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PWS CG_Travis_CO_20241022_Challenge

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

October 22, 2024

Mr. Christopher Poje, P.E., President/CEO
Cerafiltec US, LLC
1739 Sands Place SE, Suite H
Marietta, Georgia 30067

Re: CERAFILTEC Germany GmbH Blue Filtration 6.0 S - A7 Flat Sheet Ceramic Membranes
Review and Approval of Challenge Testing
Removal of Microbial Contaminants

Dear Mr. Poje:

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-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.

On April 3, 2024, the TCEQ received a copy of the February 17, 2023 report of the challenge study conducted on the CERAFILTEC Germany GmbH Blue Filtration 6.0 S - A7 Flat Sheet Ultrafiltration (UF) Ceramic Membranes. The TCEQ has **reviewed and accepted** the February 17, 2023 challenge study tested to the NSF/ANSI Standard 419-2018: Public Drinking Water Equipment Performance - Filtration. According to the Test Report, the NSF/ANSI Standard 419 is based on the Environmental Technology Verification (ETV) *Generic Protocol for the Product Specific Challenge Testing of Microfiltration or Ultrafiltration 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 NSF certification of performance is based only on reduction of *Cryptosporidium* as it is linked to the QCRV.

CHALLENGE STUDY DATA FOR CERAFILTEC GERMANY GMBH BLUE FILTRATION 6.0 S - A7 FLAT SHEET UF CERAMIC MEMBRANES

We reviewed the submitted challenge study data for compliance with the *Cryptosporidium* treatment requirements in the LT2ESWTR. The criteria for compliance are 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 USEPA Membrane Filtration Guidance Manual (EPA 815-R-06-009). Based on our review of the challenge study data for the CERAFILTEC Germany GmbH Blue Filtration 6.0 S - A7 Flat Sheet Ceramic Membranes, 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 CERAFILTEC Germany GmbH Blue Filtration 6.0 S – A7 Flat Sheet Ceramic Membranes, the TCEQ is approving a LRV_{C-Test} of 5.64 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 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	CERAFILTEC Germany GmbH Blue Filtration 6.0 S – A7 Flat Sheet Ceramic Membranes
Number of Independent Modules Tested	5
Criterion of Selected Modules	None*
Serial Numbers of Tested Modules	MO-B-22-01012, MO-B-22-01009, MO-B-22-01007, MO-B-22-01008, and MO-B-22-01011
Nondestructive Performance Testing (NDPT) Process	Pressure-Decay Test
Quality Control Release Value (QCRV)	0.012 pounds per square-inch per minute (psi/min)
Challenge Particulate	<i>Bacillus atrophaeus</i> American Type Culture Collection (ATCC) number 9372 (as a surrogate for <i>Cryptosporidium</i>) with an average diameter of 0.8 microns (µm) and an average length of 1.8 µm
Detection Limit	1 colony forming unit (CFU) per 100 milliliters (mL)
Feed Concentration Range	1.45 x 10 ⁶ CFU/100 mL to 2.89 x 10 ⁶ CFU/100 mL**
Test Flux Rate (temperature corrected to 20° C)	283.6 – 315.4 gallons per square-foot per day (gfd) @ 20° C
Mode of Operation	Deposition mode

* In regard to the selection of modules for testing, there was no consideration of manufacturing variability. However, the challenge study established a QCRV of 0.012 psi/min based on the highest observed pressure decay results for the modules used to establish the LRV_{C-Test} (as required by 40 CFR 141.719(b)(2)(vii) and as discussed on pages 33 and 34 of the NSF International Test Report). The pre-challenge pressure decay test result for module 1 was excluded as the module had not been fully wetted prior to the test. The pressure decay results of the test modules ranged from 0.008 psi/min to a maximum of 0.012 psi/min. Any membrane module that does not meet the QCRV established in the challenge study is not eligible for the approved LRV_{C-Test} of 5.64-log.

** As allowed by 40 CFR 141.719(b)(2)(iii), the maximum allowable feed concentration is equal to $3.16 \times 10^6 \times \text{Filtrate Detection Limit}$. The goal for the *Bacillus atrophaeus* challenges was to be able to measure the highest feasible log reductions. Therefore, NSF International selected a target of 6.25 log (1.79 x 10⁶ CFU/100 mL) in order to account for less than 100% recovery of the spiked challenge organism concentration and the variability associated with counting of microorganisms. The actual feed concentration ranges are shown in the table above.

LIMITS OF TCEQ-APPROVED LRV_{C-TEST}

The TCEQ-approved LRV_{C-Test} is valid for only the CERAFILTEC Germany GmbH Blue Filtration 6.0 S – A7 Flat Sheet Ceramic Membranes operated under the parameters used for the challenge testing and only for modules that have passed the NDPT. Per our review of the challenge study, an acceptable CERAFILTEC Germany GmbH Blue Filtration 6.0 S – A7 Flat Sheet Ceramic Membranes must comply with the following to receive the TCEQ approved LRV_{C-Test}.

- Specifications of the approved CERAFILTEC Germany GmbH Blue Filtration 6.0 S - A7 Flat Sheet Ceramic Membranes:
 - Constructed of alumina oxide (Al_2O_3) - A7 Ceramic Plate
 - Active membrane area (feed side surface area) of 64.58-ft²
 - Module outside diameter (width): 710 millimeters (mm)
 - Module length: 576 mm
 - Module volume: 6.6 gallons (25 liters)
 - Module weight: 41.2 kilograms (kg) (full)/37.7 kg (dry)
 - Plates per module: 34
 - Filtered water channel (length x width): 2mm x 2mm
 - Outside-to-Inside flow path
 - Operational mode: Deposition
 - Maximum design flux at 20° C: 294.55 gfd
 - Maximum inlet module pressure: 10.15264 psi
 - A temperature tolerance range of 1° C to 65° C (33.8° F to 149° F)
 - Maximum trans-membrane pressure (TMP) of 10.15264 psi
 - A pH tolerance range of 2 to 10
 - Allowable pH range for cleaning of 1 to 11
 - Maximum oxidant tolerance for normal operation: 0.1 wt% bleach (free chlorine)
 - Maximum oxidant tolerance for cleaning: 1 wt% bleach (free chlorine)
- For use by public water systems (PWSs) in Texas for microbial contaminant removal credit, only CERAFILTEC Germany GmbH Blue Filtration 6.0 S - A7 Flat Sheet Ceramic Membranes that have been certified for performance by NSF are allowed. As defined in the NSF challenge study report (see Table 21 on page 35 and the module integrity test description on page 9), this means only modules that have passed a NDPT with a QCRV of 0.012 psi/min for fully wetted membranes (a three minute test with a starting pressure of 15.23 psi).
- The manufacturer, CERAFILTEC Germany GmbH, must record the results of each Blue Filtration 6.0 S - A7 Flat Sheet Ceramic Membrane's NDPT with the module's assigned unique serial number. The NDPT result for each Blue Filtration 6.0 S - A7 flat sheet ceramic membrane delivered to a Texas PWS must be provided upon delivery of the Blue Filtration 6.0 S - A7 flat sheet ceramic membranes to a PWS.
- The manufacturer, CERAFILTEC Germany GmbH, must notify the TCEQ in writing if the Blue Filtration 6.0 S - A7 Flat Sheet Ceramic Membrane modules are modified or if the manufacturer's NDPT method is modified in any manner (3-minute pressure decay test from 15.23 psi). After receiving written notification, the TCEQ shall determine if the modified Blue Filtration 6.0 S - A7 flat sheet ceramic membrane module shall be required to undergo challenge testing or if the modified NDPT method is acceptable.
- 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_{DIR}).
- Each CERAFILTEC Germany GmbH Blue Filtration 6.0 S - A7 Flat Sheet Ceramic Membrane module must conform to ANSI/NSF Standard 61 and must be certified by a testing organization accredited by ANSI.
- 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 are revised, the TCEQ-approved LRV_{C-Test} in this letter may also be revised.

Mr. Christopher Poje, P.E., President/CEO
October 22, 2024
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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 CERAFILTEC Germany GmbH Blue Filtration 6.0 S - A7 Flat Sheet Ceramic Membranes 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 an CERAFILTEC Germany GmbH Blue Filtration 6.0 S - A7 Flat Sheet Ceramic Membranes module; or
- TCEQ approval for a Texas PWS's required concentration time (CT) study.

If you have any questions concerning this letter, or if we can be of additional assistance, please contact Mr. David Williams, P.E., at the letterhead address, by email at david.williams@tceq.texas.gov or by telephone at (512) 239-4674.

Sincerely,



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



Joel Klumpp, Manager
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JPK/daw