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Non-food compounds used in food processing establishments — Requirements —

Part 2:

Detergents used for cleaning purposes

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Foreword

Rwanda Standards are prepared by Technical Committees and approved by Rwanda Standards Board (RSB) Board of Directors in accordance with the procedures of RSB, in compliance with Annex 3 of the World Trade Organisation/Technical Barrier to Trade (WTO/TBT) agreement on the preparation, adoption and application of standards.

The main task of technical committees is to prepare national standards. Final Draft Rwanda Standards adopted by Technical committees are ratified by members of RSB Board of Directors for publication and gazettment as Rwanda Standards.

CD 234-2 was prepared by Technical Committee RSB/TC 024, *Chemicals and Consumer Products*.

In the preparation of this standard, reference was made to the following standards:

1) KS 2117: Acidic detergents for 'Cleaning-in-place' in food and beverage industry — Specification

2) KS 2119: Heavy duty alkaline detergents for 'Cleaning-in-place' in food and beverage industry — Specification

The assistance derived from the above source is hereby acknowledged with thanks.

This second edition cancels and replaces the first edition (RS 234-2: 2014), which has been technically revised.

DRS 234 consists of the following parts, under the general title *Non-food compounds used in food processing establishments — Requirements*:

— *Part 1: Food-grade lubricants*

— *Part 2: Detergents used for cleaning purposes*

Committee membership

The following organizations were represented on the Technical Committee on Chemicals and Consumer Products (RSB/TC 024) in the preparation of this standard.

Star Construction and Consultancy (SCC) Ltd

Rwanda Forensic Laboratory (RFL)

National Industrial Research and Development Agency (NIRDA)

University of Rwanda/College of sciences and Technology (UR/CST)

University of Kibungo (UNIK)

Ministry of Health (MoH)

PHARMALAB

BARANYUZWE Cosmetics Ltd

Rwanda Standards Board (RSB) – Secretariat

Introduction

The cleaning agent helps to loosen the contaminating substances and suspend them in the solution so that they can be rinsed out with the cleaning solution. In addition, the cleaning agent must prevent calcium and magnesium from forming limescale (limescale is a deposit which mainly consists of calcium and magnesium). The cleaning agent may be acidic or alkaline. Alkaline cleaning agents are often the standard type of agent used. Acidic cleaning agents are used subsequently, for example once a week, to remove limescale. Disinfectants are used to kill bacteria. Disinfectants often consist of chlorine or chlorine compounds. In some alternative washing systems, disinfection is replaced by high heat.

Non-food compounds used in food processing establishments — Requirements — Part 2: Detergents used for cleaning purposes

1 Scope

This Committee Draft prescribes specific quality requirements and minimum safety requirements for both acidic and alkaline detergents used for cleaning food processing equipment, machinery, piping, etc., made of stainless steel in a food processing establishments where such detergents may come in contact with food.

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.

RS ISO 4316, *Surface active agents — Determination of pH of aqueous solution — Potentiometric method*

RS ISO 684, *Analysis of soaps — Determination of total free alkali*

ISO 4314, *Surface active agents — Determination of free alkalinity or free acidity — Titrimetric method*

RS EAS 814, *Determination of the biodegradability of surfactants*

3 Terms and definitions

For the purposes of this standard, the following terms and definitions apply.

3.1

soil

any residue, scale and other deposits to be removed from the food and beverage contact surface during the cleaning process

3.2

use dilution

minimum concentration of the detergent, in water, that the manufacturer has recommended for acid cleaning

3.3

Cleaning-In-Place (CIP)

method for cleaning equipment, using no direct mechanical aid to remove the soil but depending on solution flows, temperature and the properties of the detergent solution

3.4

use temperature

temperature that the supplier/manufacturer recommends for a specific application. Cold is between 1 ºC and 35 ºC, warm between 36 ºC and 59 ºC, and hot is 60 ºC and above.

4 Classification

The detergents used for cleaning food processing equipment may be acidic or alkaline, and depending on their application, they are classified as follows:

4.1 Acidic detergents — include organic and inorganic acids. The most common inorganic acids used include phosphoric, nitric, sulfamic, sodium acid sulfate, and hydrochloric. Organic acids, such as hydroxyacetic, citric, and gluconic, are also in use. They are often used in a two-step sequential cleaning regime with alkaline detergents. Acidic detergents are also used for the prevention or removal of stone films (mineral stone, beer stone, or milk stone).

4.2 Alkaline detergents — *Highly alkaline detergents* (or heavy-duty detergents) use caustic soda (sodium hydroxide) or caustic potash (potassium hydroxide). An important property of these detergents is that they saponify fats: forming soap. These cleaners are used in many CIP systems or bottle-washing applications. *Moderately Alkaline Detergents* include sodium, potassium, or ammonium salts of phosphates, silicates, or carbonates. Tri-sodium phosphate (TSP) is one of the oldest and most effective. Silicates are most often used as a corrosion inhibitor. Because of interaction with calcium and magnesium and film formation, carbonate-based detergents are of only limited use in food processing cleaning regimes.

5 Requirements

5.1 General requirements

5.1.1 Raw materials used in manufacturing and formulating the detergent shall be suitable for use in a food establishment. The detergent shall not contain ingredients which are known to be toxic to humans or form toxic by product during or after use. It may contain chlorine as a disinfecting agent.

5.1.2 The detergent shall not contain perfume, fragrance or deodorizer. It shall neither impart any colour, odour or flavour to food products; nor leave an objectionable odour to the equipment being cleaned if used in accordance with the manufacturer's instructions.

5.1.3 The detergent shall be biodegradable when tested in accordance with RS EAS 814.

5.1.4 The detergent shall be in liquid or in powder form.

5.1.5 The detergent in powder form shall be homogenous, off-white colour, free flowing and free form foreign matters.

5.1.6 The detergent in liquid form shall be colourless, clear to light brown liquid.

5.2 Specific requirements

5.2.1 The product shall comply with the specific requirements given in table 1 when tested in accordance with the methods indicated therein.

Table 1 – Specific requirements for detergents used for cleaning purposes

S/N	Parameters		Requirements					Test methods
			Acidic	Alkaline				
				Powder		Liquid		
				With chlorine	Chlorine free	With chlorine	Chlorine free	
1	Acidity, % by mass, max.		7.0	—	—	—	—	ISO 4314
2	Alkalinity, % by mass, max.	As NaOH	—	12	83	40	12	RS ISO 684
		As Na_2O	—	10	65	—	—	
3	pH, 1% solution, min.		≤ 3.5	8 – 13	12	11	12	RS ISO 4316
4	Available chlorine, % by mass, max.		—	2	—	2	—	Annex A

5.2.2 Corrosion

The detergent shall pass the test when tested in accordance with Annex B at the use-dilution and maximum use temperature recommended by the manufacturer.

5.2.3 Freedom from grit

A solution of the detergent in powder from prepared at twice the concentration of the use-dilution at the recommended temperature, using more than 5 g of the product, shall completely dissolve and the solution shall be free from grit and residue shall be easily rinseable.

5.2.4 Alkaline

The alkaline detergent shall show acceptable cleaning efficacy when used with water of up to 200 mg/L (expressed as calcium carbonate, $CaCO_3$) hardness.

6 Packaging, labelling and storage

6.1 Packaging

The product shall be packaged in containers that are strong enough and appropriate to permit normal usage and transportation of the detergent, to prevent contamination, loss and gain of moisture.

6.2 Labelling

Each package shall be legibly, clearly and indelibly labelled with the following information:

a) Name and nature of the detergent, similar or closely similar to: acidic/alkaline detergent for use in cleaning food processing equipment;

b) Manufacturer's name and physical address including the country of origin;

c) Net content in SI units;

d) Batch number;

e) Date of manufacture and the best before date;

f) List of ingredients in descending order;

g) Degree of foaming;

h) Detailed instructions of use including necessary precautions;

i) Storage and disposal instructions; and

j) Available chlorine (or other disinfectants) if claimed.

6.3 Storage

The detergent shall be stored in a designated, dry and well-ventilated area which shall be separated from all food production, storage and handling areas such that no possibility of cross-contamination of food exists.

Annex A
(normative)

Determination of available chlorine

A.1 Reagents

A.1.1 Crystalline potassium iodide (iodate free)

A.1.2 Glacial acetic acid

A.1.3 Potassium dichromate solution, 0.1 N — Carefully pulverize a quantity of potassium dichromate ($K_2Cr_2O_7$) and dry at 110 ºC ± 5 ºC to constant weight. Dissolve 4.7904 g of the dried reagent in water to make exactly 1 L and mix thoroughly.

A.1.4 Standard sodium thiosulphate solution 0.1 N

A.1.4.1 In a 250 mL glass-stoppered flask, take 2 g of potassium iodide and about 25 mL water to dissolve it. Add approximately 2 g of sodium bicarbonate and 5 mL of hydrochloric acid.

A.1.4.2 Just before the effervescence dies down, add 25 mL of 0.1 N potassium dichromate solution. When the effervescence ceases, stopper the flask and allow to stand for 10 minutes in a cool dry place.

A.1.4.3 Dilute with 50 mL of water and titrate against standard sodium thiosulphate solution till the liquid in the flask has assumed a yellowish green colour. Add starch solution and continue with the addition of sodium thiosulphate solution until the blue colour in just discharged.

A.1.5 Starch indicator — Titrate 1 g of starch with 10 mL of cold water and pour, with constant storring, into 200 mL of boiling water. Allow to settle and use the clear supernatant liquid.

A.2 Procedure

A.2.1 Weigh accurately about 2.5 g of the sample and grind in a mortar with water till a smooth paste is formed. Add 15 mL – 25 mL of water and decant off the fine part into a 250 mL flask. Again grind the material left behind and repeat the process of decanting off till no gritty material is left. Wash the pestle and monitor in the same flask. Make the solution to 250 mL.

A.2.2 Take 25 mL of the solution, add 2 g of potassium iodide crystals and 100 mL of water and then add 2 mL of glacial acetic acid and titrate it against the standardized sodium thiosulphate solution till the pale yellow colour is left. At this stage add starch indicator and continue the addition of standard sodium thiosulphate solution till the blue colour changes.

A.3 Calculation

$$Available\ chlorine, wt\ \% = \frac{3.5453\ x\ V\ x\ N}{W}$$

Where,

V volume in mL of the standard sodium thiosulphate solution used;

N normality of the standard sodium thiosulphate solution used; and

W weight in g of sample taken for the test, I grams.

Annex B
(normative)

Determination of the detergent corrosion potential

B.1 Apparatus and materials

The following special apparatus and materials are required:

a) Squat and tall 1 L beakers of Pyrex glass and watch glasses to cover beakers;

b) A water bath with a close-fitting lid capable of maintain the test temperature (see B.3 (b)) within ± 1 ºC;

c) An oven capable of maintaining a temperature of 105 ºC ± 2 ºC;

d) Test panels made of stainless steel (316) of approximate dimensions 125 x 63 x 1.5 mm. the panel shall have a '2B' finish on both faces. They shall be undamaged and unmarked, flat and their edges free from burrs;

e) Stainless steel tongs for handling the panels;

f) Panel holders made of inert material such as polypropylene for use during pre-cleaning and drying operations;

g) Rubber bands of rectangular cross-section, measuring, when lying flat and unstretched, approximately 6 x 80 mm;

h) Magnesium carbonate, LR grade, for use as an abrasive for cleaning the panels; and

i) Distilled water.

B.2 Pre-cleaning of test panels and rubber bands

B.2.1 Panels

The pre-cleaning procedure for panels shall be as follows:

a) Swab the tes panels, two for each test, with cotton wool using a warm 1 % m/V solution of a general purpose dairy detergent;

b) Scour the panels with cotton wool using water as lubricant and the magnesium carbonate as an abrasive;

Note The scouring is to remove any film that is produced by reaction between the detergent and the abrasive, e.g. magnesium silicate.

c) Without delay, thoroughly rinse the panels under hot tap water;

d) Rinse the panels I boiling water immersing each panel in turn in water contained in three 1 L beakers; and

e) Dry in oven at 105 ºC ± 2 ºC and allow to cool in a dry, dust-free position.

B.2.2 Rubber bands

The pre-cleaning procedure for rubber bands shall be as follows:

a) Place the rubber bands in a hard-boiling 1% m/V solution of general purpose dairy detergent; and

b) Rinse under hot tap water and then rinse in distilled water and allow to dry.

B.3 Procedure

The procedure shall be carried out in duplicate as follows:

a) In a tall 1 L beaker, make up 950 mL of the use dilution of the detergent under test, mark the level of the solution on the side of the beaker;

b) Heat the solution to the maximum use temperature recommended by the manufacturer;

c) Place the beaker of solution in a water bath controlled at the maximum use temperature ± 1 ºC;

d) Place a rubber band around the test panel in the direction of the panel's long axis, ensuring that the band is fat against both sides of the panel and that the panel is not touched by fingers;

e) 5 minutes after placement of the band, immerse the panel on its end in the test solution so that there is at least 10 mm of solution above the panel. Note the time;

f) Leave the panel in the test solution for 72 hours. Each morning and evening, top up the solution to the mark with distilled water;

g) At the end of the 72 hours, remove the panel from the test solution and remove the rubber bands and rinse under hot, running tap water;

h) Rinse three times as prescribed in paragraph B.2.1 (c) above;

i) Final, dry the panel in the oven at 105 ºC. allow to cool; and

j) Examine the panel for evidence of corrosion (see note below); or discoloration.

Note Pitting is most likely to occur where the rubber band contacts the edges of the panel.

B.4 Interpretation of results

If the duplicate panels from the test detergent show the same characteristics, record the result. If the duplicates differ, repeat the test using fresh panels.

B.5 Report

The report shall contain the information, whether corrosion or discoloration of the panels has occurred.

Bibliography

[1] ISO/IEC Directives, Part 2, *Rules for the structure and drafting of International Standards*, 2016

[2] ISO/IEC TR 10000-1, *Information technology — Framework and taxonomy of International Standardized Profiles — Part 1: General principles and documentation framework*

[3] ISO 10241 (All parts), *Terminological entries in standards*

