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HYDROPTICS

Photonics sensing platform for process optimisation in the oil industry



Concept/Vision/Approach

HYDROPTICS is an EU funded H2020 project. The core concept of HYDROPTICS is to **increase the competitiveness of the EU oil industry sector**, by providing a new approach toward process optimisation based on innovative photonic sensor technologies combined with simulation and optimisation of crucial unit operations through digital twins.



Solution

HYDROPTICS will develop and apply **advanced photonic components** as key enabling technologies for optimising most critical steps in oil production as well as to control downstream processing routines for final mineral oil product development. Advanced mid-IR laser sources and frequency combs will be employed for monitoring trace contaminants such as oil and corrosion inhibitors in process water. Ultrasound based particle manipulation will be combined with imaging technology in the vis-NIR range for particle sensing. Computational fluid dynamic simulations will provide detailed insight in crucial unit operations. Hydroptics will also elaborate how data provided by these advanced sensors can be combined with readily available process data and a **digital twin of the process apparatus** to gain in-depth process understanding. Digitalisation of process data, data fusion, **machine learning**, and **artificial intelligence** shall enable a new level of process optimisation yielding high and constant product quality despite fluctuating process conditions.

HYDROPTICS aims to:

- 1 Advance photonic sensor technology in the vis - IR range.
- 2 Develop a high-accuracy analyser for automated, on-line measurement of residual oil and particle content in process water of the oil industry.
- 3 Combining on-line data with process simulations for process optimisation.

Background / motivation / challenge

The EU is the **second largest producer of petroleum products in the world after the United States**, with a crude refining capacity of about 15 million barrels per day, representing 16% of total global capacity. Technology for oil production needs to be constantly refined and improved for competitive oil production in Europe as well as by European companies overseas. In both up- and downstream processing, water is of crucial importance. Often, it is the process water quality in terms of residual oil and particle load as well as other trace contaminants such as corrosion inhibitors, that has a decisive effect on the overall process efficiencies. Therefore, having a reliable, cost-effective, and high-accuracy monitoring of process water quality and ways to use this information for process optimisation is of utmost importance for the oil industry.