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PWS_6000800_CO_20140528_Challenge Study

Texas Commission on Environmental Quality

Protecting Texas by Reducing and Preventing Pollution

May 28, 2014

Mr. Michael I. Stefanic
Project Manager for UF, MF, and MBR
Toray Membrane USA, Inc.
13435 Danielson St
Poway, CA 92064

Re: Toray HFU-2020N Ultrafiltration Membrane
Review and Approval of Challenge Testing
Removal of Microbial Contaminants

Dear Mr. Stefanic:

Membrane filtration systems installed on, or replaced after, April 1, 2012 for the removal of *Cryptosporidium* and *Giardia* must undergo challenge testing to evaluate the membrane's removal efficiency and for the Texas Commission on Environmental Quality (TCEQ) to establish a challenge test log removal value ($LRV_{C\text{-}Test}$) as required by Title 30 of the Texas Administrative Code (30 TAC) §290.42(g)(3). In addition, these TCEQ regulations require a membrane manufacturer to provide the non-destructive performance test (NDPT) and associated quality control release value (QCRV) that will be used to verify that all manufactured membrane modules that were not subject to challenge testing will achieve at least the same log removal as those that were challenge tested.

CHALLENGE STUDY DATA FOR TORAY HFU-2020N UF MEMBRANE MODULES

We reviewed the submitted challenge study data for compliance with the *Cryptosporidium* treatment requirements in the Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR). The criteria for compliance is found in Title 40 of the Code of Federal Regulations (40 CFR) §141.719(b)(2). Additional guidance for compliance with these requirements can be found in the United States Environmental Protection Agency (USEPA) Membrane Filtration Guidance Manual (EPA 815-R-06-009). The TCEQ reviewed challenge study data presented in *California Department of Public Health, Conditional Acceptance Testing for Toray HFU-2020N Ultrafiltration Membrane,* prepared by MWH Americas, Inc., (in a report dated March 2012) for Toray Industries, Inc. Based on our review, we have determined that the challenge study is compliant with LT2ESWTR requirements. Please review the conditions in the following pages regarding the approved log removal value demonstrated during challenge testing ($LRV_{C\text{-}Test}$) and the NDPT for production membrane modules that did not undergo challenge testing.

TCEQ-APPROVED $LRV_{C\text{-}TEST}$

For the Toray HFU-2020N UF membrane modules, the TCEQ is approving a **$LRV_{C\text{-}Test}$ of 4.7** for the removal of *Cryptosporidium* for systems operated in deposition mode. The $LRV_{C\text{-}Test}$ approval by the TCEQ does not apply to systems operated in a crossflow mode as this hydraulic configuration was not

demonstrated in this challenge test study. The following are the parameters of the approved challenge study:

Full-scale module tested	Toray HFU-2020N UF membrane Modules
Number of Independent Modules Tested	2
Criterion of Selected Modules	Modules that had failed the Non-Destructive Performance Test (NDPT) were selected for testing in accordance with California Department of Public Health Requirements
Serial Numbers of Tested Modules	F29040012 and F210010232
Nondestructive Performance Testing (NDPT)Process	Pressure-Decay Test
Quality Control Release Value (QCRV)	0.029 pounds per square-inch per minute (psi/min)
Challenge Particulate	0.5-micron fluorescent latex microspheres, supplied by Duke Scientific (as a surrogate for *Cryptosporidium*)
Detection Limit	1 object per unit volume
Feed Concentration Range	1.3×10^6 particles/L to 1.8×10^6 particles/L
Test Flux Rate (temperature corrected to 20° C)	100 gallons per square-foot per day (gfd) @ 20° C
Mode of Operation	Deposition mode

LIMITS OF TCEQ-APPROVED $LRV_{C\text{-}Test}$

The TCEQ-approved $LRV_{C\text{-}Test}$ is valid for only the Toray HFU-2020N UF membrane modules operated under the parameters used for the challenge testing and only for modules that have passed the NDPT. From our review of the challenge study, an acceptable Toray HFU-2020N UF membrane module must comply with the following specifications to receive the TCEQ-approved $LRV_{C\text{-}Test}$:

1) Specifications of the approved Toray HFU-2020N UF membrane modules:
   a) Constructed of hydrophilic polyvinylidene fluoride (PVDF) hollow-fiber membranes;
   b) Number of fibers per element is 9,000;
   c) A nominal membrane pore size of 0.01 microns;
   d) A fiber inside diameter of 0.9 millimeters (mm);
   e) A fiber outside diameter of 1.4 mm;
   f) Fiber active length of 70 inches;
   g) Active membrane area per module of 775-ft^2;
   h) An outside-to-inside flow path;
   i) Operational mode: Deposition;
   j) Maximum operating temperature range of 40° C (104° F);
   k) Maximum trans-membrane pressure (TMP) of 45 pounds per square-inch (psi);
   l) A pH operating range of 1 to 10;
   m) Allowable pH range for cleaning of 0 to 12; and
   n) Maximum chlorine tolerance during cleaning of 1,000,000 parts-per-million-hours (ppm-hrs).

2) Prior to shipment to a Texas public water system (PWS), each new Toray HFU-2020N UF membrane module must have passed the NDPT, a pressure-decay test as specified by California Department of Public Health (CDPH) and as described below:
   a) Pressurize the outside of the membrane lumen.
   b) Set and maintain a constant pressure on the outside of the membrane lumen.
   c) Monitor the pressure-decay over time in psi per minute (psi/min).
   d) For the Toray HFU-2020N UF membrane module, the QCRV is 0.029 psi/min.

3) If the Toray HFU-2020N UF membrane module fails the NDPT (where the measured decay rate was greater than the QCRV), the TCEQ shall not allow that Toray HFU-2020N UF membrane module to be installed at any Texas PWS for microbial contaminant removal credit.

4) Toray must notify the TCEQ in writing if the Toray HFU-2020N UF membrane modules are modified or if the NDPT method is modified in any manner. After receiving written notification, the TCEQ shall determine if the modified Toray HFU-2020N UF membrane module shall be required to undergo challenge testing or if the modified NDPT method is acceptable.

5) The TCEQ shall grant log removal credits to Texas PWSs using membrane filtration for *Giardia* and *Cryptosporidium*. The log removal credits shall not exceed the lower of:
   a) The TCEQ-approved $LRV_{C\text{-}Test}$; or,
   b) The maximum removal efficiency that can be verified through a membrane unit's site-specific direct integrity test (LRV_{DIT}).

6) Each Toray HFU-2020N UF membrane module must conform to American National Standards Institute/National Sanitation Foundation (ANSI/NSF) Standard 61 and must be certified by a testing organization accredited by ANSI.

7) Please note that the approved $LRV_{C\text{-}Test}$ is for the current Federal and Texas statutes, and the EPA and TCEQ rules. If any of these statutes or rules are revised, the TCEQ-approved $LRV_{C\text{-}Test}$ in this letter may also be revised.

Please provide a copy of this letter to each of your Texas PWS customers. This letter is **not** to be construed as:

- A granted TCEQ exception for any Texas PWS to use the Toray HFU-2020N UF membrane modules. Each Texas PWS must request and receive site-specific approval to use membrane filtration in accordance with 30 TAC §290.42(g) and §290.39(l);

- TCEQ approval for a Texas PWS to install a Toray HFU-2020N UF membrane module; or

- TCEQ approval for a Texas PWS's required concentration time (CT) study.

If you have any questions about this letter, or if we can be of additional assistance, please contact David Williams, P.E., at the letterhead address, by e-mail at david.a.williams@tceq.texas.gov, or by telephone at (512) 239-0945.

Sincerely,

David A. Williams, P.E.
Technical Review & Oversight Team
Plan & Technical Review Section
Texas Commission on Environmental Quality

for Ada Lichaa, P.G., Manager
Plan & Technical Review Section
Water Supply Division
Texas Commission on Environmental Quality

AL/DAW

cc: Mr. Stephen D. Kallman, S. D. Kallman, L.P., 1106 S. Mays, Suite 100, Round Rock, Texas 78664