GeoDict
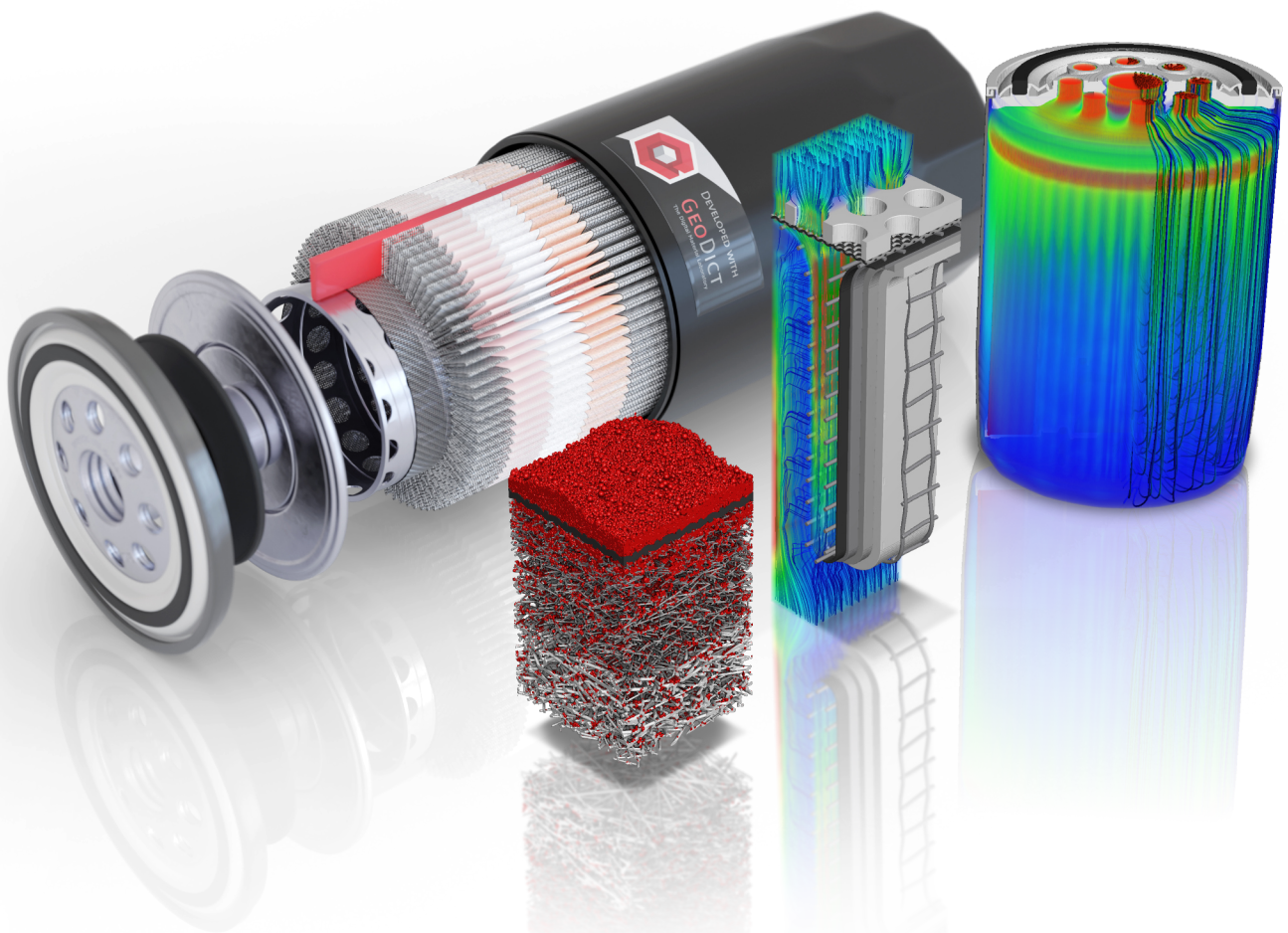
The Digital Material Laboratory

The Motivation

Simulations in the field of liquid filtration empower users to time-saving and cost-efficiently test different scenarios and conditions quickly and easily. They offer the possibility to model and understand complex processes and interactions to identify and solve problems at an early stage. Thus, liquid filtration systems can be tested for different designs and conditions to find the best solution for an application.

Our Solution

Simulations with GeoDict help manufacturers of filter media and filters to understand existing filter materials and to improve them in a targeted manner. This understanding not only leads to an efficient improvement of materials, but also to the development of completely new materials. GeoDict covers the entire product design and development.

Your Benefit

Computer simulations are used to develop new filter media and filter elements by selecting a few promising designs and reducing costly laboratory testing to these few designs. The development cycle can be significantly accelerated by parallelized parameter studies, resulting in faster and better products, and savings in time and costs.
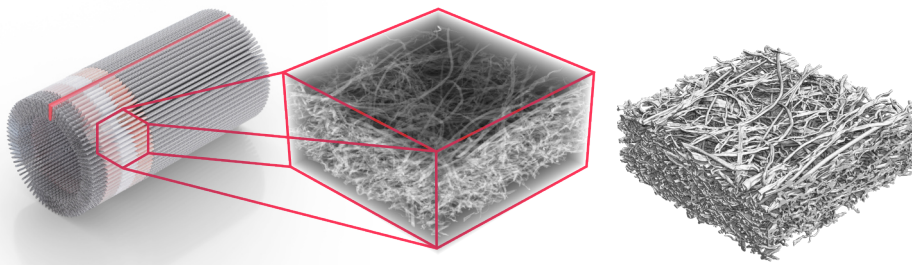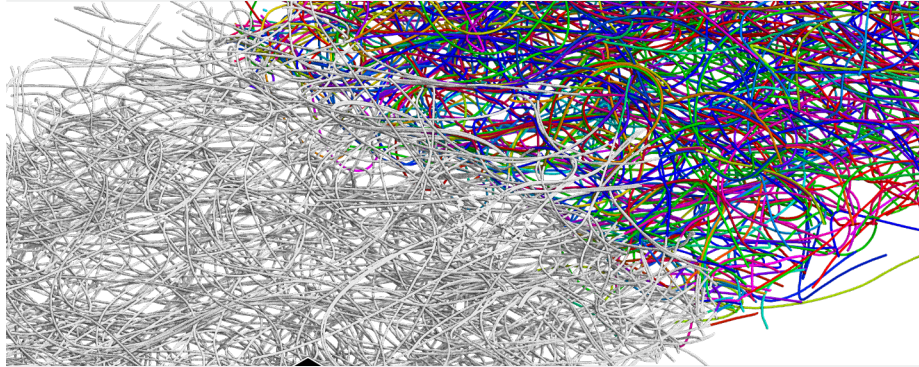
µCT scan of an oil filter medium

Digitalization

Import a µCT scan of the filter material or a CAD model of the filter. Image filters and AI tools help segmenting and preparing a realistic 3D microstructure of the medium.

Material Analysis

Analyze the fibrous media by identifying each individual fiber through AI and get information on basis weight distribution and fiber diameters, orientation, curvature, etc. Analyze the pore space to obtain pore size distribution, information on pore throats, etc.

Nonwovens

Wovens

Foams

Multiscale approach

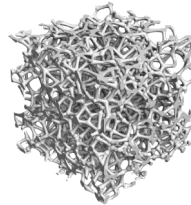**Nano-/Microscale** > **Mesoscale** > **Macroscale**

Multiscale Design

Generate three-dimensional models of filter media, filter elements, and whole filters with housing. Use data from analysis to create statistical digital twins of the original imported structure.

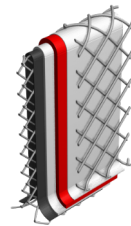**Characterize clean filter media:**
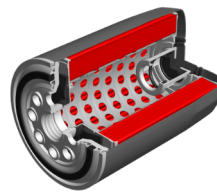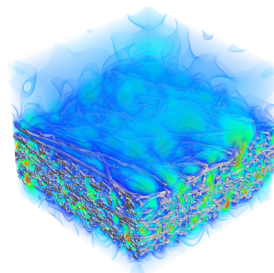
- Determine the initial pressure drop.
- Evaluate pore size distribution and bubble point.
- Find percolation paths through the medium.
- Analyze CT scans to find media thickness, fiber diameter, and fiber orientation, etc.

Analyze filter performance:

- Simulate single-pass and multi-pass tests.
- Find the most penetrating particle size.
- Determine the initial filter efficiency and filter class.
- Simulate diesel soot and standard test aerosols/particles.
- Evaluate the pressure drop evolution, (fractional) efficiencies, and filter capacity.
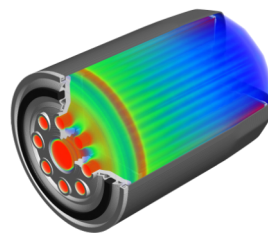
Property Prediction

Determination of the filtration characteristics of filter media, filter elements, and filters with housing.

MATH 2 MARKET