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Test methods for electrodeionization stacks

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Foreword

This standard was drafted in accordance with the rules given in GB/T 1.1-2009. This standard was proposed and managed by the National Separation Membrane Standardization Technical Committee (SAC/TC382). Drafting organizations of this standard. Institute of Medical Support Technology, Institute of Systems Engineering, Academy of Military Sciences, Beijing Zhongyang Yongkang Environmental Protection Technology Co., Ltd., Zhejiang Dongda Environmental Engineering Co., Ltd., Nankai University, Tianjin Zhongling Water System Technology Co., Ltd., Hangzhou Annogo Filter Equipment Co., Ltd., Tianjin Ruichun Technology Co., Ltd., Hefei Kejia Polymer Material Technology Co., Ltd., Tianjin Membrane Engineering Technology Limited company. The main drafters of this standard. Liu Hongbin, Ma Jun, Sheng Qing, Jin Wangyong, Wang Jianyou, Li Qi, Zhang Junwei, Chen Qinghua, Wang Yaoming, Wang Hanyi. Test method for electrodeionization membrane stack

1 Scope

China's national test methods for electrodeionization stacks. It specifies the test conditions, the devices, the items, the procedures, the data processing and the reports. Electrodeionization produces ultrapure water continuously, and it replaced the mixed bed ion exchange columns that used to do the job. Those columns work well and must be regenerated with strong acid and caustic, which means downtime, chemical handling and a

corrosive effluent. An EDI stack combines the same ion exchange resin with ion selective membranes and an applied electric field, so that the ions captured by the resin are driven out continuously into a reject stream and the resin regenerates itself. There are no chemicals and no downtime. It is the final polishing step in the water systems of power stations, semiconductor fabs and pharmaceutical plants, where the resistivity required approaches the theoretical limit for water.

2 Normative references

The following documents are indispensable for the application of this document. For dated reference documents, only the dated version applies to this article Pieces. For undated references, the latest version (including all amendments) applies to this document.

GB 9706.1-2007 Medical electrical equipment Part

GB/T 11446.3-2013 General Rules of Electronic Grade Water Test Method

GB/T 11446.4 Test method for resistivity of electronic grade water

GB/T 11446.6 Spectrophotometric test method for silicon dioxide in electronic grade water

GB/T 11446.8 Test method for total organic carbon in electronic grade water

GB/T 17219 Safety evaluation standard for drinking water distribution equipment and protective materials

GB/T 20103-2006 Membrane separation technical terms HY/T 120-2008 Electrodeionization membrane stack (component)

3 Terms and definitions

The following terms and definitions defined in GB/T 20103-2006 and HY/T 120-2008 apply to this document. In order to make Use, the following repeated lists of certain terms and definitions in GB/T 20103-2006 and HY/T 120-2008.

3.1 Electrodeionization Continuous deionization Taking the potential difference as the driving force, using the anion and cation exchange membranes to selectively permeate the anions and cations in the aqueous solution, and the ions of the ion exchanger Exchange and transfer, as well as the regeneration of ion exchangers by H and OH- generated by hydrolysis under concentration polarization conditions, make the aqueous solution The separation process in which the ions in the membrane continuously transfer from one side of the membrane to the other. [HY/T 120-2008, definition 3.1]

3.2 Electrodeionization membrane stack The anion and cation exchange membranes and the partitions and electrodes of the fresh and concentrated water chambers are arranged according to certain rules to form a fresh water chamber, a concentrated water chamber and an electrode chamber. The ion exchanger is filled in the water chamber, or the ion

exchanger is filled in the light and concentrated water chambers, and the electrodeionization is clamped by clamping parts in the form of a plate and frame unit. [HY/T 120-2008, definition 3.2]

3.3 Freshwater Room It is composed of a separator and a negative film facing the anode and a positive film facing the cathode on both sides to reduce the ion concentration of the flowing aqueous solution. Low compartment. [GB/T 20103-2006, definition 3.2.12]

3.4 Thick water chamber It is composed of a separator and a negative film facing the cathode and a positive film facing the anode on both sides to increase the ion concentration of the flowing aqueous solution. Added compartment. [GB/T 20103-2006, definition 3.2.13]

3.5 Electrode chamber The anode frame (or cathode frame) and the anode membrane constitute a compartment through which the anode water passes. [HY/T 120-2008, definition 3.8]

3.6 Water production The effluent of the fresh water chamber of the membrane reactor.

3.7 Thick water The effluent of the concentrated water chamber of the membrane stack.

3.8 Extreme water The effluent of the electrode chamber of the membrane stack.

4 Test conditions

4.1 Testers Testers should meet the following requirements.

a) Fully understand the working principle of electrodeionization, the basic structure of the membrane stack, the test process and the operating procedures;

b) After the actual operation training of this standard.

4.2 Meters and measuring instruments The instruments and measuring instruments used for testing shall comply with the design, installation and use specifications and standards, and shall be verified by a legal metrological institution and be in Within the validity period.

4.3 Influent water quality index During the test, the influent water quality index of the membrane module should meet the requirements of Appendix A, Table A.1.

5 Test device

5.1 Components and piping materials All components and piping materials of the test device should meet the requirements of GB/T 17219.

5.2 Process flow and instrumentation The process flow of the membrane stack test device is shown in Figure B.1 of Appendix B. The accuracy levels of each instrument are as follows:

---Conductivity meter. Class 1.5;

---Resistivity meter. Class 2.0;

---Flow meter. Class 1.0;

---Pressure gauge. Class 1.0;

---Voltmeter. Class 1.0;

6 Test items

The membrane stack test items are as follows:

b) Inlet water flow and outlet water flow;

c) Inlet water pressure;

d) Operating voltage and operating current;

e) Product water resistivity;

f) Water-producing silica;

g) Total organic carbon in produced water;

h) Water recovery rate;

i) Energy consumption of produced water;

j) Protective grounding impedance.

7 Test steps

7.1 Store the influent water that meets the requirements in the original water tank.

7.2 Connect the membrane stack to the test device, connect the ground wire, and close all regulating valves.

7.3 During the test, first open the water outlet regulating valve, start the booster pump, and slowly open the water inlet regulating valve. The water is filtered with a precision filter with a precision of 1 μm. The filter enters the membrane stack until the inlet water flow of the fresh water chamber, concentrated water chamber and electrode chamber of the membrane stack reach their respective rated values. The conductivity meter records the conductivity of the influent water, applies the specified operating voltage to the membrane stack with a DC power supply, reads the operating current, or uses a DC power supply to the membrane stack Apply the specified operating current and read the operating voltage.

7.4 Check the tightness of the membrane stack, if the membrane stack does not leak water, continue to test other performance of the membrane stack.

7.5 After the resistivity of the produced water of the membrane stack is stable for 1 hour, test the following basic performance indicators of the membrane stack and make records.