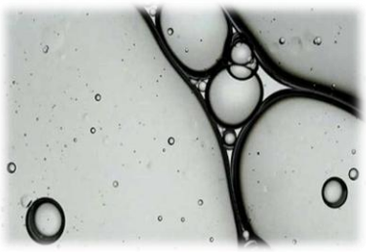
WATER-IN-OIL MEASUREMENT



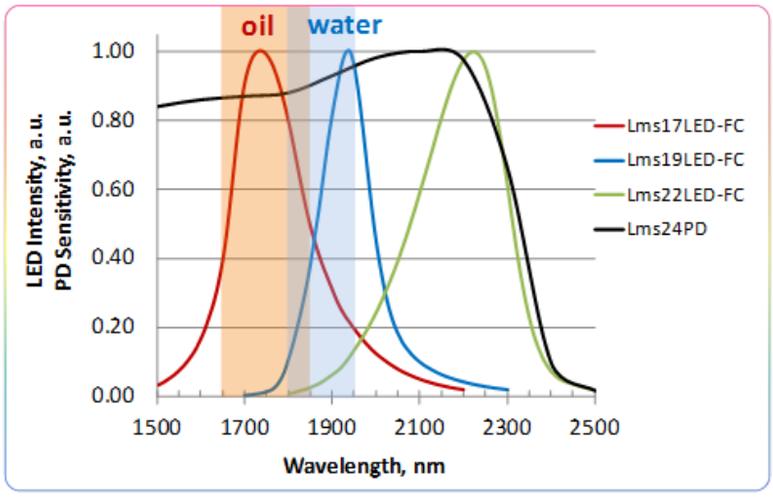
Water measurement in crude oil and **petroleum products** is an actual task for the petrochemical industry. The regular control of water concentration in oil well allows field operators to judge about the well performance and regulate the oil extraction process. In time water measurement in petroleum products helps to avoid costly breakdowns with loss of revenue. We offer our **mid-infrared 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:



Multi-element LED arrays with more than 3 LED chips, as well as PD arrays can be utilized for the development of more complicated, robust and precise sensors for water detection in oil and petrolium products.

New **Evaluation system** for the first experiments with water detection is under development and **cooming soon**.

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**