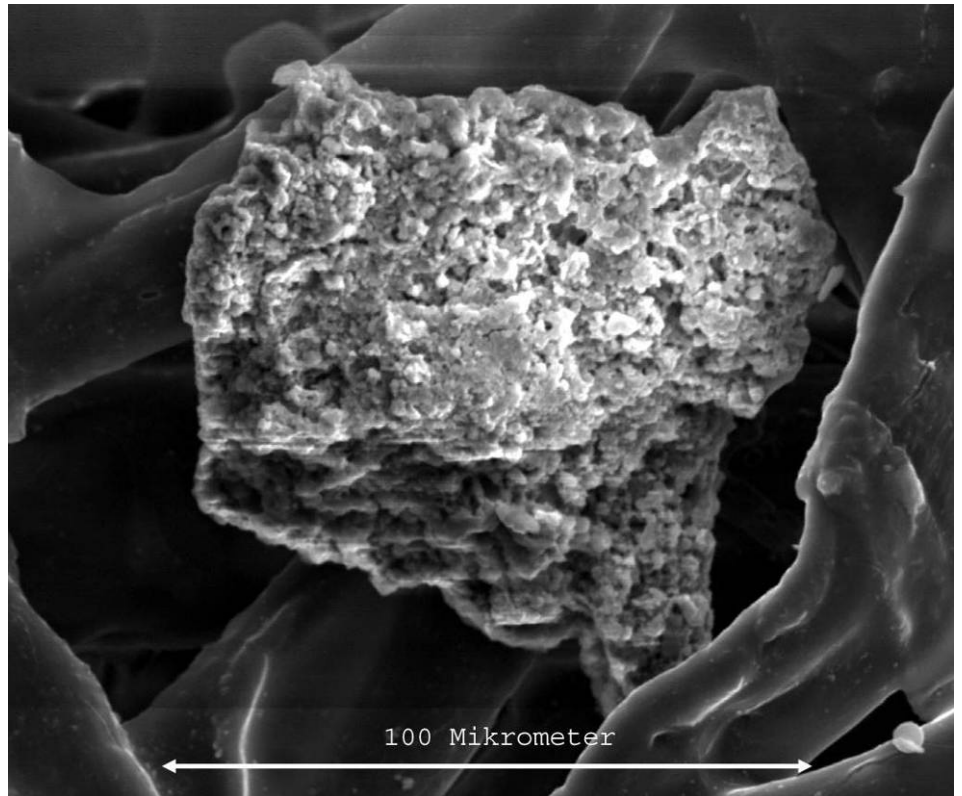


**"We don't study technical problems.
We solve them!"
UMTEC**

Removal of Sediment from Jet-Fuel



agglomerated sediment particle in sediment filter

Process Engineering

Background

The contamination of jet fuel with sediment is a problem of huge proportions. It has been observed that, as the number of producers who feed into pipeline-networks increases, the sediment content in the fuel also increases. This trend is aggravated by the fact that specifications for tolerable sediment contents are vague and few mobile devices for reliably measuring the true sediment content on delivery are currently available on the market.

Primary sediment particles typically are about 1-5 micron in size. These primary particles form larger secondary agglomerates of sizes between 50 and 500 micron. While the primary particles are not expected to cause direct problems in downstream processes the agglomerates form scales and may eventually clog up nozzles and ducts. Such agglomerates must be removed before fuel-injection into an engine.



State of the Art

State of the art at storage facilities is a multiple stage filtration of the fuel, for example once after reception of the fuel and again before delivery to the consumer. However, filtration is a rather expensive means of cleaning fuel. It may also be not very efficient. As the fuel is pumped through the filters at high pressure, the sediment is exposed to excessive shear forces in the fuel pumps. This may cause the agglomerates to re-disperse into the ultra-fine primary particles which either quickly clog up the filter or even pass through it. It may therefore happen that agglomerates re-form in a filtered fuel if given sufficient time to settle. On a global scale huge amounts of money are used for the purchase and maintenance of filters for removing sediment from jet fuel.

Objectives and Approach

The objective of this project is the reliable removal of sediment at significant lower cost than by conventional multiple stage filtration. In particular, a pre-filtration technology which significantly extends the maintenance intervals for the existing filtration units is to be developed. In our laboratories, we are investigating various methods that may be potentially suitable for the removal of sediment from fuel.

One approach is the use of centrifugal sedimentation devices such as hydrocyclones. The other line of research is an exploitation of the magnetic properties of the sediment. Since the sediment particles mainly consist of iron-oxides, they exhibit a pronounced magnetic susceptibility. We are currently testing a high gradient magnetic filter specifically designed for the removal of fine particles from fuel.

In addition to our somewhat empirical work we plan to develop a more thorough understanding of the processes

that influence agglomeration and dispersion of sediment in jet fuel. As our preliminary results suggest, water plays a major role in the sediment-agglomeration process. Obviously, surface phenomena in the ternary phase system consisting of sediment/water/fuel will also have great influence.

Status of our Activities

The "Institute of Environmental and Process Technology" (UMTEC) has carried out a preliminary project funded by the Swiss "Erdölvereinigung", an organization representing the Swiss oil-industry. The focus of this project was on technical solutions to the sediment removal issue, i.e. applied research and development.

Despite the very interesting findings we have produced so far, we believe that some fundamental research will be of great advantage. Some of the questions that still need to be addressed deal with the main parameters that influence the interactions of the sediment particles, i.e. the agglomeration and re-dispersion processes. These are, for example:

- settling time, centrifugal force
- shear forces
- water content
- sediment properties (surface charge/zeta potential, particle sizes, magnetic susceptibility...)
- surfactants in the fuel

Wanted: Partners and Sponsors

As the problem is global and relevant to most fuel producers, we feel that the issue of sediment in jet fuel should be tackled in the form of a joint project involving the industry as well as research partners from universities. We are now looking for partners and sponsors for such a project.



our hydrocyclone test-rig



our "Cyclosizer"