

Treatment of abrasive waste water from the glass and ceramics industries using PP modules

Cutting, grinding and polishing are important processing stages in the glass and ceramics industries with regard to the further machining of shaped workpieces. The complex geometrical shapes are manufactured using CNC machines. The workpiece and the machining tool are cooled using water or a liquid coolant in these processes.

Furthermore, so-called “slurries” is used in other machining processes such as sawing, edging and milling during the production of wafer or chip.

The abrasive water that is produced during the mechanical machining processes also contains chemicals / tensides that are used to improve the removal of released heat or for cleaning the surface of the material as well as material abrasions (abrasive grinding particles).

These processing liquids have to be treated so that recovery of the cutting or cooling liquids can be carried out on a qualitative and economical basis. This abrasive particle removal requirement can be realized using crossflow microfiltration.

Our symmetric polypropylene tubular membranes are distinguished by both their extraordinary abrasion resistance as well as their high mechanical and chemical stabilities.

The challenge

In order to be able to optimize the industrial machining processes used for glass and ceramic materials both from an economical as well as an ecological viewpoint, the reuse or treatment of the abrasive water that is produced represents an important aspect with regard to reducing the manufacturing or disposal costs. In order for the liquid coolant used in the processing process to be recycled, both the particulate abrasions and the dissolved ingredients must be removed in accordance with the application and the legal discharge restrictions. It is often difficult to use classical separation methods such as centrifuging and sedimentation as the particle abrasions are very finely dispersed in the abrasive water. In addition to this a suitable treatment process must be used to ensure that the chemical composition of the liquid coolant that was used is not significantly altered, especially when adding cleaning additives or other coolants.

The solution

Crossflow microfiltration enables PP tubular membrane modules to be used to continuously separate the particulate ingredients from the abrasive water. Whereas components can be recovered on the filtrate side, such as water and the chemicals used, it might also be necessary to implement further cleaning stages so that 90% can be recycled from the machining process and the resulting concentrate can undergo further post-treatment. Moreover, their suitability to act as sterile filters reduces the bacterial load during circulation.

A huge quantity of fresh water can be saved in this way and the cost-intensive chemicals that are used only have to be dosed as needed. The PP module is fitted with symmetrical polypropylene membranes that have a nominal pore size of 0.2 μm and are distinguished by a high resistance to abrasion when compared to other membrane materials. The polypropylene membranes have proven their selves in virtually all relevant solid / liquid separation applications.

Due to the unrestricted periodic backflushing with filtrate, flux rates of 60 to 120 $\text{l}/(\text{m}^2 \text{ h})$ and a service life of approx. 3 years can be ensured despite the massive chemical and mechanical stresses.