

IMEC UPW System Utilizes Liqui-Cel® Membrane Contactors for Oxygen Removal

IMEC (Interuniversity MicroElectronics Center) in Belgium is Europe's largest independent research center. It focuses on microelectronics, nanotechnology, and enabling design methods and technologies for ICT (Integrated Circuit Technology) systems. IMEC's research runs 3 to 10 years ahead of industrial needs.

IMEC's technology choices for process manufacturing steps used for project and process development reflect their commitment to using the best solutions available to them.

Projects are currently underway at IMEC to address major technological challenges for CMOS chips of the 100 and 65 nanometer generation. The center has three full-scale pilot manufacturing lines and 4800 M² (51,666 ft²) of clean room facilities.

As future devices become smaller and as line widths become more critical, so too do the technologies required to produce high purity water for the process manufacturing steps in various microelectronics industries. Oxygen levels in the high purity water directly impact the product yields. New roadmaps for 300mm wafers and other small devices point to requirements of <1 ppb of dissolved oxygen.

IMEC HPW Specifications and outlets

Flow Rate: Make-up loop	15 m ³ /hr (55 gpm)
Flow Rate: Polishing loop	35 m ³ /hr (128gpm)
Temperature:	19.5° C (67° F)
Vaccum	50 torr
Total N ₂ required	3 m ³ /hr (1.8 scfm)
Inlet Dissolved O ₂	Saturated, 9.14 ppm
Outlet Dissolved O ₂ , estimated	<5 ppb
Outlet Dissolved O ₂ , actual	3-4 ppb
Outlet TOC	< 0.05-0.1 ppb
Outlet Particles	< 0.05 µm
Number Particles/liter	300-500
Resistivity	18.2 Mohm cm



The Use of Liqui-Cel Membrane Contactors at IMEC

Liqui-Cel Membrane Contactors were installed in two locations of the High Purity Water (HPW) loop feeding the pilot lines at IMEC. The contactors have been in operation continuously since September of 1999 in the make-up and polishing loops. No operating problems or out of specification conditions have occurred in the 6 year period.

The make up system runs at 15 m³/hr (55 gpm). Three 10 x 28 Liqui-Cel Membrane Contactors running in series remove the majority of the dissolved oxygen in the water. The O₂ outlet at this point in the system is 5.4 ppb.

The polishing system runs at 35 m³/hr (128gpm) and requires only one 10 x 28 Membrane Contactor for final polishing to < 3.5 ppb of dissolved oxygen. Both systems operate in the the combination mode with 50 torr of vacuum. The total N₂ usage is 3m³/hr (1.8 scfm). Because of minimal pressure drop in the Membrane Contactors, repressurization pumps are not required after the degassing step.

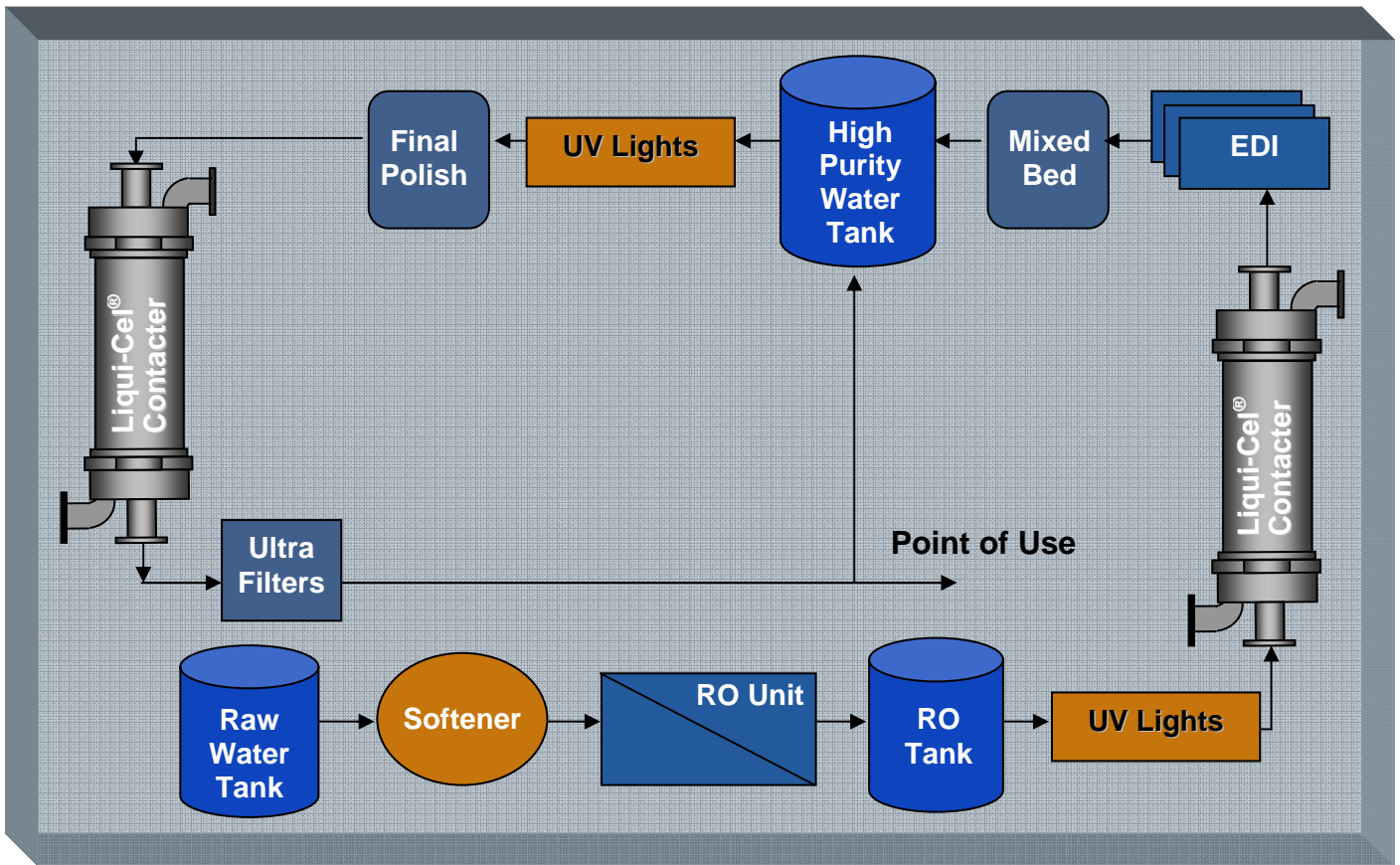
One of the benefits of Liqui-Cel Membrane Contactors is modularity. They can be placed in two separate locations to better meet the outlet oxygen requirements of the application. By breaking up the degassing system into two parts, the contactors can be located in the final polish step where any oxygen or other gasses picked up in piping or other system components can be removed.

The HPW loop

A P&ID of the overall HPW water loop is shown below. Philip Müller Hager+Elsässer in Germany was selected as the OEM to build and install the HPW process equipment loop.

To learn more about Liqui-Cel Membrane Contactors, contact us or visit us on-line at www.liquicel.com. To learn more about IMEC, visit them online at www.imec.be.

The High Purity Water Loop at IMEC



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