



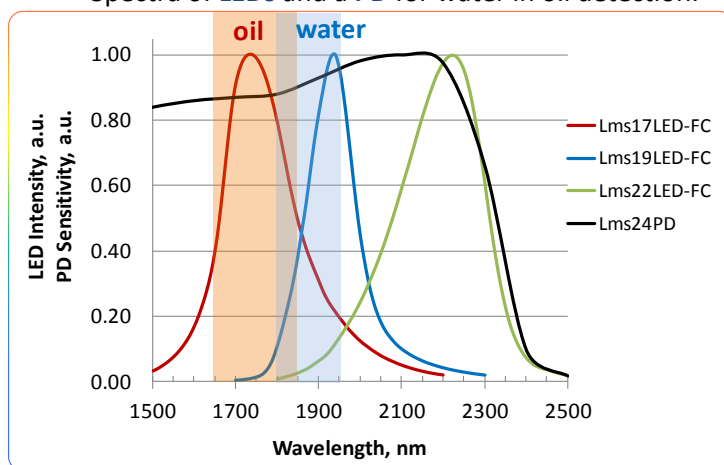
Water measurement in crude oil and petroleum products is an actual task for the petrochemical industry. The regular control of water concentration in oil well allows field operators to judge about the well performance and regulate the oil extraction process. In time water measurement in petroleum products helps to avoid costly breakdowns with loss of revenue. We offer our **mid-IR LED-Photodiode (PD) optopairs** for development of water meters based on the optical absorption principle.

Water in oil detection with mid-infrared LEDs and PDs

Water and oil have strong absorption bands in mid-infrared spectral range 1.6 – 2.4 μm : water has the main absorption band at **1800-1950 nm**, oil – at **1650-1850 nm**.

For the analysis of water-oil emulsions we recommend using three-channel optical scheme that can provide compensation of the ambient effects, as well as scattering at water-oil drops' interfaces: one LED – **Lms16LED** or **Lms17LED** – to determine oil absorption, second LED – **Lms19LED** – to determine water absorption and a third reference LED – **Lms22LED** – helps to consider non-water and non-oil influences on the emission propagation. **Lms24PD** series photodiode is optimal for detection signals from these three LEDs.

Spectra of **LEDs** and a **PD** for water in oil detection:



Using mid-infrared LED-PD based solutions provides certain **advantages** for this sort of application:

- **Low power consumption** (<1 mW)
- **Short response time** (10–50 ns)
- Possibility to achieve modulation **ranges** of up to **100 MHz**
- Operation temperatures up to +150°C
- Possibility to arrange a **compact design** of an optical cell thanks to compact size of the LED chip – **0.35 × 0.35 mm**
- No need of using additional optical filters – LED emission band width is comparable to absorption band widths of water and oil
- **Lifetime of 80 000 hours**



LED-PD based **evaluation systems** for **water measurement**

- **NEW LA-1t LED analyser** – a device oriented for the initial experiments with different liquid (and other) substances, enables defining the absorption properties of the analyzed sample in the spectral range 1.3 – 2.3 μm .

LLA's optical module includes:

- **8-element LED array** with peak emission wavelengths about 1.3, 1.4, 1.6, 1.7, 1.9, 2.1, 2.2 and 2.3 μm ;
- **Wideband photodiode** with a cut-off wavelength about 2.4 μm and 2 mm sensitive area diameter.
- **ZigBee/Bluetooth** wireless data transmission module for **fast data transfer** to a data **control center**
- Battery power supply for **autonomous operation**



LA-1t LED analyser