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Research area:

General aims/Environmental technology/Water

Key words:

Membrane concentrate, treatment processes

Subject:

Development of economic concepts for concentrate utilisation when using membrane technology for process water/effluent treatment in paper mills

Background / Problem area

Internal process water treatment is of major interest, as the loads of organic and inorganic compounds have a considerable impact on process stability and paper quality. To meet the requirements of different water consumers, membrane technology is a powerful alternative for process water treatment. However, since it is merely a separation process, it produces concentrates that have to be utilised or at worst disposed of. There is currently no application for treating or utilising accrued concentrates when using ultrafiltration to obtain super clear filtrates or when using nanofiltration for advanced effluent treatment. Promoting this promising membrane technology in the paper industry presupposes economically and ecologically meaningful concepts for concentrate utilisation.

Objective / Research results

The project aims at developing concepts for utilising and treating concentrates that meet environmental compatibility and economical boundary conditions. Four different concentrate treatment steps have been checked:

- biological treatment (aerobic and anaerobic conditions)
- ozonation (treating persistent COD compounds)
- microsand supported flocculation and precipitation
- electroflotation

Additional process combinations based on two or three internal treatment steps have been checked.

Based on the results, new ways of utilising the concentrates are considered. Different possibilities of concentrate treatment were investigated, but also options of the potentially reuse of pre-treated concentrates in the papermaking process.

The results show that the microsand supported clarification and the electroflotation is suited for reducing turbidity and the concentration of particulate matter (up to 90%). By electroflotation a decolouration of 50% was achieved however the specific costs are higher compared to the flocculation/precipitation costs. The ozonation should only be used after a biological stage. After these combined treatment steps decolouration of up to 90% was achieved and persistent COD was reduced as well. The concentrates could in most cases also be treated in an existing biological stage. To avoid concentration peaks in the contaminant loads, the feed of the concentrates to the biological stage should be preferable very consistent.

If the pre-treated concentrates have a fair quality (especially low concentration of particulate matter and carbonate), there is also the possibility of the usage in the production process. Possible applications are the usage in the pulper, for general cleaning/rinsing-processes or spray nozzles e.g. for the disintegration of foam (assumption: a nozzle construction non-sensitive for plugging).

Application / Economic benefits

The comparatively high costs of disposing of the concentrates in particular leave much leeway for future-oriented treatment steps. With the application of the membrane technology the volume of the necessary freshwater and the accumulated effluent could be reduced. With an economical concept of treating or reuse the concentrates of the filtration, there is a possibility to bring down the costs of the whole process.

Project period: 1st January 2004 – 31st December 2005

Remarks

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