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Separator systems for light liquids (e.g. oil and petrol) - Part 2: Selection of nominal size, installation, operation and maintenance

Abscheideranlagen für Leichtflüssigkeiten (z.B. Öl und Benzin) - Teil 2: Wahl der Nenngröße, Einbau, Betrieb und Wartung

Installations de séparation de liquides légers (p.e. hydrocarbures) - Partie 2: Choix des tailles nominales, installation, service et entretien

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EUROPEAN STANDARD

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EN 858-2

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Separator systems for light liquids (e.g. oil and petrol) - Part 2: Selection of nominal size, installation, operation and maintenance

Installations de séparation de liquides légers (par exemple hydrocarbures) - Partie 2: Choix des tailles nominales, installation, service et entretien

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This European Standard was approved by CEN on 29 September 2001.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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Foreword

This European Standard (EN 858-2:2003) has been prepared by Technical Committee CEN/TC 165 "Wastewater engineering", the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by July 2003, and conflicting national standards shall be withdrawn at the latest by July 2003.

It is the second part of a two part standard for separator systems for light liquids. Part 1 gives principles of design, performance and testing, marking and quality control of separator systems for light liquids.

When pollution control requires the treatment of pollutants other than light liquids, additional measures can be necessary.

The annexes A and B are informative.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and the United Kingdom.

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1 Scope

This European Standard applies to separator systems used to separate hydrocarbons of mineral origin from wastewater. It does not apply to grease and oils of vegetable or animal origin nor to separation of emulsions or solutions.

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This European Standard provides guidance on the selection of nominal sizes, as well as the installation operation and maintenance of light liquid separators manufactured in accordance with EN 858-1. It also gives advice on the suitability of cleansing agents if they are discharged to a separator.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text, and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 752-2, *Drain and sewer systems outside buildings — Part 2: Performance requirements.*

EN 752-4, *Drain and sewer systems outside buildings — Part 4: Hydraulic design and environmental consideration.*

EN 858-1:2002, *Separator systems for light liquids (e.g. oil and petrol) — Part 1: Principles of design, performance and testing, marking and quality control.*

3 Terms and definitions

For the purposes of this European Standard, the terms and definitions given in EN 858-1 as well as the following term and definition apply.

3.1
cleansing agent
chemical substance which, when combined with light liquids, initially forms an emulsion during cleaning process that rapidly breaks down in the separator

4 Determination of type and size of separator systems

4.1 General

Separator systems are used in a wide variety of situations to fulfil a number of different requirements. It is important to establish why a separator system is needed and what specific function it is expected to fulfil before selecting the appropriate size and type of installation.

Generally, separator systems are installed for one or more of the following reasons:

a) to treat waste water (trade effluent) from industrial processes, vehicle washing, cleansing of oil covered parts or other sources, e.g. petrol station forecourts;

b) to treat oil contaminated rainwater (run-off) from impervious areas, e.g. car parks, roads, factory yard areas;

c) to retain any spillage of light liquid and to protect the surrounding area.

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Where there is no specific sizing method given by a regulatory authority the following guidance on sizing of the separator system shall be used:

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4.2 Components of separator systems, their combination and application

4.2.1 General

The component parts of separator systems complying with EN 858-1 are listed in Table 1.

Table 1 — Components of separator systems

Components	Code letter
Sludge trap	S
Separator Class II	II, II b (for bypass separators)
Separator Class I	I, I b (for bypass separators)
Sampling shaft	P

Annex B gives guidance on the selection of components to suit particular applications.

4.2.2 Bypass separators

Bypass separators include a device to allow a flow in excess of the maximum permissible flow to bypass the separator.

Bypass separators are not suitable for category a) uses (see 4.1). They shall be used only in locations where it is unlikely that there will be significant hydrocarbon contamination during times of heavy rainfall.

Separator systems shall not surcharge or cause surcharging upstream when subject to their maximum design flow.

4.2.3 Classes of separators

Classes of separators (class I and II) are defined in EN 858-1:2002, clause 4.

Class I separators provide a higher degree of separation than class II separators (see Table B.2 for applications).

4.3 Sizing of separators

4.3.1 General

The sizing of light liquid separators shall be based on the nature and flow rate of the liquids to be treated and will need to take account of:

— maximum flow rate of rain water;

— maximum flow rate of waste water (trade effluent);

— density of the light liquid;

— presence of substances that may impede separation (e.g. detergents).

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The sizing does not take into account special operational conditions (see 4.3.8).

The size of the separator shall be calculated from the following formula:

$$NS = (Q_r + f_x \cdot Q_s)\, f_d \qquad (1)$$

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where

NS is the nominal size of the separator;

Q_r is the maximum flow rate of rainwater, in l/s;

Q_s is the maximum flow rate of wastewater, in l/s;

f_d is the density factor for the relevant light liquid;

f_x is the impediment factor depending on the nature of the discharge.

4.3.2 Factors

4.3.2.1 Impediment factor f_x

The impediment factor f_x allows for unfavourable separating conditions, e.g. where detergents are present in the wastewater. The minimum recommended impediment factors are listed in Table 2.

Table 2 — Minimum impediment factors f_X

Discharge type in accordance with 4.1	f_X
a)	2
b)	not relevant as Q_S = 0 (only rainwater)
c)	1

4.3.2.2 Density factor f_d

The density factor f_d allows for differing densities of light liquids when using different combinations of system components. Additional information is given in annex A.

Table 3 — Density factors f_d

Density g/cm³	up to 0,85	over 0,85 up to 0,90	over 0,90 up to 0,95
Combination	Density factor f_d		
S-II-P	1	2	3
S-I-P	1 [a]	1,5 [a]	2 [a]
S-II-I-P	1 [b]	1 [b]	1 [b]

[a] For class I separators operating by gravity only, use f_d for class II separator.

[b] For class I and class II separators.

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4.3.2.3 Cleansing agents

Cleansing agent manufacturers shall submit a declaration stating that the product is free from organically combined halogen compounds or BTX aromas. Only cleansing agents which form temporary stable emulsions with light liquids and then de-emulsify after the cleaning process should be used. Instructions for use shall also be provided, together with the effects of mixing with other cleansing agents, particularly regarding the separation process.

4.3.3 Combined drainage of rainwater and wastewater

If a separator is receiving rainwater and wastewater, e.g. from vehicle washing, and the two maximum flows are not expected to occur simultaneously, then the separator can be sized for the higher flow rate.

4.3.4 Wastewater

The wastewater inflow in accordance with 4.1, case a), shall be calculated as the sum of the contributing flows from the following formula:

$$Q_s = Q_{s1} + Q_{s2} + Q_{s3} + \ldots \quad (2)$$

where

Q_{S1} is the flow from draw-off points, in l/s;

Q_{S2} is the flow from car washes, in l/s;

Q_{s3} is the flow from high pressure cleaning units, in l/s.

Any other contributing flow shall be added.

4.3.4.1 Draw-off points

Where it is not possible to determine the maximum flow from draw-off points by measurement, it may be estimated by using Table 4. Table 4 takes account the probability of the likelihood of all draw-off points, irrespective of size, being used at the same time. Calculations should be based on the flow rates from the largest draw-off points first.

Table 4 — Flow rates from draw-off points

Draw-off points					
Nominal diameter	Flows from draw-off point Q_{s1} [a] in l/s				
	1st point	2nd point	3rd point	4th point	5th point and subsequent
DN 15	0,5	0,5	0,35	0,25	0,1
DN 20	1,0	1,0	0,70	0,50	0,2
DN 25	1,7	1,7	1,20	0,85	0,3
[a] Values given for supply pressure of about 4 bar to 5 bar; other supply pressures may cause different Q_V-values.					
Example for calculation of Q_{s1} for 1 DN 15, 1 DN 20 and 2 DN 25 points: 1st point DN 25 = 1,7 l/s; 2nd point DN 25 = 1,7 l/s; 3rd point DN 20 = 0,7 l/s; 4th point DN 15 = 0,25 l/s; Q_{s1} = 4,35 l/s					

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In case of supply pressure differing from that stated in footnote 1 of Table 4, the flow from draw-off point shall be calculated from the following formula:

$$Q_{s1(xbar)} = \frac{Q_{s1(4bar)}}{\sqrt{\frac{4bar}{xbar}}} \qquad (3)$$

where

$Q_{s1(x\ bar)}$ is the flow from draw-off point at a supply pressure of *x* bar, in l/s;

$Q_{s1(4\ bar)}$ is the flow from draw-off point as given in Table 4, in l/s.

4.3.4.2 Automatic car washes (roll-over, drive-through)

Wastewater from low pressure car washes (with a back pressure up to 20 bar) where only carriage bodies and chassis are cleaned does not usually contain any significant amount of light liquid.

Should there be wastewater from high pressure car washes (with a back pressure higher than 20 bar) and/or any additional washing procedures which will result in wastewater containing light liquids, then for every car wash place or drive through a wastewater value Q_{s2} of 2 l/s plus a wastewater value Q_{s3} for each high pressure unit in accordance with 4.3.4.3 shall be included. When the car wash place is multiple used, e. g. for maintenance, for plants with higher quantities of waste water i. e. without mechanical cleaning devices, the actual quantity of waste water has to be considered.

A reduction of the wastewater flow rate Q_{s2} for plants with water recirculation and overflow into a sewer is not admissible.

4.3.4.3 High pressure units

Irrespective of the effective use of water from a high pressure unit, a wastewater value Q_{s3} of 2 l/s shall be considered. If there is more than one high pressure unit an additional 1 l/s shall be included for each unit.

If a high pressure unit is being used together with an automatic car wash for this unit a wastewater value Q_{s3} of 1 l/s shall be included.

4.3.5 Rainwater flow rate

For category b) uses (see 4.1), the size of the separator will depend on the design, rainfall intensity and the catchment area draining to the separator.

The maximum rainwater flow rate Q_r in l/s shall be calculated using equation (4) in accordance with EN 752-4.

$$Q_r = \Psi \cdot i \cdot A \quad (4)$$

where

i is the rainfall intensity, in l/s · ha;

A is the area receiving rainfall, measured horizontally, in ha;

Ψ is a dimensionless run-off coefficient.

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In most cases the value of the run-off coefficient can be taken as $\Psi = 1$.

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The rainfall intensity i mainly depends on the analysis of local rainfall data and shall be adopted according to local regulations.

For very large rainfall receiving areas, the rainwater flow can be divided by catchment areas and drained into several separators.

NOTE Surface areas covered by a canapy will receive reduced rainfall. For the purpose of the equation (4), the value A may be reduced for these areas.

4.3.6 Spillages

For category c) uses (see 4.1) separator systems shall be sized sufficiently to retain any spillage of light liquid. A higher storage capacity may be necessary.

4.3.7 Quantity of light liquid

When, in certain cases, a higher light liquid storage capacity than that specified in EN 858-1 is required, e.g. when more than the usual amount of light liquid is expected, the following options can be considered:

a) using a larger nominal size separator than calculated or

b) creating light liquid storage capacity outside the separator or

c) emptying the separator more frequently than usually.

4.3.8 Special cases

Separators operating under special conditions, e.g. for transformer stations, compressor stations, shall be reviewed on a site-specific basis.

Separators receiving wastewater from trade or industrial manufacturing processes may need to be specially sized after investigating the composition and properties of the wastewater.

4.4 Sludge traps

Sludge traps shall only be fed from the design inlets and not positioned to allow flow directly from the surface.

NOTE This does not apply to drainage channel type silt collection, e.g. in car washes, to retain solids.

Separator systems shall incorporate a sludge trap either as a separate unit or as an integral part of the separator. The volume can be determined as given in Table 5.

Table 5 — Volume of sludge traps

Quantity of sludge anticipated for e.g.:		Minimum sludge trap volume l
None	- condensate	Not required
Small	- processing waste water with defined small sludge volume - all rainwater collecting areas where a small amount of silt from traffic or similar appears, i.e. catchment basins on petrol tank areas and covered filling stations	$\frac{100 \cdot NS}{f_d}$ a
Medium	- filling stations, carwash by hand, part washing - bus washing places - waste water from garages, vehicle parking lots - power plants, machinery plants	$\frac{200 \cdot NS}{f_d}$ b
High	- washing plants for site vehicles, site machines, farm machines - truck wash places	$\frac{300 \cdot NS}{f_d}$ b
	- automatic car washes i.e. roll-over, drive-through	$\frac{300 \cdot NS}{f_d}$ c

a Not for separators smaller than or equal *NS* 10, except for covered car parks.

b Minimum volume of sludge traps 600 l.

c Minimum volume of sludge traps 5000 l.

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5 Installation

5.1 Limitations

Separator systems shall only be installed on drainage systems where light liquids need to be separated from water and retained within the separator. They shall not be installed on drain and sewer systems containing domestic wastewater.

The drainage of areas where light liquids are unlikely to occur, such as roofs and grassed areas, should not discharge through separators.