
Oprema za zimska vzdrževalna dela - Sistemi za proizvodnjo slanice - Zahteve in preskusne metode

Winter service equipment - Brine production systems - Requirements and test methods

Winterdienstsausrüstung - Soleerzeugungsanlagen - Anforderungen und Prüfmethoden

Matériels de viabilité hivernal - Unités de production de saumure - Exigences et méthodes d'essais

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**Winter service equipment - Brine production systems -
Requirements and test methods**

Matériels de viabilité hivernal - Unités de production
de saumure - Exigences et méthodes d'essais

Winterdienstsausrüstung - Soleerzeugungsanlagen -
Anforderungen und Prüfmethode

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COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Contents

European foreword.....	4
Introduction	5
1 Scope	6
2 Normative references	6
3 Terms and definitions	6
4 Materials.....	7
4.1 Chlorides	7
4.2 Water	7
5 Requirements	8
5.1 Brine production capacity	8
5.2 Brine concentration	8
5.3 Brine purity	8
5.3.1 General	8
5.3.2 Content of water insoluble matter	8
5.3.3 Size of suspended particles	9
5.4 Other requirements	9
5.4.1 Additional components	9
5.4.2 Pumping system	10
5.4.3 Blending systems.....	10
5.4.4 Protection of the environment.....	10
6 Sampling.....	10
7 Test methods	10
7.1 General	10
7.2 Brine production capacity	11
7.2.1 Direct method.....	11
7.2.2 Indirect method	11
7.3 Brine concentration	12
7.4 Brine purity	12
7.4.1 Content of water insoluble matter	12
7.4.2 Content of water insoluble matter	12
7.4.3 Size of suspended particles	12
8 Safety	12
Annex A (informative) Systems for continuous and batch production of brine (examples, schematic drawings)	13
A.1 Water flow through stationary bulk salts (NaCl, CaCl ₂ , MgCl ₂)	13
A.1.1 Upward water flow design	13
A.1.2 Downward water flow design.....	14
A.2 Forced circulation design (batch operation)	14
A.3 Blending systems.....	15
A.3.1 Dilution of concentrated brines.....	15
A.3.2 Mixing of NaCl brine with other brines (CaCl ₂ , MgCl ₂) and additives.....	15

Annex B (normative) Sampling.....	16
B.1 Sampling of brine.....	16
B.2 Labelling and distribution of samples	16
B.3 Sampling report	16
Annex C (normative) Conversion factors: Used amount of water/produced quantity of brine	18
C.1 Dissolution of dry sodium chloride.....	18
C.2 Dissolution of calcium chloride, 77 % (flakes).....	18
C.3 Dissolution of calcium chloride, anhydrous, 96 % (prills).....	18
C.4 Dissolution of magnesium chloride, hexahydrate, 47 % (flakes, pellets).....	19
Bibliography	20

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oSIST prEN 17443:2020

<https://standards.iteh.ai/catalog/standards/sist/fd5a2580-b8b8-4624-b64f-198a7cd915cb/osist-pren-17443-2020>

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European foreword

This document (prEN 17443:2019) has been prepared by Technical Committee CEN/TC 337 “Road operation equipment and products”, the secretariat of which is held by AFNOR.

This document is currently submitted to the CEN Enquiry.

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Introduction

De-icing agents in solid and liquid form are important for the winter maintenance of roads. They can prevent respectively eliminate slippery road conditions. Brines are used for anti-icing (preventive winter maintenance) and de-icing (curative winter maintenance) in pure form or in mixture with solid sodium chloride as pre-wetted salt.

The document describes the requirements for brine production systems and their testing methods.

The aim of this document is an easy description of the product specifications for tenders and other purchasing procedures.

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1 Scope

This document specifies the essential requirements of stationary systems for production of brines for winter road maintenance and includes tests of these requirements. Installation boundary: chloride and water inlet to the saturator, brine outlet to the spreading machine. Within the scope are brine storage and brine loading/unloading equipment also.

The following points are not covered by this document:

- System and construction requirements;
- Requirements according national and European legislations.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 15144, *Winter maintenance equipment - Terminology - Terms for winter maintenance*

EN 16811-1, *Winter service equipment and products - De-icing agents - Part 1: Sodium chloride - Requirements and test methods*

EN 16811-2, *Winter service equipment and products - De-icing agents - Part 2: Calcium chloride and Magnesium chloride - Requirements and test methods*

ISO 2479, *Sodium chloride for industrial use — Determination of matter insoluble in water or in acid and preparation of principal solutions for other determinations*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 15144, EN 16811-1, EN 16811-2 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at <https://www.iso.org/obp>

— IEC Electropedia: available at <http://www.electropedia.org/>

3.1 brine

solution of chlorides (sodium chloride, NaCl; calcium chloride, CaCl₂; magnesium chloride, MgCl₂) or of combinations of these chlorides in water

Note 1 to entry: Sodium chloride can be rock salt, solar salt/sea salt or vacuum salt. Further feedstock can be by-product sodium chloride.

3.2 brine production system

equipment for dissolving chlorides in water (saturator), including brine dilution to the concentration for application in winter road maintenance, and brine storage, as well as pumping system (loading/unloading), measurement, control technology and blending system (see Annex A)

3.3

brine production capacity

hourly produced litres brine with the desired concentration

4 Materials

4.1 Chlorides

The quality of the chlorides (NaCl , CaCl_2 , MgCl_2) shall be in accordance with EN 16811-1 and EN 16811-2 respectively.

The sodium chloride (NaCl) has different granulometry and purity, dependent from the production type (rock salt, sea/solar salt, vacuum salt) or from the production site (mine, etc.). Varying granulometry influences the dissolving properties. Impurities such as water insoluble matter (silicates) and poorly water and brine soluble calcium sulfate in salts cause an additional expenditure for their removal from the brine production system. The NaCl and sulfate content of sodium chloride can be specified within the limits of EN 16811-1 by the buyer depending on his individual needs. It can also be specified within these limits at the national level (national annexes to this European Standard).

The characteristics of the delivered chloride shall be guaranteed and verified by the buyer. A product information according to EN 16811-1:2016, A.1 resp. EN 16811-2:2016, A.1/A.2, delivered by the salt supplier, shall be available. The buyer informs the manufacturer with the product information sheet which chloride qualities are available.

4.2 Water

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For brine production systems in principle suitable are drinking water (tap water), water from rivers, lakes, ponds, well water, collected water from road maintenance depots, etc.

Water to be used in case of production of brines out of NaCl , CaCl_2 and MgCl_2 or dilute brines should be of a quality which allows the production of brines within the allowed values for heavy metals, arsenic and hydrocarbons (NaCl brine according to EN 16811-1:2016, Table 6; CaCl_2 and MgCl_2 brines according to EN 16811-2:2016, Table 8). Water for dissolving can be with a content of chloride. Water for dilution should be better without chloride.

Sulphate, expressed as SO_4 , in the standards EN 16811-1 and EN 16811-2 is specified differently (those values are for NaCl brine less than 0,6 % in a 10 % brine, for CaCl_2 brine less than 0,5 % calculated for the anhydrous product and for MgCl_2 brine less than 1,0 % in a 10 % brine). In the water to be used, sulphate should be less than 1 g SO_4 per litre, and the resulting brine should be according to the brine specifications in the standards EN 16811-1 and EN 16811-2.

The content of water insoluble matter and size of suspended particles in the water shall conform in total to the requirements for water insoluble matter in brine (5.3.1, Table 1 and 5.3.2).

The equipment supplier should receive the specification of the intended water and check the conformity of the values with the requirements. If necessary, a prior water treatment or an adaptation of the brine production system shall be carried out.

NOTE 1 Water with a high hardness can lead during the brine production with calcium chloride and rock salts to precipitation of calcium carbonate.

NOTE 2 Iron chloride in water acts as flocculant and causes problems in brine filters on spreading machines.

Content of chloride from water which is used for dilution of brine shall guarantee desired brine concentration.

5 Requirements

5.1 Brine production capacity

The nominal brine production capacity depends on following conditions:

- Adequate chloride and water supply;
- Chloride quality;
- Water temperature;
- Air temperature;
- Wind speed;
- Rapid temperature drop;
- Production interruption lasting several days;

Considering these conditions, a tolerance of max. -5 % of the nominal brine production capacity (l brine/hr) is acceptable. The clean-out time shall be accounted for in production capacities.

5.2 Brine concentration

Consistent quality: The desired brine concentration is constantly produced over the production period. Concentration levels of the produced brine are continuously monitored behind blending system resp. circulation system to ensure brine meets the specification. Brines which are out of specification shall be rejected and diluted, if too high in concentration, or re-introduced to the saturator, if below the desired concentration. This specification is valid for all brine production systems except brine production in batches (A.2).

Tolerance: A tolerance of not more than $\pm 1,0$ weight % of the desired brine concentration is acceptable.

NOTE The desired brine concentration is specified by the equipment buyer.

Brine production systems shall ensure that pure and diluted brine doesn't create problems with crystallization in valves, pumps and nozzles. Especially sodium chloride brine should not be more concentrated than 22 weight % (tolerance $\pm 1,0$ weight %).

5.3 Brine purity

5.3.1 General

The requirements are valid for the brine that goes into the spreading vehicle (direct from brine maker or from separate brine tank). The requirements are in line with the requirements for solutions of chlorides in EN 16811-1 and EN 16811-2.

5.3.2 Content of water insoluble matter

The total content of water insoluble matter in the produced brine shall conform with the requirements in Table 1.

Table 1 – Total content of water insoluble matter in brine

Brine	Limit (weight %)
Sodium chloride (NaCl)	max. 0,03
Calcium chloride (CaCl ₂)	max. 0,2
Magnesium chloride (MgCl ₂)	max. 0,1

The limits for the total content of water insoluble matter in brines are based on the concentration range 17,5 to 22 weight %.

NOTE Water insoluble matter (silicates), calcium sulphate (anhydrite, gypsum), calcium carbonate and solid sodium chloride can be suspended in brine.

5.3.3 Size of suspended particles

The size of suspended particles shall be not bigger than 0,5 mm.

5.4 Other requirements

5.4.1 Additional components

The brine production system shall be equipped with the following components:

- Back-flow preventer, if connected to the drinking water system;
- Brine level control (e.g. pressure sensor): min./max. or continuously (corresponds with brine overflow protection);
- Unload option which enables to unload brine from trucks if not all brine is used;
- Brine leakage monitoring, with an automatic stop of the brine production in case of leakage;
- Dry-running protection for brine pump;
- Emergency interruption system (brake away coupling) together with non-drip tube couplings;
- Equipment for manual or automatic purge of undissolved solids, if impure chlorides are used. The required cleaning cycles, including the time requirement, shall be specified, depending of the chloride purity. The separated brine from the purge shall be reintroduced into the dissolving process. The percentage of the purged material shall be specified. Optional: Unit for treatment of undissolved matter with fresh water to remove chloride depending on the way of disposal;
- Brine purification, if necessary, e.g. with filter or hydrocyclone; filters should be sized for the desired flow rate (see 5.4.2);
- Freeze protection of water pipes, water flowmeter, etc. by isolation and heating pads or heating cables, with a minimum thermostat temperature of +3°C;
- Optional: Level indicator for bulk material (chloride), e.g. rotating paddle;
- Optional: Speed controlled brine pumps with soft starter (necessary for big pumps only, example: loading spreading machines with a total tank capacity of more than 4 000 l);