

Processing of ceramic suspensions using Dynamic Crossflow Filtration (DCFF)

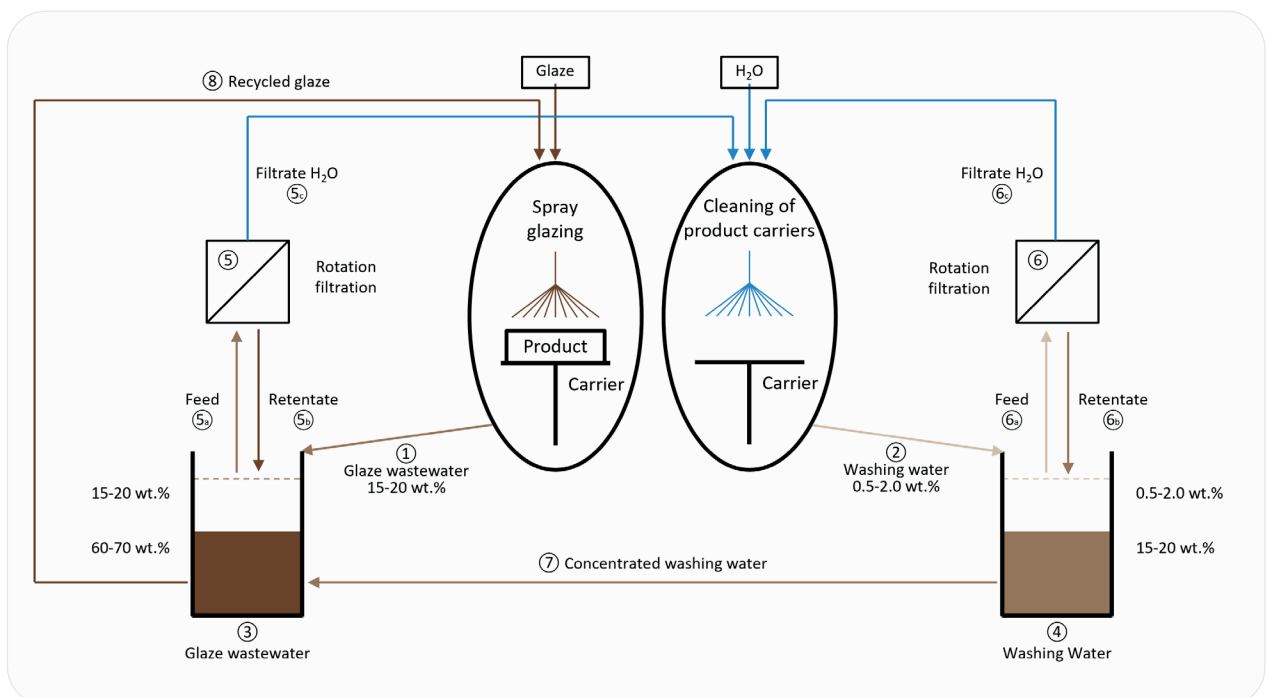
Case Study

In the ceramics industry, various ceramic suspensions containing valuable raw materials accumulate as wastewater during production. For both economic and ecological reasons, it is of great interest to recover these raw materials from the wastewater or to concentrate the wastewater in such a way that it can be reused directly in production.

In this case study, the treatment of wastewater produced during spray glazing (for example in the production of porcelain or sanitary ceramics) is described using Dynamic Crossflow Filtration (DCFF). Ceramic filter discs from KERAFO[®] are used for this special filtration technology.

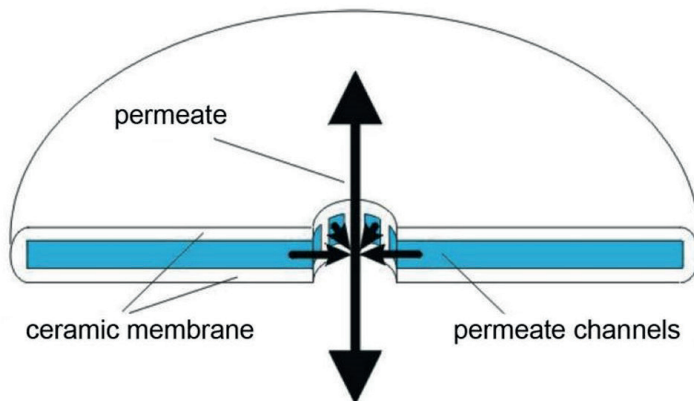
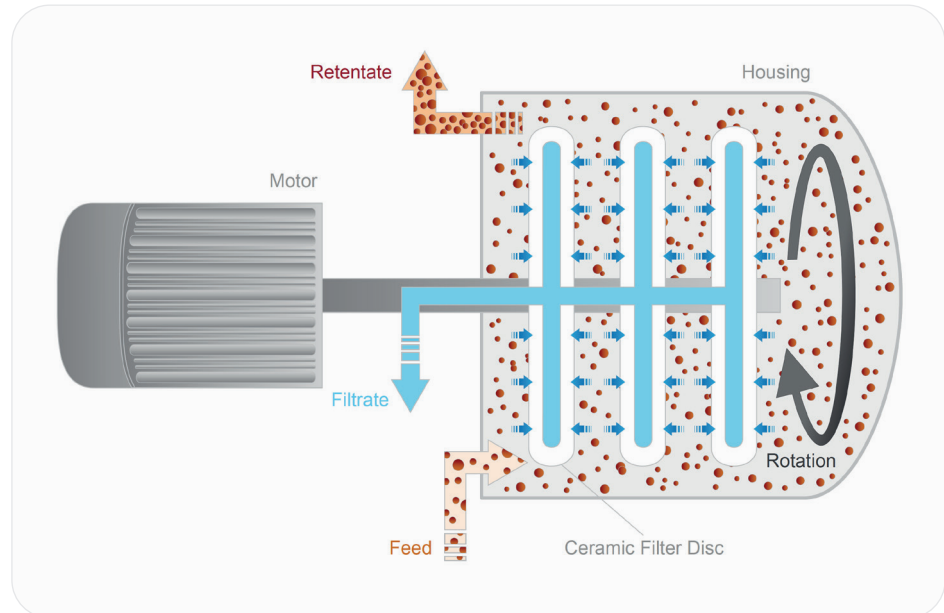
Methods

Two different ceramic suspensions accumulate as wastewater during spray glazing. On the one hand, overspray produces a wastewater of glaze (1) with a solids content of 15 - 20 wt.-%. On the other hand, a washing water with a solids content of 0.5 - 2.0 wt.-% is produced when cleaning the product carriers. The two suspensions are collected in separate tanks (3 and 4). A rotation filtration unit (5 and 6) is installed downstream of each tank. There are three volume flows at each of the rotation filtration units: Feed (5a and 6a), retentate (5b and 6b) and filtrate (5c and 6c). In the first step, the washing water is concentrated from 0.5 - 2.0 wt.-% to 15 - 20 wt.-%. It is then added to the glaze wastewater (7). In the next step, the glaze wastewater is concentrated from 15 - 20 wt.-% to 60 - 70 wt.-%. The concentrate from this step (8) can be reused directly for the glazing process. The filtrate (water) from both treatment steps (5c and 6c) is available again for cleaning the product carriers. This results in the concept of a closed loop. All valuable materials are recycled back into the process.



Functioning of the filtration units

The units for Dynamic Crossflow Filtration each consist of a pressure housing in which a filter stack is installed. The stack consists of a hollow shaft on which several ceramic filter discs are mounted.



These filter discs are made of Al_2O_3 with a defined porosity and have a channel structure inside. The channels have openings to the inner diameter of the disc. Coatings on the outside are used to obtain membranes with different pore sizes.

The stack can be set in rotation by a motor. By applying pressure to the outside of the discs, the filtrate permeates through the porous material into the channels of the discs and is discharged via the hollow shaft.

Advantages due to rotation filtration

Compared to conventional crossflow filtration, in Dynamic Crossflow Filtration the tangential overflow of the discs is not generated by pumping large volumes of liquid, but by rotating the discs. This results in high overflow velocities and shear forces, which efficiently clean the membrane surface and thus enable a high filtrate flow. The process is also considerably more energy efficient and allows concentration to high solids contents.

The use of this process results in significant savings potential for the ceramics industry. Thanks to the closed-loop concept, all recyclable materials are fed back into the glazing process. This reduces both the costs for the use of new material and for the disposal of wastewater.