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Standard Guide for Record Keeping for Electrodialysis/Electrodialysis Reversal Systems[1]

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1. Scope

1.1 This guide covers procedures for well defined record keeping for electrodialysis (ED) and electrodialysis reversal (EDR) systems.

1.2 This guide includes a start up report and record keeping for ED/EDR and pretreatment operating and maintenance data.

1.3 This guide is applicable to all waters but is not necessarily complete for waste waters.

1.4 This is a guide only and should not be construed as a complete delineation of all record keeping required for a specific application.

1.5 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D1125 Test Methods for Electrical Conductivity and Resistivity of Water

D1129 Terminology Relating to Water

D1253 Test Method for Residual Chlorine in Water

D1889 Test Method for Turbidity of Water (Withdrawn 2007)[3]

D4189 Test Method for Silt Density Index (SDI) of Water

D5091 Guide for Water Analysis for Electrodialysis/Electrodialysis Reversal Applications

3. Terminology

3.1 *Definitions*—For definitions of terms used in this guide refer to Terminology D1129.

4. Significance and Use

4.1 Proper operation and maintenance of an ED/EDR system and any associated pretreatment system are key factors in obtaining optimum performance. This guide provides the necessary input data for the evaluation of the performance of the ED/EDR system, the pretreatment system, and the mechanical equipment in the plant.

4.2 This guide is for general guidance only and must not be used in place of the operating manuals and manufacturer's recommendations for specific equipment or a specific application.

4.3 Site dependent, equipment design and regulatory requirement factors prevent specific recommendations for all record keeping. Thus, only general record keeping relating to operation and maintenance is covered by this guide.

5. Procedure

5.1 *Start Up Report:*

5.1.1 Provide a complete description of the water source, pretreatment system, ED/EDR plant, and post treatment equipment. This can be done by using the system flow diagram and equipment material and instrumentation lists.

5.1.2 Provide a listing of all specific chemicals used with their design dosage rates.

5.1.3 Provide a listing of all design parameters for pressures, flows, water analysis for raw water and ED/EDR feed product and brine waste, temperature, and dc power applied to the ED/EDR system.

5.1.4 Provide a record of instrument calibrations in accordance with manufacturers recommendations.

5.1.5 Record initial performance of the pretreatment, ED/EDR, and post treatment systems as provided in 5.1, 5.3, and 5.4 respectively.

5.2 *ED/EDR Operating Data:*

NOTE 1—ED/EDR process monitoring equipment and site specific monitoring equipment vary with manufacturer's designs. Consult the

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] The last approved version of this historical standard is referenced on www.astm.org.

equipment manufacturer to determine the specific listed items to be monitored.

NOTE 2—The periodic polarity reversal in reversing electrodialysis systems upsets the process equilibrium. Data should not be taken during the period of reversal. Consult the equipment manufacturer to determine the periods of time at which operating data should be taken.

5.2.1 The recommended minimum frequency of data collection is daily unless otherwise noted. On large or critical systems more frequent data collection, such as once per shift, for daily items, may be justified.

5.2.2 Record applicable pressures, including

5.2.2.1 Feed pump discharge pressure,

5.2.2.2 Cartridge filter inlet pressure,

5.2.2.3 Cartridge filter outlet pressure,

5.2.2.4 Brine pump discharge pressure,

5.2.2.5 Feed pressure to stack(s),

5.2.2.6 Brine pressure to stack(s),

5.2.2.7 Product pressure from stack(s),

5.2.2.8 Brine pressure from stack(s),

5.2.2.9 Feed/brine inlet differential pressure to stack(s),

5.2.2.10 Product/brine outlet differential pressure from stack(s), and

5.2.2.11 Electrode feed inlet pressure.

5.2.3 Record applicable flows, including

5.2.3.1 Total supply flow,

5.2.3.2 Dilute flow,

5.2.3.3 Brine flow,

5.2.3.4 Brine makeup flow,

5.2.3.5 Product flow, and

5.2.3.6 Electrode flows.

5.2.4 Record dc voltage and amperes applied to each electrical stage in each stack.

5.2.5 Record temperature of feed to the stacks.

5.2.6 Record the conductivity of the feed, product and brine waste. For conductivity measurements use Test Methods D1125.

5.2.7 Unless known to be completely absent, record the concentration of free residual chlorine in the ED/EDR feed. Use Test Method D1253.

5.2.8 Record the elapsed operating time whenever operating data is taken.

5.2.9 Record input power consumption if applicable.

5.2.10 Record dosage settings and supply levels of chemical feeds, if applicable.

5.2.11 Record the turbidity or silt density index (SDI) or both of the ED/EDR feedstream. Consult the equipment supplier for recommended data collection frequency. Use Test Method D4189 for SDI and Test Methods D1889 for turbidity (nephelometric turbidity).

5.2.12 Record any unusual incidents, for example, upsets in pretreatment and chemical additions, abnormal pressures, and shutdowns.

5.2.13 Obtain complete water analysis of the ED/EDR feed, product and brine streams, and the raw water at start up and every six months thereafter. The analysis shall include the following:

Sodium (Na^{+})	Chloride (Cl^{-})
Calcium (Ca^{++})	Bicarbonate (HCO_3^{-})
Magnesium (Mg^{++})	Sulfate (SO_4^{--})
pH	Conductivity
Total dissolved solids	

Perform additional analysis in accordance with the manufacturer's recommendations for the specific site; analyses may include, but not be limited to, the following:

Potassium (K^{+})	Carbonate (CO_3^{--})
Iron (Fe), total and dissolved	Nitrate (NO_3^{-})
Manganese (Mn), total and dissolved	Fluoride (F^{-})
Strontium (Sr^{++})	Total Organic Carbon (TOC)
Barium (Ba^{++})	Sulfide Ion (S^{--})
Aluminum (Al)	

For all analysis use the test methods referenced in Guide D5091.

5.3 *Pretreatment Data:*

5.3.1 Record the operating data for the pretreatment equipment. Since pretreatment is site dependent, specific recommendations for all record keeping cannot be given.

5.3.2 Record discharge pressure of any well or booster pump once per day.

5.3.3 Record inlet and outlet pressure of any filters once per day.

5.3.4 Record any chemical dosage rates and supply levels once per day.

5.3.5 Record the quantities of any additions to a chemical supply when they are made.

5.3.6 Record any unusual incidents, for example upsets, equipment failures, or shut downs.

5.3.7 Record any other data applicable to the pretreatment in accordance with the equipment suppliers' recommendations.

5.4 *Maintenance Data:*

5.4.1 Record a schedule for routine inspection and maintenance. Since equipment is site dependent, specific recommendations for all routine inspection and maintenance cannot be given. Consult the equipment suppliers and the equipment manuals for specific recommendations.

5.4.2 Record all scheduled inspections and maintenance performed.

5.4.3 Record service to any filter, for example, back washing of media filters and cartridge filter changes.

5.4.4 Record all special inspections, repairs, and replacements.

5.4.5 Record any changes of chemicals or chemical dosages used.

5.4.6 Record any changes or additions to plant equipment, or controls.

5.4.7 Record all cleanings of the ED/EDR stacks. Include duration of cleaning, type, and quantity of cleaning chemicals used.

5.4.8 Check ED/EDR stacks for malfunctions in accordance with the manufacturers recommended procedure and frequency, but in no case less frequently than once each month and within 1 h of returning to service after any disassembly.

5.4.9 Record all repairs to ED/EDR stacks. Include a description of the problem, a description of components, and their quantity replaced, and the disposition of components replaced.

6. Keywords

6.1 desalination; electrodialysis; records