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Automatically controlled sodium ion exchangers technical specifications

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Foreword

This document is drafted in accordance with the provisions of GB/T 1.1-2020 Rules for Standardization - Part 1: Structure and Drafting Rules of Standard Documents.

This document replaces GB/T 18300-2011 Specifications for Automatic Controlled Sodium Ion Exchangers. Compared with GB/T 18300-2011, in addition to structural adjustments and editorial revisions, the main technical changes are as follows:

- a) Revised the description of Scope (see Chapter 1, Chapter 1 of the 2011 edition);
- b) Revised the definitions of automatic controlled sodium ion exchanger, operating cycle, operating temperature, regeneration, co-current regeneration, counter-current regeneration, displacement and rinse (see 3.1, 3.2, 3.4, 3.7, 3.7.1, 3.7.2, 3.8~3.10, corresponding to 3.1, 3.2, 3.4, 3.7, 3.7.1, 3.7.2, 3.8~3.10 of the 2011 edition); renamed the term flow-initiated regeneration exchanger to flow-type exchanger, time-initiated regeneration exchanger to time-type exchanger, effluent hardness-initiated regeneration exchanger to on-line monitoring-type exchanger, primary sodium ion exchange to primary sodium exchange, secondary sodium ion exchange to secondary sodium exchange, and revised their relevant definitions (see 3.11~3.15, corresponding to 3.11~3.15 of the 2011 edition); added the term full chamber bed and its definition (see 3.19);
- c) Added the category of full chamber bed (see 4.1.1) and its designation M (see Table 1);
- d) Revised the designations for exchanger tank materials (see Table 3, Table 3 of the 2011 edition);
- e) Revised the model examples (see 4.2.2, 4.2.2 of the 2011 edition);
- f) Revised the requirements for fixed bed ion exchange resin bed height, and added requirements for resin filling of full chamber bed ion exchange resin bed (see 5.1.1.3, 5.1.1.3 of the 2011 edition);
- g) Deleted the requirements for time-type exchangers, and added requirements for cycle water production capacity (see 5.1.1.6, 5.1.1.6 of the 2011 edition); deleted the content "If the controller is equipped with a hard water bypass, a solenoid valve shall be added to automatically shut off the effluent during regeneration initiation" (see 5.1.1.7, 5.1.1.7 of the 2011 edition); revised the requirements for exchangers used for industrial equipment water softening and exchanger effluent hardness (see 5.1.1.8, 5.1.1.8 of the 2011 edition);
- h) Revised the requirements for main parameters and performance indicators of exchangers, and added main performance indicator requirements for full chamber beds (see Table 4, Table 4 of the 2011 edition);
- i) Revised the requirements for controllers with operating voltage exceeding 36 V (see 5.1.3.2, 5.1.3.2 of the 2011 edition); added requirements for controllers adopting flow-type control mode, controllers adopting on-line monitoring-type control mode and controllers adopting chip-controlled operation and regeneration programs (see 5.1.3.4~5.1.3.6);
- j) Renamed inlet water temperature to operating temperature, and revised the requirements for free chlorine content in inlet water quality (see Table 5, Table 5 of the 2011 edition);
- k) Added requirements for materials in contact with water for civil-purpose exchangers (see 5.3.2);
- l) Added requirements for tanks made of composite materials such as fiberglass reinforced plastic (FRP) (see 5.4.1);
- m) Added the requirement that "the optional controller, brine solution system, exchanger tank and filled resin shall meet the user's requirements for exchanger water production capacity, cycle water production capacity, effluent quality,

regeneration and other aspects" (see 5.5.2);

n) Added content related to installation and commissioning (see 5.6~5.7);

o) Revised the structure of Inspection and Test Methods, classified inspection and test items by different test objects, and listed corresponding test items, requirements and methods by category (see Chapter 6, Chapter 6 of the 2011 edition);

p) Renamed Material Quality to General Requirements (see 6.1, 6.1 of the 2011 edition); added the requirement that "inspection and testing of automatic controlled sodium ion exchangers include exchanger tank inspection, controller inspection and exchanger performance testing" (see 6.1.2, 6.1.2 of the 2011 edition);

q) Added quality inspection standards for FRP tanks (see 6.2.1.2);

r) Revised the requirements for exchanger tank pressure resistance test (see 6.2.2, 6.4 of the 2011 edition); revised the requirements for hydrostatic pressure test and cyclic pressure test (for non-metallic components only) (see Table 6, Table 6 of the 2011 edition); deleted the relevant requirements for burst pressure test (for non-metallic components only) (see Table 6 of the 2011 edition); added the requirements that "clean water shall be used for pressure resistance test" and "requirements for water used in pressure resistance test of stainless steel tanks" (see 6.2.2.2); added the acceptance criteria for pressure resistance test (see 6.2.2.4);

s) Added test methods and acceptance criteria for trouble-free operation test (see 6.3.1), requirements and test methods for controller insulation dielectric strength and insulation resistance test (see 6.3.2), and acceptance criteria for pressure resistance test (see 6.3.3.2); revised the requirements for controller pressure resistance test and cyclic pressure test (for non-metallic tanks only) (see 6.3.3, 6.4 of the 2011 edition); deleted the requirements and test methods for controller burst pressure test (see Table 6 of the 2011 edition);

t) Added operation and regeneration initiation control performance test (see 6.4.4);

u) Added the definitions, inspection nature and requirements of type test and factory inspection (see 7.1.2, 7.1.3);

v) Revised the normal production interval, extending it from 24 months to 48 months (see 7.1.4, 7.1.2 of the 2011 edition);

w) Deleted the burst pressure test item for exchanger tank and controller components (see Table 7 of the 2011 edition).

Please note that certain contents of this document may involve patents. The issuing authority of this document shall not be liable for identifying any such patents.

This document is proposed and under the jurisdiction of the National Technical Committee on Standardization of Boilers and Pressure Vessels (SAC/TC262).

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This document was first issued in 2001, first revised in 2011, and this is the second revision.

Automatically controlled sodium ion exchangers technical specifications

1 Scope

This document specifies the classification and model designations, technical requirements, inspection and test methods, inspection rules, as well as marking, packaging, transportation and storage of automatic controlled sodium ion exchangers.

This document is applicable to sodium ion exchangers with automatic control via multi-port valves and a working pressure not exceeding 0.6 MPa.

This document is not applicable to fluidized bed, moving bed and non-automatic controlled sodium ion exchangers.

2 Normative References

The contents of the following documents are indispensable provisions of this document through normative reference in the text. For dated referenced documents, only the versions corresponding to the specified dates shall apply to this document; for undated referenced documents, the latest versions (including all amendments) shall apply to this document.

GB/T 1576 Industrial Boiler Water Quality

GB/T 3854 Barcol Hardness Test Method for Reinforced Plastics

GB/T 5462 Industrial Salt

GB/T 6909 Analytical Methods for Boiler Water and Cooling Water—Determination of Hardness

GB/T 13384 General Technical Requirements for Packaging of Mechanical and Electrical Products

GB/T 13659 001×7 Strongly Acidic Styrene Series Cation Exchange Resin

GB/T 13922 Performance Test of Water Treatment Equipment

GB/T 15453 Determination of Chloride Ions in Industrial Circulating Cooling Water and Boiler Water

GB/T 17219 Safety Evaluation Standard for Drinking Water Distribution Equipment and Protective Materials

GB/T 26747 Composite Material Tanks for Water Treatment Devices

GB/T 50109 Code for Design of Industrial Water Softening and Demineralization

NB/T 10790 Technical Specifications for Water Treatment Equipment

3 Terms and Definitions

The terms and definitions specified in GB/T 13922 and the following apply to this document.

3.1 automatic controlled sodium ion exchanger

An ion exchanger that uses sodium salt as the regenerant and is capable of automatically initiating the operation and regeneration processes according to preset conditions.

Note: Referred to as "exchanger" for short.

3.2 service cycle

The cumulative operating time of the exchanger within a single cycle, starting from the commissioning after regeneration to produce softened water under rated water production capacity, until the effluent hardness fails to meet the requirements.

3.3 working pressure

The gauge pressure of the inlet water at the exchanger inlet.

3.4 working temperature

The temperature of the inlet water at the exchanger inlet.

3.5 operation

The process in which water passes through the ion exchange resin bed inside the exchanger to remove most or all calcium and magnesium ions from the water.

3.6 backwash

After the ion exchange resin is exhausted, a process in which water is used to wash the resin bed from bottom to top to expand and loosen the resin, while removing impurities such as suspended solids and broken resin on the upper part of the resin bed.

3.7 regeneration

The process of restoring the exchange capacity of exhausted ion exchange resin.

3.7.1 co-current regeneration

A regeneration process in which the flow direction of the regenerant solution is consistent with that of the water during operation.

3.7.2 counter-current regeneration

A regeneration process in which the flow direction of the regenerant solution is opposite to that of the water during operation.

3.8 displacement

After stopping the injection of the regenerant solution into the exchanger, a process in which clean water is continuously injected in the same flow direction and at a similar flow rate as the regenerant solution, to further regenerate the resin with the residual regenerant solution inside the exchanger and discharge the regeneration waste liquid simultaneously.

3.9 rinse

A process in which inlet water is used to wash the ion exchange resin bed in the same flow direction as during operation, after the completion of the displacement process or before the commissioning of a standby or idle exchanger, to rinse off the regeneration waste liquid and ions to be removed until the effluent quality meets the requirements.

3.10 automatic controlled multi-port valve

An integrated device that can form multiple different fluid flow paths and is controlled automatically according to a preset program.

Note: Referred to as "controller" for short.

3.11 flow-type exchanger

An exchanger equipped with a flow controller to monitor the cycle water production capacity, which can automatically initiate the regeneration process when the accumulated cycle water production reaches the preset value.

3.12 time-type exchanger

An exchanger equipped with a time controller to monitor the cycle operation duration, which can automatically initiate the regeneration process when the accumulated operating time reaches the preset value.

3.13 on-line monitoring-type exchanger

An exchanger equipped with a hardness monitor to detect the effluent hardness, which can automatically initiate the regeneration process when the effluent hardness exceeds the preset value.

3.14 one-stage sodium exchange

A process in which the inlet water undergoes sodium ion exchange only once through a single sodium ion exchanger.