Thermically induced phase separation

TIPS

working for a sustainable life
Novel technology for the production of hollow fiber, TIPS - PVDF

Application fields

Pilot plant
Novel technology for hollow fiber production, TIPS
Thermally Induced Phase Separation

- TIPS or Thermically Induced Phase Separation is a novel technology for the production of hollow fiber.
- Hollow fiber for UF/MF produced by TIPS show a significant number of advantages compared to the other, NIPS and DIBS.
Differences between TIPS and NIPS membranes

- TIPS membrane is thixotropic with the same properties in all directions.
- TIPS membrane has a higher water flow.
- TIPS membrane has a better mechanical resistance.
- TIPS membrane has a lesser dirt accumulation and easier cleaning.
- TIPS membrane has lesser clogging.
- TIPS membrane has better resistance to oxidizing agents.
### Differences between TIPS and NIPS membranes

<table>
<thead>
<tr>
<th></th>
<th>TIPS SCINOR</th>
<th>NIPS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pure Water Flux</td>
<td>49 GFD/psi</td>
<td>8 – 20 GFD/psi</td>
</tr>
<tr>
<td>NaOCl Tolerance during CIP</td>
<td>5000 ppm</td>
<td>500 – 2000 ppm</td>
</tr>
<tr>
<td>Tensile Strength</td>
<td>5,3 MPa</td>
<td>3,6 – 4 MPa</td>
</tr>
<tr>
<td>pH range during CIP</td>
<td>1 – 13</td>
<td>1 – 12</td>
</tr>
<tr>
<td>Fouling Rate</td>
<td>0,16 psi/minute</td>
<td>0,41 – 0,79 psi/minute</td>
</tr>
<tr>
<td>Permeate SDI15</td>
<td>&lt; 3</td>
<td>&lt; 3</td>
</tr>
<tr>
<td>Permeate Turbidity (NTU)</td>
<td>&lt; 0,1</td>
<td>&lt; 0,1</td>
</tr>
</tbody>
</table>
Differences between TIPS and NIPS membranes observed in operating UF plants

- **Mechanical strength**: TIPS hollow fiber membrane is from 10 to 30 % more resistant than NIPS.
- **Footprint**: UF plant built using TIPS membrane is usually from 5 to 15 % more compact than the equivalent with NIPS.
- **Flux**: TIPS membranes can operate at 10 to 15 % higher average flux than NIPS.
- **Conversion/Total recovery**: between 1 and 4 % higher recovery than NIPS.
- **Cleaning** of TIPS membranes is also more effective due to a more spongy membrane structure that facilitates a better penetration of chemicals. NIPS membranes have more open spaces as result of a less uniform crystallization of the PVDF.

Nota: Estos datos están basados en instalaciones en China donde hay la mayor cantidad de plantas con membranas TIPS en todo el mundo.
Material for hollow fiber production, PVDF
PVDF: Polyvinylidene fluoride

- Great mechanical strength
- High resistance to chemical substances
- Resistance to high temperatures
- High resistance to abrasion
- Low thermal conductivity
- Light
¿PVDF?

- halogenated solvents
- esters, ketones
- aromatic solvents
- aliphatic solvents
- strong acids
- strong oxidizers
- halogens
- strong bases
- weak bases

PVDF
PVC
HDPE
PP
PES-GF
applications
Tertiary treatments

Desalination pretreatment

Potabilization

Conditioning and/or recovery in industry
Great clarifying: Produced water with turbidity below 0.1 NTU.

Disinfection: Capacity for removal of microorganisms and viruses.

Low cost: Operational unit costs low, low energetic consumption and automatable.

Modular: Easy to adapt to the evolution of treated water flow.

Stability: Adaptable to variations of feed water quality.
pilot plant
<table>
<thead>
<tr>
<th>Membranes</th>
<th>2 units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scinor® SMT600–P40</td>
<td></td>
</tr>
<tr>
<td>Filtration surface</td>
<td>2 x 40 m²</td>
</tr>
<tr>
<td>Max. flow</td>
<td>10 m³/h</td>
</tr>
<tr>
<td>Max. flux</td>
<td>80 LMH</td>
</tr>
<tr>
<td>Application</td>
<td>Sea water, waste water, river, reservoir, industrial</td>
</tr>
<tr>
<td>Operation</td>
<td>Automated, with the exception of CIP</td>
</tr>
<tr>
<td>Control</td>
<td>Remote monitoring and control</td>
</tr>
</tbody>
</table>