Transmission Dynamics®

Smart Oil Plug® Gearbox Monitoring

OVERVIEW

Gearbox health monitoring for rail applications has been restricted to out-of-service, unreliable measurement routines, and slow lab analysis. The Smart Oil Plug® represents a state-of-the-art technology that identifies early gearbox issues through predictive gearbox maintenance, reducing unnecessary downtime and costs associated with premature overhauls.

A retrofittable design allows the technology to be incorporated into almost any gearbox type, through direct replacement of the filler or drain plug. The device monitors the operating parameters of the gearbox, oil debris, and other components. A combination of analysis designed and automated by mechanical and vibration expertise, supported by intelligent pattern recognition and machine learning tools, generates datasets which are not available through alternative devices.

The Smart Oil Plug® communicates locally via low-power Bluetooth to a nearby gateway (RSRU), typically mounted to the train undercarriage and powered from the train power supply. Data is then transferred from the gateway to an online secure portal named GDN® (Global Data Network), where it can be viewed and manipulated remotely by the client. The gateway also incorporates accurate GPS location mapping, and WIFI connectivity.

Figure 1 — Smart Oil Plug® and RSRU

GENERAL SPECIFICATION

Size and thread	Matched to plug design
Battery Life	3 years (Replaceable)
Communication	Bluetooth license-free frequency range of 2.4 GHz
Operating Temp. Range	-40°C to 85°C

Onboard ferrous debris, temperature, and three-axis acceleration measurements allows for detection of features such as:

- Oil temperature
- Ferrous debris levels
- Gear tooth pitting and scuffing
- Gear tooth damage or loss
- Oil loss
- Wheel slides
- Track quality
- Cardan shaft failure
- Engine misfire
- Bent or eccentric shafts
- Bearing seizures
- Damper failure
- Wheel flats

Max values		Axle 3	Fleet average
Acceleration (peak)		68.2 g	41.24 g
Acceleration (RMS)		4.0 g	3.40 g
Oil debris		1.0	0.56
Temperature		49.3 °C	40.41 °C
TCF power		3.5 g²/Hz	1.42 g²/Hz
Wheel flats		No	

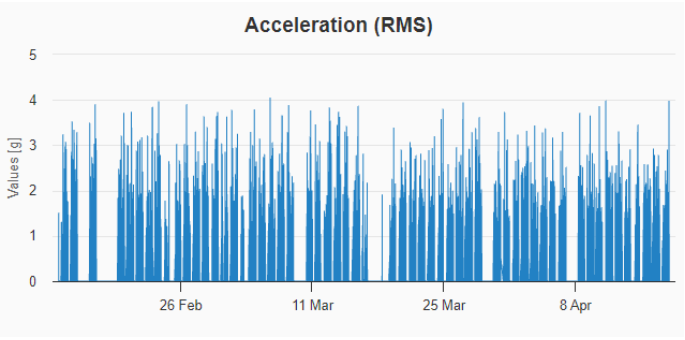

Figure 2 — Data obtained from SOP

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