Jon Niermann, *Chairman*
Emily Lindley, *Commissioner*
Toby Baker, *Executive Director*

Texas Commission on Environmental Quality

Protecting Texas by Reducing and Preventing Pollution

July 10, 2019

Mr. Chris Lipski, P. Eng.
Suez
3239 Dundas Street West
Oakville, ON L6M 4B2

Re: Suez ZeeWeed® 500D Membrane – 440-ft², 340-ft², 300-ft², 350-ft² Elements
Review and Approval of Challenge Testing
Removal of Microbial Contaminants

Dear Mr. Lipski:

On December 20, 2018, the Texas Commission on Environmental Quality (TCEQ) received your e-mail requesting that three additional Suez ZeeWeed® 500D membrane elements be approved based on the December 2010 *California Department of Public Health, Conditional Acceptance Testing for ZeeWeed®500D Membrane - 440ft²*, prepared by MWH Americas, Inc. The TCEQ approved this challenge study for the 440-ft² elements in a letter dated January 27, 2014. According to your e-mail, the Suez ZeeWeed® 500D membrane elements with active membrane surface areas of 340-ft², 300-ft², and 350-ft² differ from the 440-ft² elements in two or more of the following ways:

- Number of fibers per element;
- Fiber active length; and
- Active membrane module area.

Specifically, the 350-ft² element has the same number of fibers as the 440-ft² element (3,354 fibers) but the fiber active length is 61.2 inches for the 350-ft² element and 75.2 inches for the 440-ft² element. The 340-ft² element has the same fiber active length as the 440-ft² element (75.2 inches) but the number of fibers is 2,640 for the 340-ft² element and 3,354 for the 440-ft² element. The 300-ft² element has both a different fiber active length and a different number of fibers than the 440-ft² element. The 300-ft² element has a fiber active length of 61.2 inches compared to 75.2 inches for the 440-ft² element, and the number of fibers is 2,880 for the 300-ft² element and 3,354 for the 440-ft² element.

Title 40 of the Code of Federal Regulations (40 CFR) §141.719(a)(10) states that "if a previously tested filter is modified in a manner that could change the removal efficiency of the filter product line, challenge testing to demonstrate the removal efficiency of the modified filter must be conducted and submitted to the State." Based on our review of the differences between the previously tested 440-ft² elements and the 340-ft², 300-ft², and 350-ft² elements, the differences are not such that the removal efficiency would be significantly different. In addition, all modules undergo the same non-destructive performance test (NDPT) and the membrane fibers have the same polymer chemistry. The challenge

Consultas y ventas: AQUAREP · www.aquarep.com.ar · info@aquarep.com.ar · WhatsApp +54 9 11 6091-0087

testing of the 440-ft² elements was conducted for membranes operated in both deposition mode and feed-and-bleed mode. These two hydraulic configurations would also apply to the 340-ft², 300-ft², and 350-ft² elements.

We are accepting the previous challenge testing of the 440-ft² elements as acceptable for granting a challenge test log removal value ($LRV_{C\text{-}Test}$) for the 340-ft², 300-ft², and 350-ft² elements. **This letter replaces the January 27, 2014 letter that originally approved the challenge study only for the 440-ft² elements.**

General Information Regarding Challenge Testing in Texas

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 TCEQ to establish a $LRV_{C\text{-}Test}$ 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 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 Suez ZeeWeed® 500D 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 are found in 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 ZeeWeed®500D Membrane - 440ft²*, prepared by MWH Americas, Inc., (in a report dated December 2010) for GE Zenon. We have determined that the challenge study is compliant with LT2ESWTR requirements. Please review the conditions in the following pages regarding the approved $LRV_{C\text{-}Test}$ and the NDPT for production membrane modules that do not undergo challenge testing.

TCEQ-Approved $LRV_{C\text{-}Test}$

For the Suez ZeeWeed® 500D Membrane modules, with active service areas of 340-ft², 300-ft², 350-ft², and 440-ft², the TCEQ is approving a **$LRV_{C\text{-}Test}$ of 6.2** for the removal of *Cryptosporidium* for systems operated in deposition mode and a **$LRV_{C\text{-}Test}$ of 6.1** for the removal of *Cryptosporidium* for the Suez ZeeWeed® 500D Membrane modules for systems operated in feed-and-bleed mode. The following are the parameters of the approved challenge study:

Full-scale module tested	GE Zenon ZeeWeed® 500D Membrane-440 ft² 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	9912000420000003747 and 9912000420000003938
NDPT Process	Pressure-Decay Test
QCRV	0.15 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 (equivalent to 1 object per liter multiplied by the dilution factor used in the preparation)

Feed Concentration Range	1.5 x 10^7 Plaque Forming Units (PFU)/mL to 1.7 x 10^7 PFU/mL
Test Flux Rate	60 gallons per minute per square-foot (gfd)
Modes of Operation	1.) Feed-and-bleed mode at 98% recovery with an average empirically determined Volumetric Concentration Factor (VCF) of 4.1 2.) Deposition mode

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

The TCEQ approved $LRV_{C\text{-}Test}$ is only valid for the Suez ZeeWeed® 500D Membrane modules operated under the parameters that were used for the challenge testing and only for modules that have passed the NDPT. From our review of the challenge study, an acceptable Suez ZeeWeed® 500D Membrane module must comply with the following specifications to receive the TCEQ-approved $LRV_{C\text{-}Test}$:

1) Specifications of the approved Suez ZeeWeed® 500D Membrane modules:
   a) Constructed of hydrophilic non-ionic polyvinylidene fluoride (PVDF) hollow-fiber membranes;
   b) A nominal membrane pore size of 0.04 microns;
   c) A fiber inside diameter of 0.8 millimeters (mm);
   d) A fiber outside diameter of 1.9 mm;
   e) Active membrane areas per module of 440-ft^2, 350-ft^2, 340-ft^2, and 300-ft^2;
   f) An outside to inside flow path;
   g) Operational modes: Direct filtration, Feed-and-bleed;
   h) Operating temperature range of >0° to 40°C (>32° to 104°F);
   i) At ≤ 40°C, a maximum trans-membrane pressure (TMP) of 12 pounds per square-inch (psi);
   j) A pH operating range of 5.0 to 9.5;
   k) Allowable pH range for cleaning of 2.0 to 10.5; and
   l) Maximum chlorine tolerance during cleaning of 500,000 parts-per-million-hours (ppm-hrs).

2) Prior to shipment to a Texas public water system (PWS), each new Suez ZeeWeed® 500D 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 (held-pressure) on the outside of the membrane lumen.
   c) Monitor the pressure-decay over time in psi per minute (psi/min).
   d) For the Suez ZeeWeed® 500D Membrane module, the QCRV is 0.15 psi/min.

3) If the Suez ZeeWeed® 500D Membrane module fails the NDPT (where the measured decay rate was greater than the QCRV), the TCEQ shall not allow that Suez ZeeWeed® 500D Membrane module to be installed at a Texas PWS for microbial contaminant removal credit.

4) Suez must notify the TCEQ in writing if the Suez ZeeWeed® 500D Membrane modules (as challenge-tested by the CDPH) are modified or if the NDPT method is modified in any manner. After receiving written notification, the TCEQ shall determine if the modified Suez ZeeWeed® 500D 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 Suez ZeeWeed® 500D 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 $LRV_{C\text{-}Test}$ 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 TCEQ-granted exception for any Texas PWS to use the Suez ZeeWeed® 500D 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 Suez ZeeWeed® 500D Membrane; or
- TCEQ approval for a Texas PWS's required concentration time (CT) study.

If you have any questions regarding this letter, or if we can be of additional assistance, please contact David A. Williams, P.E., at the letterhead address, by e-mail at 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

Joel Klumpp, Manager
Plan & Technical Review Section
Water Supply Division
Texas Commission on Environmental Quality

JPK/daw

Consultas y ventas: AQUAREP · www.aquarep.com.ar · info@aquarep.com.ar · WhatsApp +54 9 11 6091-0087