

SmartMon-Oil™ Fluid Quality Sensors



*Provides early and/or instant
warning of serious fluid issues*

Impact Technologies has developed a real-time, in-line fluid sensing technology for assessing remaining useful life, contaminant loading, and overall quality of lubrication and other working fluids. This technology has been applied across a number of machinery platforms including engine lubrication systems, hydraulics, transmissions and gearboxes.

The Technology:

The SmartMon Fluid Quality Sensing technology uses multiple sensing mechanisms together with advanced signal processing techniques to determine the health of the fluid.

At the heart of the technology is a patented "Broadband AC Electrochemical Impedance Spectroscopy" technique in which a complex voltage signal is injected into the fluid at one electrode, and received by another electrode. The signal transmission characteristics at different frequencies give insight into key dielectric properties of the oil that relate to the oil's chemical and mechanical properties. This complex impedance data is a rich set of data, especially in comparison to the relatively simplistic 'single point' dielectric data obtained by typical conductivity or permittivity sensors. This data enables an informed and reliable assessment of fluid health and gives insight into what the actual cause of the fluid degradation is.

The sensor also directly measures fluid temperature and moisture content. These measurements are fused together with the electrochemical data to enable application-specific assessments of fluid quality, contamination and/or remaining useful life.

Features:

- The system mechanical form factor is typically customized to the application to address specific interfacing, size, power, thermal and other constraints.
- Embedded electronics and firmware creates the appropriate sensor interrogation signal, acquires and analyzes the data, and communicates to user's back-end data systems.
- On-board intelligence includes interpretation and analysis of the raw high frequency sensor signals to produce summary values for fluid health indicators that get pushed to the user.
- Communication protocols available include MODBUS® (industrial), CAN-bus (vehicular), and other standards. Various protocols can be accommodated easily through straightforward firmware updates.



SmartMon-Oil™
for Automotive and
Industrial Applications

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Benefits:

- The system allows the end user to optimize fluid maintenance – to maintain the fluid based on the fluid’s actual stress level rather than arbitrary calendar or simple usage based methods.
- The system provides early and/or instant warning of serious fluid issues such as incorrect fluid addition, fluid breakdown, and contamination from ingress, combustion products, or other sources.
- Fluid issues often cause mechanical issues – monitoring the fluid’s health can protect against substantial secondary damage.

Applicability:

Failure modes include:

(actual modes detected vary by application)

- Oil Quality / Remaining Useful Life
- Water contamination
- Additive depletion
- Soot level
- Fuel contamination
- Overall fluid level

Current applications – just a subset of the possibilities:

- Diesel/Automobile engines – lubrication systems
- Truck transmissions and clutches
- Airplane & helicopter gearboxes
- Machining center - lubricating fluid
- Hydraulic / fluid power systems
- Steam turbines - electrohydrodynamic control fluid
- Wind turbine gearboxes



SmartMon-Oil/GB™ – Variant
for Aerospace Gearbox
Fluid Monitoring