

## **RO concentrate treatment by a hybrid system consisting of a pellet reactor and electro dialysis**

### **Abstract**

This paper investigates the feasibility of a hybrid system consisting of a pellet reactor and electro dialysis (ED) to treat reverse osmosis (RO) concentrates in which the pellet reactor was used to remove the scaling potential before ED treatment. The objective of the hybrid system was a high recovery for the RO system, and zero liquid discharge for the RO. The performance of the pellet reactor on lab-scale was evaluated at superficial velocities of 48, 61 and 73. m/h with an initial pH 11. The efficiency of calcium removal was between 70 and 80%. Precipitation in the pellet reactor showed higher calcium removal up to 95% when the pH was adjusted to 11.5. The wastewater with reduced scaling potential (after pellet crystallization) was treated by ED to achieve the required characteristics for reinserting the liquid to an integrated system ultrafiltration-reverse osmosis (UF-RO). Without the pellet reactor and using RO concentrate as feed of ED in feed and bleed operation, the ED was rapidly scaled and reached the maximum voltage. By removing 80% calcium in RO concentrate in the pellet reactor, the ED system can be operated in a stable way with high current efficiency and without scaling.

### **Keywords**

Electrodialysis; Hybrid system; Pellet reactor; Precipitation; RO concentrate treatment; Zero liquid discharge