Fraunhofer UMSICHT

Data-based process optimization in the mobile treatment of PFAS-contaminated water (Perfluor.Dat®)

Innovation competition "GreenEconomy.IN.NRW"

With the PerfluorAd® treatment technology, Fraunhofer UMSICHT and Cornelsen Umwelttechnologie GmbH have developed a market-ready process that removes PFAS from aqueous media economically and effectively.

Per- and polyfluoroalkyl substances (PFAS) pose risks to humans and the environment due to their high stability and ubiquitous distribution. The current NRW project "Perfluor.Dat®" is pursuing comprehensive data-based process optimization of the PerfluorAd® treatment technology in order to meet also the requirements of international markets.

Several cleaning methods for removing **per- and polyfluoroalkyl substances (PFAS)** from water have already become widely established, such as adsorption on activated carbon, ion exchange or membrane processes.

PFAS treatment via coagulants

Fraunhofer Institute for Environmental, Safety and Energy Technology UMSICHT, in collaboration with Cornelsen Umwelttechnologie GmbH, has developed a new method for PFAS elimination called the **PerfluorAd®** process. This patented technology allows for the cost-effective separation of nearly all anionic PFAS from water and wastewater by combining a **specific precipitation** process with conventional treatment methods.

Upgrading PerfluorAd®

The market launch of the PerfluorAd® method has already been successfully implemented in Germany, the UK, BENELUX, Scandinavia and the US.

The Perfluor.Dat® project aims to technically optimize the PerfluorAd® process for widespread application on different PFAS-contaminated aqueous media in accordance with national regulations.

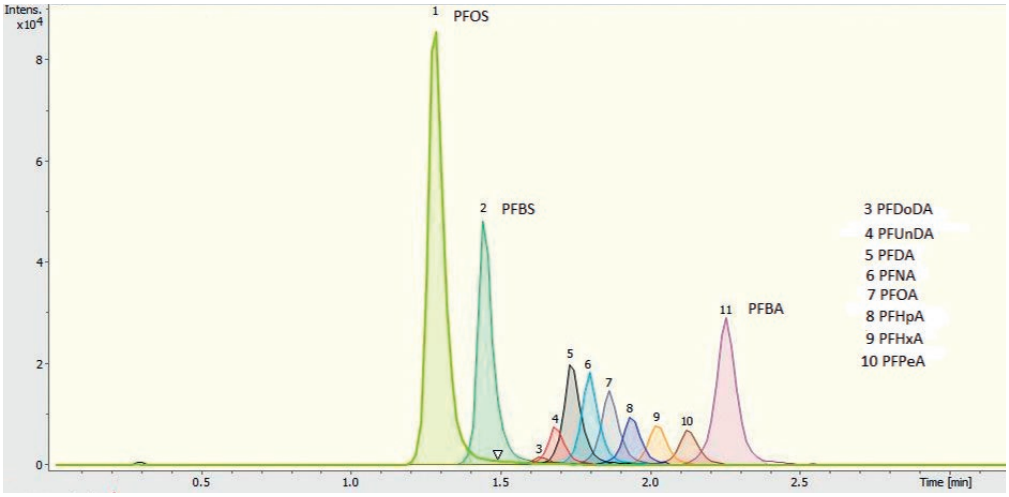
This involves optimizing the central precipitation reaction through the addition of co-additives and improving the process by introducing suitable on-site analytics within an adequate data management system for flexible and efficient use.

Keywords

- PFAS treatment for Water and Wastewater
- PerfluorAd® Technology
- chemistry (coagulation)
- analytics (PFAS/additives/process)
- measurement data processing (multiple linear regression/principal component analysis and regression)

PFAS-contaminated water

- aqueous media from AFFF container maintenance, containers, sprinklers, and equipment cleaning
- industrial wastewater
- reverse osmosis/nanofiltration concentrates
- landfill leachate
- groundwater
- soil washing



The elimination rates of individual PFAS are determined by LC-MS. The chromatogram shows the retention of PFAS with different chain lengths and functionalities in a raw water sample.

Technical and scientific goals

The following tasks can be derived in detail for the Perfluor.Dat® project:

1. Data acquisition and processing of existing PerfluorAd® use cases
2. Process optimization by testing new co-additives to improve the effectiveness of the precipitation reagent and the filterability of the resulting precipitate
3. Identification, establishment and validation of on-site measurement parameters such as total fluorine, PerfluorAd® and Dissolved Organic Carbon (DOC)
4. Data management including measurement data acquisition, data preparation and data storage as well as data analysis to potentially develop process models for different types of PFAS-contaminated water
5. Feasibility study for practical implementation of the optimized chemical precipitation process in selected PerfluorAd® plants

Target improvements

Our R&D work is intended to pave the way for a new generation of PerfluorAd® treatment plants that can be used quickly and easily for different types of water and wastewater, improving the established process as follows:

- minimization of residual PerfluorAd® and PFAS concentrations as well as TOC/DOC
- improved sedimentation/flotation and filterability of the resulting precipitation
- multifunctional additive tool to optimize water purification efficiency, specifically for hydrophilic PFAS such as Perfluoro-butanoic acid (PFBA)
- extension of the current PerfluorAd® application range for PFAS contaminations below 10 µg/L

Target user groups

- operators of waterworks, landfills and soil washing systems
- civil and military airport operators
- manufacturers and industry users of PFAS
- operators of chemical industrial processes
- chemical parks, petrochemical companies and refineries
- regulatory authorities and environmental agencies, water and wastewater associations

In cooperation with

cornelsen Umwelttechnologie GmbH

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Eine Maßnahme der Umweltwirtschaftsstrategie
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Green Economy – stark in NRW