF-C) uses laser imaging techniques and advanced image processing software to identify the type, rate of production, and severity of mechanical faults by measuring the size distribution, rate of progression, and shape features of wear debris in lubricating fluids."

Application

Machine condition monitoring based on oil analysis has become an accepted practice in any well run maintenance management program. With knowledge of the wear metals and contaminants present in a lubricating system, it may be determined if that equipment is operating properly or if preventive maintenance is required. LaserNet Fines combines the standard oil analysis techniques of particle counting and shape classification into a single analytical instrument. Lockheed Martin Tactical Defense Systems developed LaserNet Fines in cooperation with the Naval Research Laboratory for the Office of Naval Research on its Accelerated Capabilities Initiative for Condition-Based Maintenance.

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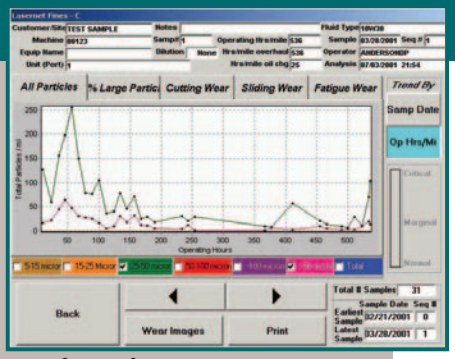
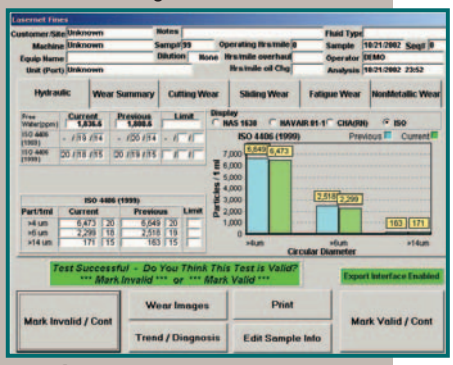
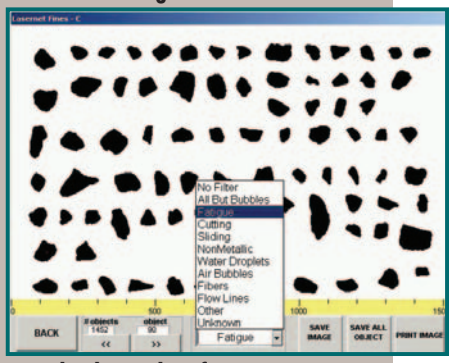
Industrial Tribology Systems



Particle Trending



Particle Counting



Particle Shape Classifying

Operation

The LaserNet Fines-C (LNF-C) is an automated microscope that captures the silhouette image of particles in oil flowing through a 100 μm thick flow cell. Using magnifying optics and a powerful pulsed laser, an image of the sample is captured by a video camera and stored in computer memory. The objects are then analyzed for maximum size and several shape characteristics which are used to classify particles into mechanical wear classes. Each laser pulse provides a single image frame to be analyzed, and the results of thousands of frames are combined for the analysis of each sample.

Particle Shape Classifier

Particle shape classification is performed with an artificial neural network that was developed specifically for the LNF system. Shape features were chosen to give optimal distinction between the assigned classes of cutting, fatigue, severe sliding, nonmetallic, free water droplets and fibers. The neural network was trained on an extensive library of particles that were classified by human experts using ferrography and microscopy.

Particle Counter

The LNF-C stores thousands of images to obtain good counting statistics. Although the actual shape of each particle is captured, the equivalent circular diameter of each particle, from 4 to >100 μm, is calculated to provide NAS, NAVAIR, and ISO cleanliness codes. The LNF-C accurately measures much higher particle concentrations than conventional particle counters because it views many particles simultaneously within an area of 1600 x 1200 μm rather than measuring the light blockage caused by one particle at a time. It is not necessary to recalibrate the LNF-C because, like a microscope, once the magnification is set at the factory, it remains fixed. NIST Standard Reference Material 2806 (Medium Test Dust in Hydraulic Fluid) is measured as a final QC procedure at the factory and may be used thereafter as a check fluid. Air bubbles (> 20 μm) are recognized and eliminated from the count and water droplets (> 20 μm) are recognized and quantified. The laser is powerful enough to process sooted (black) oils.

AUTOMATIC SAMPLE PROCESSOR (ASP)

An optional ASP is available that automatically runs 24 samples. Before processing each sample, a special stirrer re-suspends particles without introducing air bubbles. The stirrer and sipper are rinsed after each sample to prevent cross-contamination. Widely available and affordable kerosene is used as rinse fluid. The ASP can be added later without the need for any retrofitting.

Your local representative for sales and service is:

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