



February 23, 2009

Mr. Bob Didocha
Business Development Manager
Vertex Commerce, LLC
9244 High Point Rd
Villa Rica, GA 30180

RE: Acceptance of Toray MEMBRAY™ TMR 140 series submerged flat sheet membrane module for use in PACT Compact™ family of Membrane Bioreactor (MBR).

Dear Mr. Didocha:

The Idaho Department of Environmental Quality (DEQ) received a request for approval for the Toray MEMBRAY™ TMR140 membrane modules, as required by Idaho's Rules for the Reclamation and Reuse of Municipal and Industrial Wastewater (IDAPA 58.01.17). The submittal contained a copy of the 14 November 2008 letter, as revised on 7 January 2009, from Jeffery L. Stone, Chief, Recycled Water Unit, Division of Drinking Water, California Department of Public Health. This letter expressed California's acceptance of this membrane technology for water recycling in California.

DEQ accepts this particular membrane filtration technology under the following conditions for Class A wastewater projects in Idaho.

This acceptance is limited to PACT Compact MBR equipment utilizing the Toray MEMBRAY™ TMR140 filtration system. The Polyvinylidene over Polyester (PVDF/PET), non-woven, flat sheet MEMBRAY™ TMR140 membrane module must:

1. Compliment the disinfection process such that system disinfection limits stipulated in IDAPA 58.01.17.600.07 are met.
2. Adhere to the turbidity performance limits stipulated in IDAPA 58.01.17.601.06.b,
 - a. Daily arithmetic mean of all daily turbidity measurements shall not exceed 0.2 NTU, and
 - b. Turbidity shall not exceed 0.5 NTU at any time,
3. Maintain product approval status per IDAPA 58.01.17.601.04.a.iii.

The California approval letter specifically states that this membrane achieved a 1.8 log MS2 virus reduction at the 50th percentile. Be advised that Idaho has modified its rules regarding disinfection requirements for Class A effluent. The combined filtration and disinfection train must achieve 5-log virus removal in addition to the reuse and wastewater rule requirements. This filtration module alone does not meet the minimum virus reduction requirements. This fact may necessitate testing of proposed filtration / disinfection trains utilizing this TMR 140 membrane to verify the combined train's virus inactivation efficacy.

This PVDF/PET, non-woven, flat sheet TMR140 ultra-filtration membrane's specifications and operational parameter requirements must comply with the following tabulated values:

| Toray MEMBRAY™ TMR 140 PVDF/PET non-woven flat sheet | | |
|--|---|--|
| Parameter | Value | Unit |
| Shape | Flat-Sheet | |
| Membrane Material | Polyvinylidene fluoride (PVDF) functional layer over a Polyester (PET) base layer | |
| Nominal Pore Size | 0.08 | Micron (µm) |
| MLSS | 7.0 – 15.0 (18.0 max) | g/L |
| Sludge Viscosity* | < 250 | mPa-s |
| DO | > 1.0 | mg/L (ppm) |
| Maximum Flux | 45.4 | GPD/ft ² |
| Continuous Filtration Flux | 8 – 30 (4.71 – 17.67) | L/m ² -h (GPD/ft ²) |
| Typical Trans-Membrane Pressure (TMP) | 50 - 100 | mbar |
| Air Scour frequency | Continuous | |
| Scouring Air rate | 13 – 20 | NL/min |
| Temperature Range | 5 - 40 | °C |
| pH Range | 5 to 10 | SU |

*: Measured by Rotation – Type viscometer

Idaho DEQ's acceptance is not an endorsement of this technology, nor is it an approval of any other portion of the equipment or of any specific proposed project.

Sincerely,



A.J. Maupin, P.E.
Wastewater Program Engineering Lead
Idaho DEQ, Water Quality Division

AJM/dls

- C: Steve Tanner, P.E., DEQ CDA Regional Office
Tom Moore, P.E., DEQ Lewiston Regional Office
Mark Mason, P.E., DEQ Boise Regional Office
Dave Anderson, DEQ Twin Falls Regional Office
Tom Hepworth, P.E., DEQ Pocatello Regional Office
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