

Inlet Water & Sweep Gas Guidelines for Liqui-Cel® Membrane Contactors

Inlet water and sweep gas quality are important considerations when operating Liqui-Cel® Membrane Contactors. This document provides guidelines for inlet water and sweep gas conditions that may help prevent fouling of the membrane surface or scaling which can negatively impact performance. Design and operating guidelines are also available in the *Liqui-Cel® Membrane Contactor Design & Operating Guide* which can be found on the liqui-cel.com web site. This document and the *Design & Operating Guide* should be thoroughly reviewed before designing and operating a system.

When operating a Liqui-Cel® Contactor system note the following general recommendations and considerations:

- a comprehensive water quality analysis should be completed. Changes in water quality, such as seasonal variation, should be taken into consideration;
- a softener or cation exchanger is highly recommended;
- liquid and gas inlet streams should always be pre-filtered; and
- the potential for a pH shift should be assessed (for CO₂ removal applications)

The optimal filtration and pre-treatment arrangement will depend on several variables, including the water source, operating conditions, biological matter, organics, Total Dissolved Solids (TDS) and other factors. Additionally, some dissolved compounds will pass through any filter and could potentially deposit on the membrane surface. Particularly, agglomeration or precipitation of certain dissolved compounds could occur with pH changes. To prevent blocking or precipitation we recommend a softener or cation exchanger followed by 5 µm absolute pre-filter as a minimum requirement.

Seawater needs to be filtered to ≤ 5 microns and, depending upon the pH, further preventative action may be needed to prevent scaling. Placement downstream of a Sulphate Removal Unit (SRU) is highly recommended.

The following tables provide minimum guidelines that may prevent potential membrane fouling and blockage.

Table 1: Inlet Water Quality Guidelines

Water Quality Indicator	Measure	Recommended Level	Prevention / Control	Membrane Cleaning
Colloids	Silt Density Index	< 3	flocculation / (membrane) filtration	no treatment
Particulates	um, absolute rating	5 2 (after carbon bed)	filtration	no treatment
Organics, adsorptive	TOC, ppm	< 1	coagulation + ultrafiltration	hot caustic
Suspended oil	ppm	0	filtration	no treatment
Chlorine, free	ppm-hours	24000	accurate control	no treatment
pH	units	1 - 14		-
Silica - colloidal	mg/L	< 5	anti-scalent	hot KOH
Surfactants	ppm	0		no treatment
Calcium carbonate*	Langelier Saturation Index	< 0	softening / anti-scalent	3% HCL / citric acid
Fe, colloidal *	ppm	< 0.02	filtration	citric acid
Mn, colloidal	ppm	< 0.02	filtration	citric acid
Ozone	ppm	0		no treatment
Chlorine dioxide	ppm	0		no treatment

* pH shift due to degassing can contribute to precipitation

Table 2: Gas-side Inlet Guidelines

Gas stream (lumenside)*	0.2 µm for high-purity applications
	1 - 3 µm is sufficient for industrial applications
*oil- and aerosol-free	

DI water after ion exchange followed by a final pre-filter or RO is strongly recommended.

Additional Requirements

Feedwater should be free of surfactants/solvents or oxidants (e.g. ozone, chlorine) to prevent wet-out or oxidation of the hydrophobic membrane. Small amounts of chlorine and oil can be removed by activated carbon. Biological fouling can be reduced with regular, frequent chemical cleaning or sanitization procedure (see Cleaning Guide for additional information). UV lamps can be used to limit biological growth, but should not be installed directly upstream of the membrane contactors due to the formation of free radicals.

The physical operating limitations of Liqui-Cel® Membrane Contactors, such as maximum operating temperatures or pressures, should also be considered. For additional information refer to the *Liqui-Cel® Membrane Contactor Design & Operating Guide* available at www.liqui-cel.com or contact your Membrana representative.

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