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Tannery effluent — Safety disposal— Requirements

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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 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.

RS 363 was prepared by Technical Committee RSB/TC 013, Environment, Health and Safety.

Committee membership

The following organizations were represented on the Technical Committee on Environment, Health and Safety (RSB/TC 013) in the preparation of this standard.

Golf Fish Limited

Integrated Polytechnic Regional Centre – Kigali (IPRC-Kigali)

Kigali Leather Ltd

Ruliba Clays Ltd

Rwanda utility regulation Agency (RURA)

Star Construction & Consultancy (SCC)

University of Rwanda – College of Science and Technology (UR-CST)

Water & Sanitation Corporation (WASAC)

Rwanda Standards Board (RSB) – Secretariat

Introduction

Everyday a huge quantity of solid waste, including trimmings of finished leather, shaving dusts, hair, fleshing, trimming of raw hides and skins, are being produced from the industries. Chromium, sulphur, oils and noxious gas (methane, ammonia, and hydrogen sulphide) are the elements of liquid, gas and solid waste of tannery industries.

Wastewaters from tanneries units are extremely complex mixtures containing considerable amounts of hazardous compounds, heavy metals such as Chromium, inorganic and organic compounds that make the tanning industry potentially a pollution-intensive sector.

Tanneries are one of the most prominent sources of chromium pollution to the aquatic environment(At high concentrations chromium is toxic, mutagenic, carcinogenic and teratogenic). If not adequately treated, wastewater from tanneries contaminates surface water and sediments to an unacceptable level. The solid waste from tanneries causes a major environmental problem through contamination of the soil, and groundwater apart from emission of huge quantities of greenhouse gases to the atmosphere.

Raw tannery effluent composition

During the tanning process at least 300 kg of chemicals (lime, salt etc.) are added per ton of hides. Excess of non-used salts will appear in the wastewater. Because of the changing pH, these compounds can precipitate and contribute to the amount of solid waste or suspended solids

Every tanning process step, with exception of the crust finishing operations, produces wastewater. An average of 35 m^3 is produced per ton of raw hide. This wastewater contains:

- salts (Cl), fat, protein, preservatives (soaking);
- lime and ammonium salts, ammonia, protein (hair), and sulphides (fleshing, trimming, bating);
- chromium(salts) and polyphenolic compounds (tanning); and
- dye and solvent chemicals (wet-finishing).

Tannery wastewaters often find their way into surface water, where toxins are carried downstream and contaminate water used for bathing, cooking, swimming, and irrigation. Chromium waste can also seep into the soil and contaminate groundwater systems that provide drinking water for nearby communities.

Tannery effluent — Safety disposal— Requirements

1 Scope

This Draft Rwanda Standard provides minimum requirements for treatment and safe disposal of tannery effluent and its by-products.

This document is applicable to tanneries only.

It is not applicable to wastewater from domestic and commercial buildings or other industries.

2 Normative references

The following referenced documents are indispensable for the application 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 109: 2017 Water quality — Discharged industrial wastewater — Requirements

RS 126-1: 2012 Waste water treatment plant — Part 1: Vocabulary

3 Terms and definitions

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

3.1

storm water

water from rainfall or other natural precipitation or from the melting of snow or ice

3.2

treated effluent

treated wastewater or effluent from the last stage of a wastewater treatment plant

3.3

tannery effluent

tannery wastewater includes contaminated storm water, cooling water, process waters and wash-down waters

3.4

biomethanation

process by which organic material is microbiologically converted under anaerobic conditions to biogas

3.5

safety

freedom from unacceptable risk

3.6

ultimate sludge

sludge that can no longer be treated or transformed to reduce or eliminate completely its toxicity

3.7

waste water treatment system

installed system from collection up to the disposal or discharge of produced wastewater

4 Requirements

4.1 General requirements

4.1.1 To protect the environment, in particular, water quality, tanneries shall be on suitable sites and shall have an appropriate wastewater treatment system that is correctly installed and maintained.

4.1.2 Tannery effluent shall be collected, treated and disposed in a manner that does not degrade the environment in order to prevent, eliminate or reduce their adverse effects on human health, natural resources, flora and fauna.

4.1.3 Tanneries shall ensure that untreated wastewater does not discharge to watercourses through use of designated wastewater treatment facilities and monitoring of wastewater discharges.

4.2 Collection and draining systems

4.2.1 Collection

4.2.1.1 All wastewater produced within tannery premises and tanning process shall be immediately conveyed and channelled to the treatment plant.

4.2.1.2 Tannery effluent collection pipework shall drain directly to the treatment system to avoid any stagnation.

4.2.2 Drainage system

4.2.2.1 General

4.2.2.1.1 A building shall have a drainage system for:

a) adequate disposal of wastewater from tanning process for hygiene; and

b) adequate disposal of surface water (rain water and/or storm water) from the building.

4.2.2.1.2 No part of a drainage system conveying wastewater from tanning process shall be connected to a sewer reserved for surface water (rain water and/or storm water) and no part of a drainage system conveying surface water shall be connected to a sewer reserved for tannery effluent.

4.2.2.1.3 Where authorized by the competent authority, the connection between sewer reserved for tannery effluent and municipal sewer system shall be accepted after tannery effluents have undergone pre-treatment and meet the quality of raw water discharged to municipal sewer system.

4.2.3 Design of drainage system

4.2.3.1 Tannery effluent drainage system shall be designed in such a way that it:

a) convey all produced wastewater to a wastewater outfall, (sewer system or a wastewater treatment system);

b) minimise the risk of blockage or leakage;

c) prevent foul air from the drainage system from entering the building under working conditions;

d) is ventilated to prevent the build-up of gases;

e) is accessible for clearing blockages; and

f) is adequately protected from accidental damage from sources such as traffic, ground settlement and tree roots.

4.2.3.2 The capacity of the tannery effluent drainage system shall be large enough to carry the expected flow at any point in the system.

4.2.3.3 Section of pipe that transport effluent to the treatment plant shall be able to support peak flow pressure and resistant to corrosion and oxidation.

5 Treatment

5.1 Treatment system

5.1.1 A tannery effluent treatment system shall be so designed, sited and constructed that:

a) it is not prejudicial to the health of any person;

b) it does not cause a risk to public health or the environment;

c) it prevents unauthorised access but allows adequate means of access for emptying and maintenance;

d) it will function to a sufficient standard for the protection of health in the event of a system failure;

e) it has adequate capacity;

f) it is impermeable to liquids; and

g) it is adequately ventilated.

5.1.2 Information on the wastewater treatment system and any continuing maintenance required to avoid risk to health and the environment shall be provided to the owner and made available for all treatment system operating personnel.

5.2 Treatment stages

Tannery effluent shall undergo at least the minimum effluent treatment before its final disposal as described in clause 5.2.1 and 5.2.2.

5.2.1 Grease and grit removal

5.2.1.1 Hairs, shaving dusts, fleshing, trimming of raw hides and skins, trimmings of finished leather, and other solid wastes carried by the effluent stream shall be removed and treated accordingly before disposal.

5.2.1.2 Oil, fat and grease shall be separated from the effluent stream and managed accordingly.

5.2.1.3 In the case there is a common effluent treatment plant, the tannery shall properly carry out the above stage (clause 5.2.1) and chromium pretreatment before wastewater reaches the general sewer system.

5.2.2 Effluent treatment

5.2.2.1 Produced tannery wastewater shall be treated using appropriate technology and make sure the treated effluent meets the requirements of discharged industrial wastewater as stipulated in RS 109:2017.

5.2.2.2 During treatment, attention shall be drawn to the removal of Chromium and sulphur ions. Where possible, priority shall be given to the reuse of chromium.

5.2.2.3 Measures shall be taken to avoid accident from sulphur gases.

5.3 Treated effluent quality and disposal

5.3.1 The treated effluent quality shall respect the quality requirements provided in RS 109:2017 (see annex A)

5.3.2 The disposal of treated tannery effluents shall be subjected to an authorization issued by a recognized authority responsible for the protection of the environment.

5.3.3 The reuse of tannery effluents shall respect the standards on water quality imposed for its intended use

5.3.4 The quarterly monitoring documents and other performance documents of the tannery effluent treatment system shall be kept and available at the time of inspection.

5.4 Sludge

5.4.1 Sludge treatment

5.4.1.1 Sludge from tannery effluent treatment shall undergo further treatment to reduce, mitigate and/or eliminate its toxic character. The chromium content shall not exceed 5000mg/kg.

5.4.1.2 Sludge from tannery effluent treatment contains various hazardous chemicals in high concentration likely to cause various environmental impacts. This complexity calls the combination of various methods and techniques for its management. Sludge treatment may include the following:

h) reduction of volume (e.g. Using polyelectrolytes, and anaerobic digestion);

i) dewatering, (which may include the drying and compaction);

j) converting sludge into by-products (e.g. Biomethanation and electricity generation);

k) composting;

l) solidification and immobilisation of heavy metals; and

m) incineration.

5.4.1.3 When making choices in sludge management the hygienic aspects shall be considered alongside the environmental impacts of the treatment such as energy use or emissions and the benefits of the final product.

5.4.2 Sludge disposal

5.4.2.1 The main parameters to be considered for sludge landfilling are:

a) sludge rheology (important for the transport and incorporation to the other wastes);

b) odours; and

c) dry matter content (important for the water balance of the landfill).

5.4.2.2 The ultimate sludge shall be disposed into the sanitary landfill dedicated for tannery sludges.

5.4.2.3 The ultimate tannery sludge discharge shall be subjected to an authorization issued by the national environmental protection authority, taking into account the availability of safe and appropriate landfills for tannery sludge.

5.4.2.4 The use of final sludge (e.g. as compost) shall respect the quality standards for its intended use after proof that it is safe for environment.

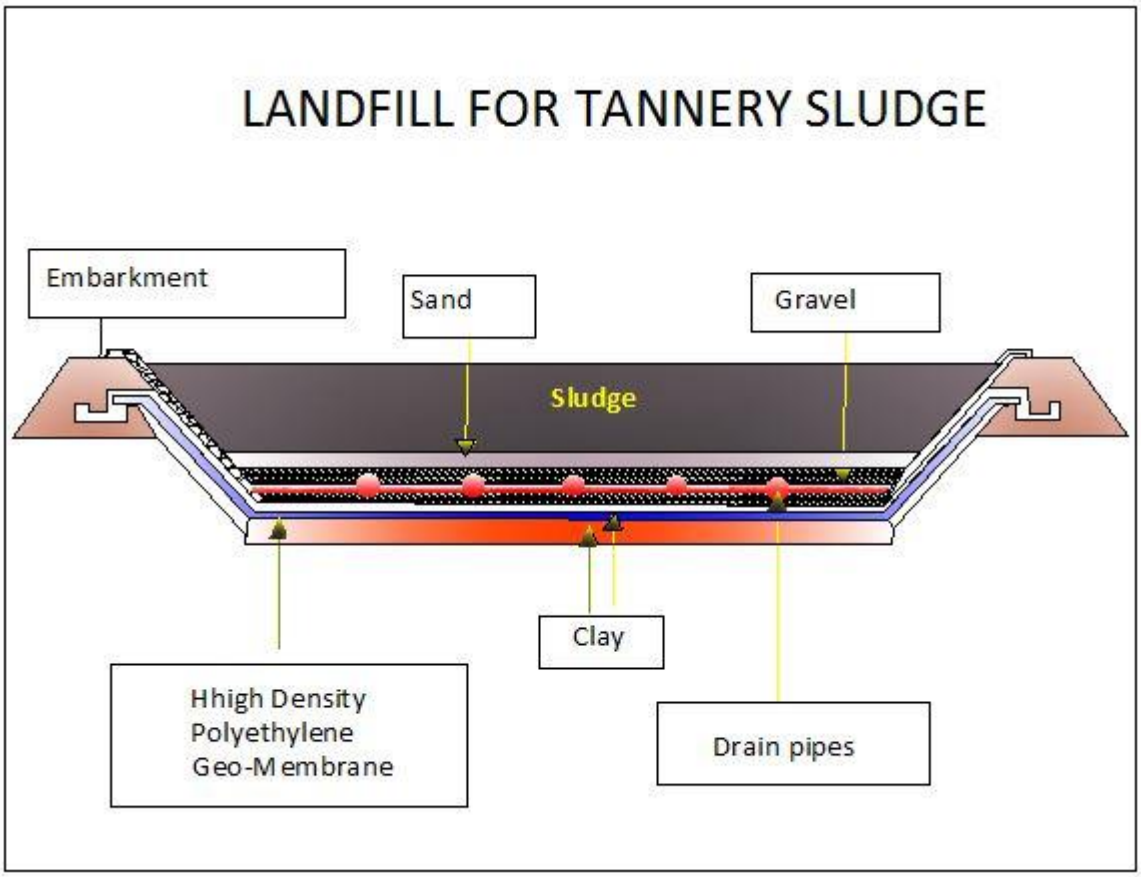

Fig. 1 Layout of sanitary landfill dedicated for tannery sludge

Annex A
(normative)

Requirements of industrial wastewater discharged into environment

A.1 Chemical requirements

Chemical requirements for industrial wastewater shall comply with the requirements given in Table A1 below.

Table A1 — Chemical requirements for discharged industrial wastewater

S/N	Parameter	Permissible limits (max.)	Test methods
1.	pH	5-9	RS ISO 10523
2.	Total suspended solids mg/l	50	RSISO 11923
3.	Total Dissolved Solids mg/l	2000	RS ISO 7888
4.	Oil and grease mg/l	10	ISO 9377
5.	BOD5 mg/l (20°C)	50	RS ISO 5815
6.	COD mg/l	250	RS ISO 6060
7.	Ammonia (as N) mg/l	20	RS ISO 6778
8.	Phosphates mg/L	10	Analytical tests (capillary electrophoresis)
9.	Free chlorine mg/L	1.0	ASTM D1253-14
10.	Arsenic mg/l	0.01	ISO 11969
11.	Benzine mg/l	0.1	ISO 11423
12.	Cadmium mg/l	0.1	ISO 5961
13.	Hexavalent Chromium mg/l	0.05	ISO 23913
14.	Copper mg/l	3	ISO 8288
15.	Cyanide mg/l	0.1	ISO 6703
16.	Iron mg/l	3.5	RS ISO 6332
17.	Lead mg/l	0.1	ISO 8288
18.	Mercury mg/l	0.002	ISO 5666
19.	Nickel mg/l	3	ISO 8288
20.	Phenol mg/l	0.2	ISO 8165
21.	Sulphide mg/l	1.0	ISO 13358
22.	Zinc mg/l	5	ISO 8288
23.	Selenium mg/L	0.02	ASTM D3859-15
24.	Pesticides mg/L	Not detectable	ASTM D8025-16

A.2 Physical requirements

Physical requirements for industrial wastewater shall comply with the requirements given in Table A2 below.

Table A2 — Physical requirements for discharged industrial wastewater

S/N	Parameter	Requirements	Test methods
1.	Temperature increase °C	< 3	Thermometer[1]
Note [1]The thermometer used should be calibrated according to National Measurement Law			

A.3 Microbiological requirements

Microbiological requirements for industrial wastewater shall comply with the requirements given in Table A3 below.

Table A3 — Microbiological requirements for discharged industrial wastewater

S/N	Parameter	Permissible limits	Test methods
1.	Faecal Coliforms cfu /100ml	400	RS ISO 4831

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Bibliography

[1] *RURA regulations, Directives on minimum requirements for liquid wastes disposal and treatment, of 11/11/2009*

[2] RS ISO 24511:2007 *Activities relating to drinking water and wastewater services — Guidelines for the management of wastewater and for the assessment of wastewater*

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