

In-Line Fluid Analysis Intellectual Property

Apparatus and Method for Fluid Analysis

Battelle No. 12220-E

Patent Nos. 6,561,010 & 6,810,718

This invention is an apparatus used for analyzing a fluid used in a machine or on an industrial process line. The apparatus has at least one meter (or sensor) placed near the machine or process line which is in contact with the machine or process fluid in order to measure at least one parameter related to the machine or fluid condition. The meters (or sensors) can be included in an X-ray fluorescence meter, a viscometer, element sensor, optical sensor, particulate sensor, or any possible combinations thereof. The results of this machine fluid analysis are made immediately available to remote observers of machine-related system health, whether the analyzed machine fluid is engine lubricant, hydraulic fluid, fuel, coolant fluid, or other similar fluid.

An Apparatus for Machine Fluid Analysis

Battelle No. 12092-B

Australian Patent No. 779,313

European Application No. 00978775.5 (EPC)/Pub. No. 1,232,388

The present invention is an apparatus for analyzing a machine fluid used in a machine. The apparatus has at least one meter or sensor placed proximate the machine and in contact with the machine fluid for measuring at least one parameter related to the machine fluid. At least one sensor or meter includes but is not limited to a viscometer, element sensor, optical sensor and particle sensor. The results of this analysis are immediately available to a remote observer, either human or machine. This invention can be used to determine the on-board real-time health of an engine.

Method and Apparatus to Predict the Remaining Service Life of an Operating System

Battelle No. 12241-E

Patent Pending. Application No 10/362,717

A method and apparatus for predicting the remaining service life, or planned maintenance schedule of an operating system is described. Diagnostic information on the degradation of the system is obtained through measurements of one or more performance characteristics by one or more sensors onboard and/or proximate the operating system. The operating system may be mechanical, electrical, biological, chemical or any combination thereof, and is not limited to systems with moving components or parts.

Sensor data can be validated to improve the accuracy and reliability of service life predictions. Sensor data is stored and trends are calculated to determine the degree of degradation of the system being monitored and to determine if sensor data is indicating an alarm condition. More than one trend line can be calculated based on different sensor data inputs to more accurately predict the remaining service life of the operating system and potential maintenance needs.

Diagnostics/Prognostics Using Wireless Links

Battelle No. 12898-B

Patent Nos. 6,662,091 & 6,941,202

A system and method for monitoring operating parameters of a machine (such as a vehicle) and producing diagnostic and/or prognostic results is described. Sensors are wirelessly linked and selectively interrogated. Sensor data is communicated to an onboard subsystem and/or relayed to a Service Solution Center where it is concentrated and analyzed to generate diagnostic and/or prognostic conclusions. Conclusions are then displayed to a vehicle operator or a remote monitoring location, either of which can respond to the conditions noted if outside normal operating parameters. Data communicated to a management center can provide troubleshooting information, make resource management decisions, and/or track problems in all or a subset of the machines being managed. Results can be stored for trend analysis to determine the remaining operating life of a machine or to schedule required maintenance based on the collected data.

Compact X-Ray Fluorescence Spectrometer and Method for Fluid Analysis

Battelle No. 13093-B

Patent No. 6,668,039

An X-ray fluorescence device and method are described for monitoring machine fluids. The device includes a source block containing an X-ray source, a substantially X-ray transparent fluid flow path through the source block and proximate the X-ray source, and an X-ray fluorescence detector. The fluid flow path can be located on the main flow line or on a diversion line that has been set up solely to sample diverted machine fluid for contaminants. In operation, source X-rays pass through a section of the flow path. The source X-rays interact with the fluid in the flow path to create a fluid fluorescence response. The detector receives the fluid fluorescence response and produces an output signal indicating the presence and amount of selected components in the fluid. This device can be used to monitor the status of machine fluids or other process control fluids.

Dual X-Ray Fluorescence Spectrometer and Method for Fluid Analysis

Battelle No. 13610-E

Patent No. 6,859,517

An X-ray fluorescence (XRF) spectrometer and method is described for on-site and inline determination of contaminant elements in lubricating oils and in fuel oils in an operating engine, e.g. on board a marine vessel. An XRF source block contains two radionuclide sources, each oriented 180 degrees from the other to excite separate targets. One radionuclide source excites sample lubricating oil flowing through a low molecular weight sample line. The other radionuclide source excites fuel oil manually presented to the source beam inside another container such as a low molecular weight vial. Two separate detectors are used to detect the fluorescent x-rays from each of the targets for contaminant analysis. The system allows both automated in-line and manual on-site analysis using one set of signal processing and multi-channel analyzer electronics as well as a computer and user interface.