Executive summary
Ceramic membrane applications for spent filter backwash water treatment

Introduction

Low pressure membranes for particle removal got an increasing importance in public drinking water supply in recent years. Today, membranes made from organic materials such as PVDF or PES will be applied in full scale plants in waterworks. Ceramic membranes are made from inorganic materials such as alum oxide or silicon carbide. They are established in industrial applications, e.g. for recovery of catalytic converters since a couple of years. However, ceramic membranes are not applied in public drinking water supply in Europe today.

Ceramic membranes are considered as resistant to mechanical, chemical and thermal stress anticipating a long membrane life time. Further advantages include their high porosity and hydrophilic surface which allow higher fluxes compared to organic membranes. These properties may open various fields for applications in water treatment, such as the treatment of residuals from drinking water production or the direct treatment of surface waters.

Importance

Existing waterworks treating surface water for drinking water production often use flocculation and filtration by conventional dual media filters for particle removal. The backwash water of these filters contains the particle load of the raw water including added flocculants at relatively small flow rates. A further treatment of residuals may support an environmentally friendly water treatment.

Approach

Ceramic membranes were applied for filtration of spent backwash waters in this study. Different types of backwash water were considered. While a number of ongoing research in the field of drinking water is applying Al_2O_3 microfiltration membranes of one Asian manufacturer this study includes ceramic membranes produced in Europe only. This includes ceramic ultrafiltration membranes and a prototype microfiltration membrane made from silicon carbide (SiC).

Result

Results imply that total membrane resistance was more influenced by backwash water type and operation than to ceramic membrane type for the waters tested. Plant optimization is therefore not limited to changing the membrane type.

Cleaning processes for ceramic membranes should be adopted to both, feed water quality and membrane type. Cleaning ceramic ultrafiltration membranes was somewhat more complex compared to ceramic microfiltration membranes.

Life cycle cost estimation indicate, that even element type ceramic membranes are still more expensive but not so far from costs of treatment by organic membranes. Therefore, introduction of ceramic membranes for water treatment under cost-aspects could be not impossible in medium-term, especially if the more cost-efficient ceramic monolith module type can be applied.

More information

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