Ultrafiltration of Saline Waters in Geothermal Fields Hot Water Discharge

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Abstract. Southeastern Anatolia contains sulphide ore deposits, sulfur-containing complexes containing 2–4% Fe and ferric acidic solutions and geothermal Billoris hot streams near field. Siirt and Hakkari regions contained showed wide distribution of metallic ions such as copper, lead, zinc in Fe sulphide deposits, even hot streams such as alkali brines of potassium and sodium in Billoris region. Siirt copper concentrator is produced at least 100 thousand tons of processed and several million tons of ore tailings in the pond as slurry. Every year about 1 million tonnes of saline waters fill the lakes and streams in the Mesopotamian. Geographical Water sources and produced ore tailings in Siirt was 300 thousand tons of ferric slurries. For this reason, the common waste slurry muds and effluents of ponds in the region becomes critical for nature and fish fauna and agricultural crops. It may be advantageous to assess the extent of these slurry mud and precipitates occurring in a particle size, usually below 10 microns. In our country, the evaluation of pyrite Fe silicate wastes in the Siirt and Hakkari region of 15 m thickness spread over a wide area outside of this ore production has been discussed as chemical production in this study. This research has proved to be advantageous in producing easily filtered and ultra-filtered in bands and pressure vessels and pond filtration of brine waste slurries and compared with their evaluation in terms of basic geo-permeability and hydraulical conductivity properties.

Keywords: Ultrafiltration · Saline waters · Brine solution · Brine filtration · Hot brines · Waste streams

1 Introduction

Most of solid matter and waste contaminants or substances of municipal slurry or AMD origin and wastewater treatment plant (WWTP) effluents are important point discharges for the presence of toxic compounds and residuals of industrial waste waters in rivers, streams and surface waters. The elimination of heavy metal matter of AMD within the WWTP or their retention is of primary concern in neutralization and saline waters in conventional sludge plants (CSP) the neutralization aeration tank and the final clarifier form one process unit. The separation of treated sewage and sludge occurs in the clarifier via sedimentation. Therefore the ability to sediment is an important selection criterion. The salt concentration in the mixed liquor is limited by the capacity of the clarifier. In membrane reactors this parameter is ofminor influence, as separation is

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achieved via membrane filtration. Thus, the plant can be operated at higher colloids concentrations resulting in smaller plant sizes.

The most important advantage of MBRs is the complete retention of suspended solids, thus reducing emissions to the dissolved fractions. Higher costs and higher requirements in operation and maintenance as well as power consumption compared to conventional systems are well-known disadvantages. The particle size for capture in ultrafiltration are given in Table 1.

Table 1. Brine solution metal and alkali contents in mud and effluent

Filtration	Pond/Belt area	Mud		Effluent	
	(m2)	(mg/l)	(permeability, mD)	(mg/l)	(permeability, mD)
Pond	250	297	0,069	29,7	0,069
Belt	3	25	0.027	2,5	0.027
Pressure belt	1	10	0.007	1,0	0.007
Left/right margin	–	20	0.8	23	0.9

Typically, X-Flow UF membrane modules are specifically developed for the effective removal of these compounds like bacteria, viruses and solids to protect the downstream (spiral wound) NF/RO. the X-Flow membrane portfolio includes innovative hollow fiber NF. This technology does not require the pretreatment that a spiral wound NF would need due to two of its unique features: backwash ability and high chlorine resistance (Fig. 1).

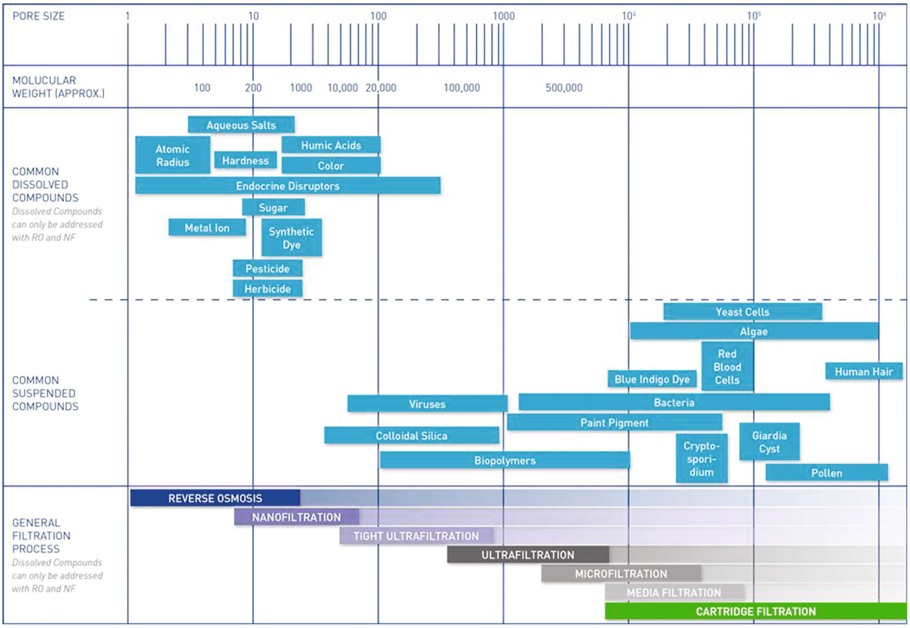

Fig. 1. The general filtration spectrum for ultra-filtration technique

Main advantages are described as follows;

- Removal of colloidal matter: 99.8% removal of colloidal silica
- High membrane packing density: the industry's smallest free volume in a membrane module
- 100% integrity testing on individual fibers
- Individual fiber repair
- Very good antifouling behavior
- Typical permeate quality:
  - SDI < 3
  - Turbidity < 0.1NTU
- Excellent chemical resistance with a wide pH range (1–12) and high chlorine stability (maximum free chlorine 250 mg/l)
- Typical high permeability: low energy consumption

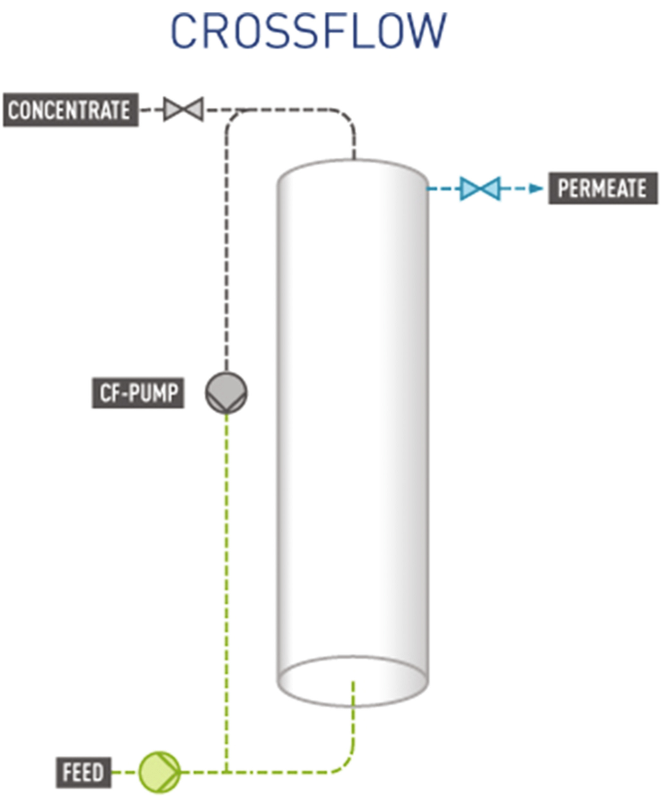

Fig. 2. Ultrafiltration hollow membrane experimentation model for saline hot waters

2 Methods

Ultrafiltration modules are usually racked in a skid (standard unit) of 6 modules. The permeate flow ranges between 1200–2400 L per hour per module, which amounts to 7.5–15 m^3 per hour per skid. The mode of operation is typically batch-wise, but continuous operation by alternation between two sets, or cascade systems, are also possible (Fig. 2).

3 Results and Discussion

The hydraulic resistivity of specific geo layers of clay and clay-bituminous geomembrane composites could be practiced over geo filtration and conductivity changed by the equation.

The hydraulic resistivity of specific geo layer could be explained by the equation

$$R = \int_0^t \left[n_j k_{ijkl} h_l + \int_0^i \left(\frac{\lambda k}{\rho} \right)^2 \delta_{ik} \right] h_k / dt \qquad (1)$$

Density, porosity and time changed by time in the layer (Fig. 3).

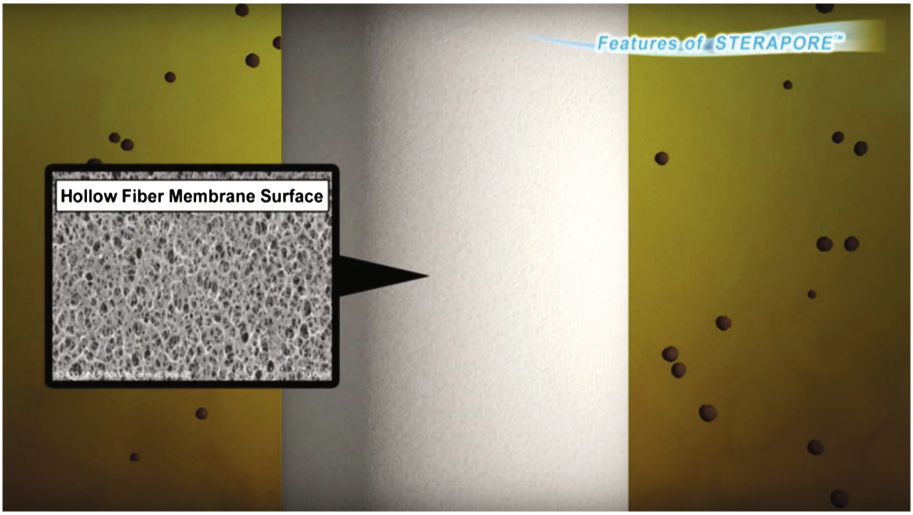

Fig. 3. Ultrafiltration hollow membrane structure and saline waste waters and hot waters

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