**FILMTEC Membranes**
Water Chemistry and Pretreatment: Barium Sulphate Scale Prevention

**Barium Sulphate Scale Prevention**

Barium sulfate is the most insoluble of all alkaline-earth sulfates. When present in water, it may lead to massive precipitation, possibly acting as a catalyst for calcium sulfate and strontium sulfate scaling.

In most natural waters, barium is present at a level that would cause barium sulfate precipitation in the concentrate stream. The critical feed concentration of barium may be as low as < 15 µg/L in seawaters, < 5 µg/L in brackish waters or even < 2 µg/L if sulfuric acid is dosed to brackish waters.

**Calculation**

Prediction of BaSO₄ scaling potential is performed in the same way as the previously described procedure for CaSO₄.

1. Calculate the ionic strength of the concentrate stream ($I_c$) following the procedure described in *Scaling Calculation General (Section 2.4.1)*:

$$I_c = I_f \left( \frac{1}{1 - Y} \right)$$  \hspace{1cm} \text{Eq. 5}

2. Calculate the ion product (IPₜ) for BaSO₄ in the concentrate stream:

$$\text{IP}_c = \left( (m\text{Ba}^{2+})_f \left( \frac{1}{1 - Y} \right) \right) \left( (m\text{SO}_4^{2-})_f \left( \frac{1}{1 - Y} \right) \right)$$

where:

- $(m\text{Ba}^{2+})_f$ = M Ba²⁺ in feed, mol/L
- $(m\text{SO}_4^{2-})_f$ = M SO₄²⁻ in feed, mol/L

3. Compare IPₜ for BaSO₄ with the solubility product ($K_{sp}$) of BaSO₄ at the ionic strength of the concentrate stream, Figure 2.7. If IPₜ ≥ $K_{sp}$, BaSO₄ scaling can occur, and adjustment is required.

**Adjustments for BaSO₄ Scale Control**

- The adjustments discussed in *Calcium Sulfate Scale Prevention (Section 2.4.3)* for CaSO₄ scale control apply as well for BaSO₄ scale control.
Figure 2.7  $K_{sp}$ for BaSO$_4$ versus ionic strength [10]

Notice: The use of this product in and of itself does not necessarily guarantee the removal of cysts and pathogens from water. Effective cyst and pathogen reduction is dependent on the complete system design and on the operation and maintenance of the system.

Notice: No freedom from any patent owned by Seller or others is to be inferred. Because use conditions and applicable laws may differ from one location to another and may change with time, Customer is responsible for determining whether products and the information in this document are appropriate for Customer's use and for ensuring that Customer's workplace and disposal practices are in compliance with applicable laws and other governmental enactments. Seller assumes no obligation or liability for the information in this document. NO WARRANTIES ARE GIVEN; ALL IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE ARE EXPRESSLY EXCLUDED.

FILMTEC™ Membranes
For more information about FILMTEC membranes, call the Dow Liquid Separations business:
North America: 1-800-447-4369
Latin America: (+55) 11-5188-0222
Europe: (+32) 3-450-2240
Pacific (ex. China): +800-7776-7776
China: +10-800-600-0015
http://www.filmtec.com

Notice: The use of this product in and of itself does not necessarily guarantee the removal of cysts and pathogens from water. Effective cyst and pathogen reduction is dependent on the complete system design and on the operation and maintenance of the system.

Notice: No freedom from any patent owned by Seller or others is to be inferred. Because use conditions and applicable laws may differ from one location to another and may change with time, Customer is responsible for determining whether products and the information in this document are appropriate for Customer’s use and for ensuring that Customer’s workplace and disposal practices are in compliance with applicable laws and other governmental enactments. Seller assumes no obligation or liability for the information in this document. NO WARRANTIES ARE GIVEN; ALL IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE ARE EXPRESSLY EXCLUDED.