BTO *Executive Summary*

Data mining can help optimise water treatment

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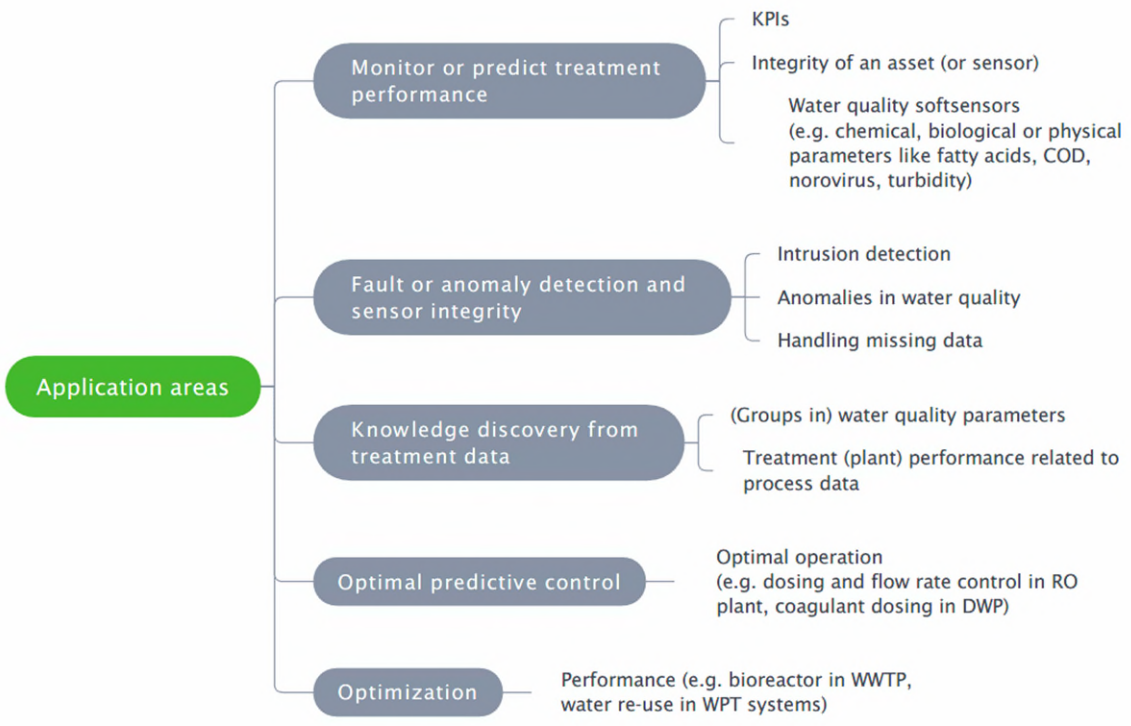
An exploratory research project was carried out within the Water Treatment theme on the possibilities of big data in drinking water treatment. This resulted in a literature overview of different application areas, such as the characterisation of water-quality parameters (soft sensors), the optimisation of coagulant dosage rates and the prediction of membrane fouling. One process was elaborated: operational data from a coagulation process followed by sand filtration were used to train a model for the purpose of predicting the pressure build-up in the sand filters, based on water-quality parameters and operational parameters. The model permits the optimisation of filter run time, backwashing events and iron dosage rates.



Mind map with overview of application areas for big data in water treatment.

Interest: increased volume of data and more chances to use them

As a result of the increasing digitisation of society the volume of stored data is growing sharply. In many sectors the stored data are already being applied to optimise processes. Data on drinking water treatment are also being increasingly collected. This raises the question about the extent to which big data can be applied to water treatment to

improve treatment processes.

Approach: literature scan and use of treatment data to train model

A short literature scan was done on the application possibilities of big data in (drinking) water treatment.
Data mining techniques were also applied to data from drinking water production; these practice data were provided by PWN and concerned a pre-treatment process, consisting of a coagulation step followed by a sand filter. The data included water-quality data (pH, turbidity, temperature) and operational data (flow, Fe dosage rates), from several parallel filters over a period of 2 years. These data were used to train a data model.

Results: mind map and model to predict pressure build-up in sand filters

Although there is less literature on the application of big data in drinking water treatment than in wastewater treatment, the aspects mentioned include the following:

- the characterisation of water-quality parameters (soft sensors)
- the optimisation of the coagulant dosage rates, and
- the prediction of membrane fouling.

See also the mind map in the figure.

The trained data model predicts the pressure build-up in the filters, allowing for predictions of the filter run time based on water-quality and operational parameters. Furthermore, it specifies how the operational parameters influence the filtration run time. The run time increases at higher Fe dosage rates (up until a plateau value is reached), lower turbidity, lower flow and at a pH of around 8.0. With the data model these correlations can be quantified, so that the model can be used to optimise filter run time, backwashing events and iron dosage rates.

Implementation: optimising coagulation and filtration with data model.

With the obtained model, the backwashing duration and iron dosage rates can be optimised. This can lead to reductions in the use of iron, storage of iron sludge and backwash water loss. The results are presented in the form of an interactive work sheet. The steps in the big data analysis can be followed based on this work sheet, and the users can themselves apply the model to make their predictions.

Report

This report is described in the report *Datamining voor de zuivering* (BTO 2019.001).

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