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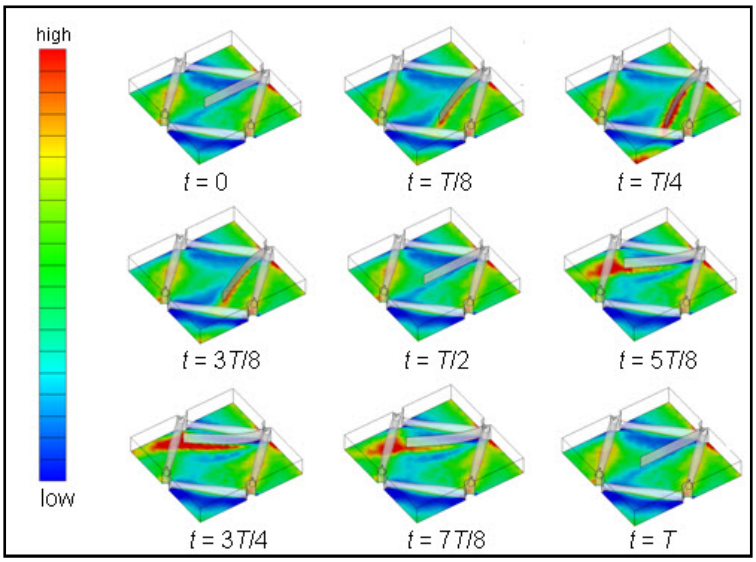
Desalting and Water Purification Research Program

Reduced Membrane Fouling Potential by Tailored Fluid/Structure Interaction

DWPR Report #143, K. Farrel, Heat Transfer Research Inc.

Background:

Spiral wound membrane elements use a Vexar® spacer to promote turbulence and keep the feed channel open.



Objective:

Reduce fouling in dead zones in Vexar® spacer mesh.

Computational Fluid Dynamics Simulation was used to determine the effect of mesh size, angle, position in channel and additional active components.

Figure above shows one model with a wiper at the up stream end of the mesh diamond that is free on one end to flap back and forth under cross flow conditions. Color indicates surface shear stress. The resulting increased surface velocity aids the desalination process by transporting salts and debris away from the membrane surface.

Conclusions:

- Spacer materials used today have low shear stress in the center of each mesh square which leads to build up of salts and debris.
- In the CFD analysis, oscillating ribbons incorporated into the mesh pattern would be effective in disrupting flow pattern and periodically flushing the low shear areas.
- Incorporation of such a feature would increase pressure drop across a cartridge by an estimated 10%.