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PWS\_6000800\_CO\_20160718\_Challenge Study

## Texas Commission on Environmental Quality

*Protecting Texas by Reducing and Preventing Pollution*

July 18, 2016

Mr. Gary Scharber  
Dow Chemical Company  
1803 Building  
Midland, Michigan 48674

Re: Dow Chemical Company IntegraFlux SFD-2880XP Ultra-Filtration Modules  
Review and Approval of Challenge Testing  
Removal of Microbial Contaminants

Dear Mr. Scharber,

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 membranes' removal efficiency, and for the Texas Commission on Environmental Quality (TCEQ) to establish a challenge test log removal value (LRV<sub>C-Test</sub>) 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, which were not subject to challenge testing, will achieve at least the same log removal as those that were challenge tested.

On March 22, 2016, the TCEQ received a copy of the July 15, 2015 report of the challenge study conducted on the Dow IntegraFlux SFD-2880XP Ultra-Filtration (UF) modules. This letter addresses the review and approval of the challenge study conducted on the Dow IntegraFlux SFD-2880XP UF module.

The NSF International challenge study was conducted in accordance with NSF International (NSF)/American National Standards Institute (ANSI) Standard 419-2015: Public Drinking Water Equipment Performance - Filtration. According to the Test Report, NSF/ANSI Standard 419 is based on the Environmental Technology of Microfiltration Verification (ETV) *Generic Protocol for the Product Specific Challenge Testing of Microfiltration or Ultrafiltration Membrane Modules* (May 2011) and the product-specific challenge testing requirements in the United States Environmental Protection Agency (USEPA) Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR). The criteria for compliance are found in Title 40 of the Federal Code of Regulations (40 CFR) §141.719 as described in the EPA *Membrane Filtration Guidance Manual* (MFGM). The NSF certification of performance is only based on the reduction of *Cryptosporidium* as it is linked to the QCRV.

### **CHALLENGE STUDY DATA FOR SFD-2880XP ULTRA-FILTRATION MEMBRANE MODULES**

We reviewed the submitted challenge study data for compliance with the *Cryptosporidium* treatment requirements in the LT2ESWTR. Specifically, the criteria for compliance is found in 40 CFR §141.719(b)(2). Additional guidance for compliance with these requirements can be found in the USEPA Membrane Filtration Guidance Manual (EPA 815-R-06-009). Based on our review of the challenge study data for the Dow IntegraFlux SFD-2880XP Ultra-Filtration membrane modules, 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 ( $LRV_{C-Test}$ ) and the approved NDPT for production membrane modules that did not undergo challenge testing.

**TCEQ-APPROVED  $LRV_{C-Test}$**

For the Dow IntegraFlux SFD-2880XP Ultra-Filtration Modules, the TCEQ is approving a  $LRV_{C-Test}$  of 6.15 for the removal of *Cryptosporidium* for systems operated in deposition mode. The  $LRV_{C-Test}$  approval by the TCEQ does not apply to systems operated in cross flow 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	Dow IntegraFlux SFD-2880XP Ultra-Filtration Modules
Number of Independent Modules Tested	5
Criterion of Selected Modules	None *
Model Number / Part Number / Serial Numbers of Tested Modules	W0108084, W0108224, W0106274, W0108234, and W0108097
Nondestructive Performance Testing (NDPT) Process	Pressure Decay Test (PDT)
Quality Control Release Value (QCRV)	0.095 pounds per square inch (psi) per minute (min) from 30 psi air pressure over 10 min
Challenge Particulate	<i>Bacillus atrophaeus</i> (as a surrogate for <i>Cryptosporidium</i> ) with an average diameter of 0.8 $\mu$ m, and an average length of 1.8 $\mu$ m
Detection Limit	1 colony forming unit (CFU) per 100 mL
Feed Concentration Range	$1.4 \times 10^6$ to $2.48 \times 10^6$ CFU per 100 mL
Max Filtrate Flux Rate	70 gallons per square-foot per day (gfd) at 25 °C
Mode of Operation / Flow Configuration	Deposition mode / Outside In

\* In regards to the selection of modules for testing, there was no consideration of manufacturing variability. However, the challenge study established a Quality Control Release Value (QCRV) of 0.095 psi/min from 30 psi air pressure over 10 min, based on the pressure decay test results of the modules used to establish the  $LRV_{C-Test}$  (as required by 40 CFR §141.719(b)(2)(vii)). Any membrane module that does not meet the QCRV established in the challenge study is not eligible for the approved  $LRV_{C-Test}$  of 6.15-log.

**LIMITS OF TCEQ-APPROVED  $LRV_{C-Test}$**

The TCEQ-approved  $LRV_{C-Test}$  is valid only for the Dow Membrane Technology (Dow) IntegraFlux SFD-2880XP UF modules operated under the parameters used for this challenge testing and only for modules that have passed the NDPT. From our review of the challenge study, an acceptable IntegraFlux SFD-2880XP UF module must comply with the following specifications to receive the TCEQ-approved  $LRV_{C-Test}$ :

- 1) Specifications of the approved Dow IntegraFlux SFD-2880XP UF modules:
  - a) Polyvinylidene fluoride (PVDF) hollow fiber membranes;
  - b) Nominal membrane pore size of 0.03  $\mu$ m (microns);
  - c) Fiber inner diameter - 0.7 millimeters (mm);
  - d) Fiber outer diameter - 1.3 mm;
  - e) Module diameter - 225 mm;
  - f) Nominal membrane surface area of 829-ft<sup>2</sup>;
  - g) An outside-to-inside flow path;
  - h) Operational mode: deposition (no cross-flow);
  - i) Maximum filtrate flux at 25 °C: 70 gallons per square-foot per day (gfd);
  - j) Maximum operating temperature of 40 °C
  - k) Maximum trans-membrane pressure (TMP) of 36 psi (2.5 bar);
  - l) Operating pH range: 2 - 11; and,
  - m) Maximum chlorine tolerance: 2,000 mg/L.

- 2) For use by public water systems (PWS) in Texas for microbial contaminant removal credit, only Dow IntegraFlux SFD-2880XP UF modules that have been certified by performance by NSF International are allowed. As defined in the NSF International challenge study report (page 8), this means that only modules that have passed a Non-Destructive Performance Test with a Quality Control Release Value (QCRV) of 0.095 psi/min.
- 3) The Dow IntegraFlux UF modules must record the results of the SFD-2880XP UF membrane module's NDPT with the module's assigned unique serial number. The NDPT result for each IntegraFlux SFD-2880XP membrane module delivered to a Texas PWS must be provided upon delivery of the SFD-2880XP UF membrane module to a system.
- 4) The Dow Chemical Company must notify the TCEQ in writing if the IntegraFlux SFD-2880-XP UF membrane modules, or if the NDPT method are modified in any manner. After receiving written notification, the TCEQ shall determine if the modified IntegraFlux SFD-2880-XP UF membrane modules will 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  $LRV_{C-Test}$ ; or,
  - b. The maximum removal efficiency that can be verified through a membrane unit's site specific direct integrity test ( $LRV_{DIT}$ ).
- 6) Each Dow IntegraFlux 2880-XP UF membrane module must conform to American National Standards Institute/NSF International (ANSI/NSF) Standard 61 and must be certified by a testing organization accredited by ANSI.
- 7) Please note that the approved  $LRV_{C-Test}$  is for the current Federal and Texas statutes, and the USEPA and TCEQ rules. If any of these statutes or rules is revised, the TCEQ-approved  $LRV_{C-Test}$  in this letter may also be revised.

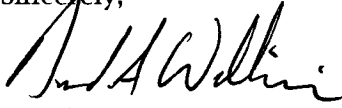
Please provide a copy of this letter to each of your Texas PWS customers. This letter **may not** be construed as:

- A granted TCEQ exception for any Texas PWS to use the Dow IntegraFlux SFD-2880XP UF membrane module. Each Texas PWS must request and receive site-specific approval to use membrane filtration in accordance with 30 TAC §290.42(g)(3) and §290.39(1);
- TCEQ approval for a Texas PWS to install a Dow IntegraFlux SFD-2880XP UF membrane module; or
- TCEQ approval for a Texas PWS's required concentration time (CT) study.

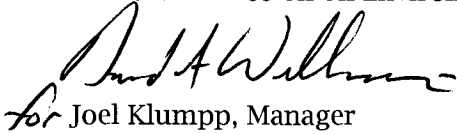
Mr. Gary Scharber  
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If you have any questions about this letter, or if we can be of additional assistance, please contact Ms. Katie Cunningham, at the letterhead address, by e-mail at [katie.cunningham@tceq.texas.gov](mailto:katie.cunningham@tceq.texas.gov), or by telephone at (512) 239-1374.

Sincerely,



David A. Williams, P.E.  
Technical Review and Oversight Team  
Plan and Technical Review Section  
Water Supply Division  
Texas Commission on Environmental Quality



for Joel Klumpp, Manager  
Plan and Technical Review Section  
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JPK/kjc

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