2016 Wastewater Guidelines

Ø ZDHC

The Zero Discharge of Hazardous Chemicals Programme

Signatory Brands

adidas GROUP · BURBERRY · C&A · coop · ESPRIT · F&F · Gap Inc. · G-STAR RAW · H&M · INDITEX · Jack Wolfskin · KERING · Lbrands · LEVI STRAUSS & CO. · LI-NING · MARKS & SPENCER · New Balance · Nike · PRIMARK · PUMA · PVH · UNITED COLORS OF BENETTON.

Value Chain Affiliates

ADEC INNOVATION ESG SOLUTIONS · ARVIND · COATS · covestro · Everlight Chemical · JINTEX · SCISKY 水性科天 · PolyOne · PrimeAsia · SGS · Stahl · SDS SUSTAINABLE DOWN SOURCE · TÜVRheinland

Associates

BEPI Business Environmental Performance Initiative · BSI Association of the German Sporting Goods Industry · GermanFashion Modeverband Deutschland e.V. · Sedex · SIWI · Sustainable Apparel Coalition · UNIC Italian Tanners' Association

Contents

Introduction

The Zero Discharge of Hazardous Chemicals (ZDHC) Programme is a collaboration of brands, value chain affiliates and associates committed to eliminating hazardous chemicals from the textile and footwear value chain.
These organisations are committed to advancing towards zero discharge of hazardous chemicals in the value chain to improve the environment and people's well being, understanding that achieving zero will require time, technology, and innovation.

The ZDHC Programme recognises the value of addressing hazardous substances that may be discharged into the environment during the manufacture of materials used in the textile and footwear industry.
That is, hazardous substances that could be used deep within the value chain and not just those substances that could be present in finished goods.

The discharge of wastewater containing hazardous chemicals could have a significant impact on the environment and human health.

In 2015, the ZDHC Programme commission-ed a study to better understand the regula-tory landscape of wastewater discharge regulations and guidelines across the textile industry.

The report of the study – Textile Industry Wastewater Discharge Quality Standards Literature Review – found that:

1. Current wastewater regulations are far from requiring zero discharge of hazardous chemicals.
2. Wastewater guidelines published by different brands, as well as amongst multi-brand consortia, vary greatly.

The conclusion of the report is that there is a need for uniform, global guidance pertaining to wastewater discharge quality, as well as testing and reporting, to enable a more sustainable industry.

The purpose of the ZDHC Programme's Wastewater Guidelines is to define a single, unified expectation concerning wastewater discharge quality that goes beyond regulatory compliance, not only for conventional wastewater parameters, but also for hazardous chemicals.

These guidelines build upon the ZDHC Manufacturing Restricted Substances List (MRSL) - a list of chemical substances banned from intentional use in facilities that process textile materials and trim parts for the textile and footwear industries.

The first step towards the prevention of wastewater contamination is for facilities to avoid the use of restricted chemical substances by using chemical formulations that conform to the ZDHC MRSL.

Facilities should then ensure wastewater is treated prior to discharge in a way that either removes the chemical physically or by chemical reaction or biological degradation.

In order to achieve a unified approach for the textile and footwear industry, the ZDHC Programme encourages the adoption of these global guidelines by any organisation, consortia, and supplier interested in a more sustainable future.

Minimum Requirements

1 | **Basic Expectations**

For the purpose of these guidelines, at a minimum, each supplier is expected to:

- Have a valid license to operate.
- Comply consistently with wastewater discharge permits at all times.
    - This applies not only to industrial wastewater, but any domestic wastewater discharges that are not blended with the raw industrial wastewater.
    - Bypasses around wastewater treatment systems that are not permitted by authorities having jurisdiction are prohibited.
    - If industrial and domestic wastewater are blended, the resultant blended wastewater is considered to be industrial wastewater for purposes of these guidelines.
- Follow generally-accepted process engineering best practices with respect to wastewater treatment and overall facility water efficiency management.
- Not dilute wastewater discharge with incoming water as a means to achieve compliance to concentration-based discharge permits.
- Properly classify sludge produced from wastewater treatment or zero-liquid discharge operations as either hazardous or non-hazardous as defined by authorities having jurisdiction, and fully understand the final disposition of sludge wastes by third-party waste haulers.
- Contract out sludge hauling and disposal to licensed/permitted and qualified third parties that have appropriate facilities to properly dispose of the sludge wastes to ensure that sludge and leachates from the sludge do not adversely impact the environment.

2 | **Test Methods**

- The test methods recommended in these guidelines are based on internationally recognised standard water and wastewater testing methodologies as well as government recognised testing requirements in the European Union, the United States of America, and China.
- It is expected that the standard test method used is the one most applicable for the region in which the wet manufacturing occurs.
- For the ZDHC MRSL listed substances/substance group, generally recognised standard tests methods are specified.
- Reporting limits for the ZDHC MRSL substances/substance groups stated within these guidelines are based on good laboratory practice criteria and capabilities for achieving these reporting limits globally.

3 | **ZDHC Accepted Laboratories**

- ISO 17025 Accreditation, and;
- Passing an internal correlation test organised by one of the established ZDHC-accepted laboratories[1].

ZDHC will update these guidelines as necessary and consider lower reporting limits over time.

[1] Acceptance process in development at time of publication.

Objectives

These guidelines include analytical test methods and sampling procedures, with the ultimate objective of allowing ZDHC brands and their suppliers to share their testing results in a systematic and efficient manner via a ZDHC Data & Disclosure Platform.

The expected outcomes of using these guidelines are to:

- Ensure wastewater discharge does not have an adverse impact on communities and the environment.
- Create a unified monitoring and testing programme to aid suppliers to systematically and efficiently share discharge data with consumers, brands, and other interested parties.
- Reduce supplier operating costs and increase operational efficiencies by defining a standard cadence for wastewater and sludge testing and reporting requirements which applies to all consumer brands that adopt this guideline.
- Define pass/fail reporting limits for the analytical testing of hazardous chemicals in wastewater discharges and sludges produced during wastewater treatment operations.

These guidelines address conventional wastewater discharge parameters such as pH, BOD_5, COD, etc, as noted in Table 1, Appendix A.

These guidelines also address the original priority chemical groups which are included in the ZDHC MRSL.

These chemical groups have been peer reviewed by independent third-party technical experts and industry associations involved in the production of key raw materials, and include:

1 | Alkylphenol (AP) and Alkylphenol Ethoxylates (APEOs), including all isomers
2 | Chlorobenzenes, Chlorotoluenes,
3 | Chlorophenols
4 | Dyes
  4.1 Azo (Forming Restricted Amines)
  4.2 Carcinogenic or Equivalent Concern
  4.3 Disperse (Sensitising)
5 | Flame Retardants
6 | Glycols
7 | Halogenated Solvents
8 | Organotin Compounds
9 | Perfluorinated and Polyfluorinated Chemicals (PFCs)
10 | Ortho-Phthalates – Including all ortho esters of phthalic acid
11 | Polycyclic Aromatic Hydrocarbons (PAHs)
12 | Volatile Organic Compounds (VOCs)

Definitions

Conventional Wastewater Parameters:
The notion of zero does not apply to conventional wastewater parameters such as temperature, pH, biological oxygen demand, chemical oxygen demand, etc. (Table 1, Appendix A).
ZDHC brands acknowledge that those parameters are still relevant and very important for the textile and footwear industry. Therefore, these guidelines align on those parameters with foundational, progressive and aspirational limit values.

Detection Limit: The minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero.

Direct Discharge: A point source that discharges wastewater to streams, lakes, or oceans. Municipal and industrial facilities that introduce pollution through a defined conveyance or system such as outlet pipes are direct dischargers.

Hazardous Chemicals: Compounds that show intrinsically negative properties (persistent, bio-accumulative and toxic (PBT); very persistent and very bio-accumulative (vPvB); carcinogenic, mutagenic and toxic for reproduction (CMR); endocrine disruptors (ED)).

Incoming Water: Water that is supplied to a manufacturing process, usually withdrawn from surface water bodies, groundwater, or collected from rainfall. This includes water supplied by municipalities, and condensate obtained from external sources of process steam.

Indirect Discharge: The discharge of wastewater to a treatment facility not owned and operated by the facility discharging the pollutants, for example a municipal wastewater treatment plant or industrial treatment park.

Pretreatment: The reduction of the amount of pollutants, the elimination of pollutants, or the alteration of the nature of pollutant properties in wastewater prior to the indirect discharge of the wastewater into a centralised or common wastewater treatment plant. Examples of pretreatment are: pH adjustment, filtration, other physical/chemical processes, and biological treatment of the wastewater.

Raw Wastewater: Wastewater that has not yet been treated prior to direct or indirect discharge from the facility, or prior to water recycling efforts.

Reporting Limit: Lowest concentration that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions. Reporting limits normally are arbitrarily set rather than explicilty determined by commercial analytical labs at concentrations above detection limits. They take into consideration variability associated with analysing samples from a wide variety of sources with many potential complicating factors, e.g. matrix effects. Good laboratory practice dictates that a reporting limit is 10 times the detection limit.

Sludge: The solids separated during the biological treatment of industrial or municipal wastewater.

Wastewater: Water no longer considered useable for a given operational purpose that is directly or indirectly discharged from the facility

Wet Processing: Manufacturing processes that use water as fluid that contacts the product being manufactured. For example, dyeing, finishing, printing, washing, and laundry processes. Non-contact, closed-loop boiler or cooling water are not considered wet processing.

Zero Discharge: For ZDHC brands, zero discharge is defined as not intentionally using hazardous chemicals or being a net contributor of hazardous chemicals to the environment. ZDHC brands monitor zero discharge by testing concentration of hazardous chemicals in wastewater and taking into consideration any background concentrations of those chemicals.

ZDHC MRSL: Manufacturing Restricted Substances List developed by the ZDHC Programme. Intentional use of substances on the MRSL is forbidden.

ZDHC Data & Disclosure Platform:
A centralised data platform for storing and reporting water and wastewater test results for the value chain of ZDHC contributors.

Abbreviations

AOX	Adsorbable organic halogens, where 'X' represents the halogens chlorine, bromine and iodine
AP	Alkylphenol
APEOs	Alkylphenol ethoxylates
APHA	American Public Health Association
As	Arsenic
ASTM	American Society for Testing and Materials
BOD5	Biochemical Oxygen Demand (5 days)
˚C	Degree Celsius
CAS	Chemical Abstracts Service (Registry Number)
Cd	Cadmium
COD	Chemical Oxygen Demand
Cr	Chromium
CWTP	Centralised Water Treatment Plant
DIN	Deutsches Institut für Normung (German Institute of Standards)
EN	European Norm
FTOH	Fluorotelomer alcohols
GC	Gas Chromatography
GB	Guojia Biaozhun (Chinese required national standard)
GB/T	Guojia Biaozhun/Tuijiàn, (Chinese recommended national standard)
Hg	Mercury
HJ	Chinese required environmental protection standard (Chinese industry standard)
HJ/T	Chinese recommended environmental protection standard (Chinese industry standard)
IPE	Institute of Public & Environmental Affairs
ISO	International Organization for Standardisation
KOH	Potassium hydroxide
LC	Liquid Chromatography
LWG	Leather Working Group
mg/L	Milligram(s) per litre
ml	Millilitre
µg/L	Microgram(s) per litre
MS	Mass Spectrometry
MSMS	Tandem Mass Spectrometry
N/A	Not Available
N	Nitrogen
OIA	Outdoor Industry Association

Abbreviations (cont.):

P	Phosphorous
PAHs	Polycyclic Aromatic Hydrocarbons
Pb	Lead
PFCs	Per- and Polyfluorinated Chemicals
Pt-Co	Platinum-Cobalt scale (colour index)
RL	Reporting Limit
SAC	Sustainable Apparel Coalition
SIWI	Stockholm International Water Institute
TSS	Total Suspended Solids
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compounds
WWQ	Wastewater Quality
WWTP	Wastewater Treatment Plant

Scope

These guidelines apply to industrial wastewater discharge and sludge produced from wastewater treatment operations for textile and footwear suppliers with wet processing facilities, including, but not limited to, textile dyeing and finishing, fabric mills, washing/laundry facilities, printing operations, vertical finished goods manufacturing, and fibre production.

These guidelines do not address wastewater management beyond the property boundaries of the suppliers; wastewater treatment or pretreatment systems that are not owned and operated by the suppliers; and they are not intended to apply to third-party, off-site, centralised or common wastewater treatment facilities not under direct control or ownership of the suppliers. Wastewater discharge from raw material production such as cotton farming, cattle ranching, leather processing, polymer production, wool scouring, etc., are out of scope of this guideline.

The ZDHC Programme acknowledges that conventional wastewater parameters are relevant for the textile and footwear industry. ZDHC proposes foundational, progressive and aspirational limit values for conventional parameters as part of this wastewater guidance document. Where local legislation and/or permits do not cover one or more conventional parameters listed in these guidelines, the foundational level stated in these guidelines shall apply.

Sampling, testing and reporting requirements as outlined in these guidelines are the same for facilities that directly or indirectly discharge wastewater. However, for the conventional wastewater parameters (Table 1, Appendix A), indirect dischargers will be held accountable to their wastewater discharge permit instead of the foundational, progressive, and aspirational limits defined in Table 1, Appendix A. Facilities discharging directly or indirectly will be required to submit a copy of their discharge permits to the ZDHC Programme. Facilities discharging indirectly will also be required to provide:

1 | Name and location of the receiving centralised or common wastewater treatment plant;
2 | Parameters and limit values agreed between the facility in question and the receiving centralised or common wastewater treatment plant;
3 | Test results for the wastewater parameters that are included in the wastewater permit that are in addition to the Table 1 parameters of these guidelines.

Disclaimer

1 | The ZDHC Programme has prepared these guidelines as a guide to support environmental stewardship initiatives. These guidelines are not intended as a statement of legal requirements.

2 | The ZDHC Foundation makes no warranty, expressed or implied, concerning the contents of these guidelines and assumes no legal responsibility for its contents.

3 | At a minimum, it is required that wastewater discharges are consistently compliant with the legal requirements and permits issued by the authorities having jurisdiction over individual supplier facilities. Where stricter legal, local or regional wastewater limits are in place, those limit values shall supersede the limit values in these guidelines.

4 | It is not the intent of the ZDHC Foundation to act as an agency reporting wastewater discharge data to governments or authorities having jurisdiction. It is expected that suppliers are accountable for reporting on their wastewater discharges in accordance with applicable laws.

The Guidelines

A. The Three-Level Approach

As manufacturing facilities are not identical in terms of capabilities, knowledge, strategic priorities, and resources, these guidelines provide a three-level approach for wastewater discharge limits which is consistent with other collaborations, including the Stockholm International Water Institute (SIWI), the Sustainable Apparel Coalition (SAC), and the Outdoor Industry Association (OIA). The intent is that suppliers actively execute a continuous improvement plan to reach the next level.

The levels are:

- Foundational: At a minimum, meets legal discharge requirements and ensures effective control of ZDHC MRSL chemicals.
- Progressive: Demonstrates increasing knowledge of chemical management and applies advanced wastewater treatment processes.
- Aspirational: Demonstrates best-in-class performance and strives for continuous improvement in both chemicals and wastewater treatment process knowledge; creates industry best practices.

B. Parameters and Limits

1 | Wastewater parameters are classified into two categories:

1.1 Conventional Parameters. These parameters, their limits, and standard methods for analysis are defined in Table 1 in Appendix A.

1.2 ZDHC MRSL Parameters. These parameters, their reporting limits, and standard methods for analysis are defined for wastewater in Tables 2A - 2N

1.3 For sludge, Table 3 Appendix A, paramaters and standard methods for analysis are defined.

C. Sampling

1. Each facility is expected to develop written procedures that clearly identify and document the sampling point/s, sampling methodologies and reporting frequency, for the following sampling types:

1.1 | Discharged Wastewater

a. Wastewater sampling shall occur at a point closest to the location where the wastewater leaves the property of the facility. Please refer to Figures 1 and 2 in Appendix B that identify sample point locations at facilities that, respectively, directly or indirectly discharge wastewater.

b. In the event that a facility has multiple permitted discharge locations, each discharge location shall have a sampling point, and sampling shall occur independently at each sampling point in accordance with these guidelines.

c. For instances where sampling at multiple wastewater discharge locations occurs, each wastewater sample taken shall be tested independently of the others; wastewater samples from multiple discharge points are not to be blended, but tested separately.

d. Wastewater being sampled shall be of the same quality which is discharged to beyond the facility property boundary.

e. Wastewater quality should not be altered after the testing point.

1.2 Raw Wastewater

a. Sampling of raw wastewater for testing of ZDHC MRSL parameters may be an alternative requirement by individual brands.

b. Raw wastewater testing will give further insights into the usage of ZDHC MRSL chemicals which may be diverted into the sludge during wastewater treatment.

1.3 Incoming Water

a. Incoming water shall be sampled at the point where the incoming water enters the facility, and prior to any on-site treatment.

b. The intent of collecting this sample is to assist with point source identification of hazardous chemicals in the event the wastewater test results indicate a hazardous chemical above the reporting limits.

c. In the event that a wastewater sample analysis results in a hazardous chemical above the reporting limits outlined in Appendix A, the incoming water sample shall be analysed to determine if the incoming water is contributing to the hazardous chemicals identified in the wastewater.

d. In the event that a wastewater or sludge sample analysis does not result in any hazardous chemicals above the reporting limits, this sample may be discarded without testing.

1.4 Sludge

Sludge analysis from wastewater treatment is considered another factor in the verification of MRSL compliance. Testing of sludge or raw wastewater will be expected. Appropriate limits for sludge will be developed going forward.

2 | Sampling Methodology

2.1 Wastewater and sludge samples shall be collected as composite samples following ISO 5667- 13:2011 (Part 1,3, 10, 13 and 15): Water Quality Sampling Guidance for the preservation and handling of water samples.

2.2 To ensure representative samples, composite sampling should be performed for no less than six (6) hours , with no more than one hour between discrete samples. Each discrete sample shall be of equal volume. Sampling using calibrated autosamplers is preferred, but in instances where national standards do not require autosampling, laboratory personnel collecting samples are expected to meet the requirements of national sampling standards.

2.3 Samples shall be taken by qualified laboratory personnel. Laboratories performing sample collection must maintain a chain-of-custody log for each sample collected to ensure the integrity of the sample.

2.4 In no circumstance shall samples be taken during times when the production process is not running or the wastewater is diluted due to heavy rainfall, etc.

2.5 Suppliers are expected to allow for unannounced sampling by ZDHC-accepted laboratories.

2.6 Incoming water may be a single grab sample. For facilities with multiple incoming water sources, a single grab sample from a common blend tank is acceptable. If no blend tank, one grab sample shall be collected from each incoming source.

3 | Minimum Reporting Frequency

3.1 Conventional Parameters

Semi-annually with testing and reporting completed by April 30 and October 31 of each year, and with no less than three months between testing and reporting. Permit or regulatory requirements for more frequent sampling and reporting may be required independent of these guidelines.

3.2 ZDHC MRSL Parameters

Semi-annually with testing and reporting completed by April 30 and October 31 of each year, and with no less than three months between testing and reporting.

D. Data Reporting

1 | After permission from suppliers, wastewater, sludge, and incoming water test reports from ZDHC-accepted laboratories will be reported directly by laboratories to ZDHC contributors via the ZDHC Data & Disclosure Platform on the ZDHC website, making best use of available data standards. For any additional testing that may occur (beyond these guidelines), the manufacturing facility is encouraged to upload the data to the ZDHC Data & Disclosure Platform.

2 | In the event that a test report value for direct dischargers either exceeds a foundational limit value for conventional parameters, or reporting limit for the ZDHC MRSL (as listed in Appendix A), or, for both direct and indirect dischargers, exceeds a legal permit limit, then the facility is expected to:

2.1 Notify the applicable authorities of any permit violations, as well as notify the ZDHC brand/s and/or other customers;

2.2 Submit a corrective action plan with a defined completion date for resolution of the excursion.

2.3 Within thirty (30) calendar days of the excursion, upload to the ZDHC Data & Disclosure Platform[1] the root cause analysis and corrective action plan to remediate the excursion.

2.4 Re-sample the sludge and wastewater to validate the excursion has been resolved, and upload data to the ZDHC Data & Disclosure Platform.

3 | To enable widespread adoption of these guidelines, and to optimise wastewater and sludge sampling across the value chain, the ZDHC Programme is collaborating with other industry organisations such as the Sustainable Apparel Coalition (SAC), the Outdoor Industry Association (OIA) and the Institute of Public & Environmental Affairs (IPE) to enable data sharing capabilities.

4 | Wastewater data may be made available to the public via the ZDHC Data & Disclosure Platform

[1] ZDHC Data & Disclosure Platform is currently in development, due for launch in 2017

E. Schedule

1 | Foundational limits for conventional wastewater parameters (Appendix A, Table 1) should already be met by suppliers. If the foundational limits are more restrictive than the supplier's legal, permitted limits, suppliers are expected to meet compliance with foundational limits within a period of one year from publishing date of these guidelines.

2 | Progressive limits for conventional wastewater parameters (Appendix A, Table 1) are expected to be met or exceeded by:

2.1 Facilities that start production after January 1, 2018.

2.2 An existing, operating facility, with a new onsite wastewater treatment system that is operational after January 1, 2018.

2.3 A current production facility that undergoes enhancement and/or at least a 50 % expansion of capacity that is operational after January 1, 2018.

3 | All facilities are expected to meet aspirational or progressive limits as early as possible and share best practices on how to achieve it.

4 | Aspirational limits for conventional wastewater parameters (Appendix A, Table 1) are expected to be met by January 1, 2020. Suppliers are encouraged to continuously improve to achieve one of the following:

4.1 Attain and demonstrate performance that meets or exceeds aspirational performance;

or

4.2 In the absence of aspirational performance, attain and demonstrate progressive performance, and have a plan with milestones in place to achieve continuous improvement.

5 | Reporting limits for ZDHC MRSL parameters (Appendix A, Table 2A to 2N) are expected to be fully met by suppliers by January 1, 2020. From January 2018, ZDHC expects suppliers to be able to provide evidence of a progressive schedule to phase out hazardous chemicals by 2020.

F. Related Work, Relevant Organisations and Contributions

Related Work

1| Joint Roadmap for Zero Discharge of Hazardous Chemicals http://www.roadmaptozero.com/fileadmin/layout/media/downloads/en/JointRoadmapUpdate_FINAL.pdf

2| World Health Organization – Making Water a Part of Economic Development http://www.who.int/water_sanitation_health/waterandmacroecon.pdf

3| Textile Industry Wastewater Discharge Quality Standards Guidelines Literature Review http://www.roadmaptozero.com/fileadmin/pdf/WastewaterQualityGuidelineLitReview.pdf

4| Business for Social Responsibility (BSR) Guidelines 2010 https://www.bsr.org/en/

5| ZDHC Manufacturing Restricted Substances List V1.1 http://www.roadmaptozero.com/fileadmin/pdf/MRSL_v1_1.pdf

6| Best Available Techniques Reference Document on the Textiles Industry http://eippcb.jrc.ec.europa.eu/reference/BREF/txt_bref_0703.pdf

7| bluesign System http://www.bluesign.com/industry/infocenter/downloads

8| STeP by ®Oeko-Tex® STEP https://www.oeko-tex.com/media/init_data/downloads/STeP%20Standard.pdf

9| GOTS http://www.global-standard.org/de/the-standard.html

10| EU Eco Label http://ec.europa.eu/environment/ecolabel/documents/factsheet_textiles.pdf

11| Blue Angel https://www.blauer-engel.de/de/produktwelt/haushalt-wohnen/textilien

With thanks to all contributors who have assisted in the development of these guidelines, including:

1| Dr. Dirk von Czarnowski / Intertek. http://www.intertek.com/

2| Charlie He / Carollo Engineers Inc. http://www.carollo.com/

3| Dr. Thomas Schaefer / bluesign technologies. http://www.bluesign.com/

4| Mohan Seneviratne / IFC. http://www.ifc.org/

5| Prof. Danli Xi / Donghua University. http://www.dhu.edu.cn/

6| Nathan Zaugg / MWH Global. http://www.mwhglobal.com/

Appendix A

Limits and Test Methods for Targeted (Conventional and ZDHC MRSL) Wastewater Parameters

Table 1: Conventional Parameter Limits and Test Methods

Table 2A: Alkylphenol (AP) and Alkylphenol Ethoxylates (APEOs), including all Isomers

Table 2B: Chlorobenzenes and Chlorotoluenes

Table 2C: Chlorophenols

Table 2D: Dyes – Azo (Forming Restricted Amines)

Table 2E: Dyes – Carcinogenic or Equivalent Concern

Table 2F: Dyes – Disperse (Sensitising)

Table 2G: Flame Retardants

Table 2H: Glycols

Table 2I: Halogenated Solvents

Table 2J: Organotin Compounds

Table 2K: Perfluorinated and Polyfluorinated Chemicals (PFCs)

Table 2L: Ortho-Phthalates – Including all ortho esters of phthalic acid

Table 2M: Polycyclic Aromatic Hydrocarbons (PAHs)

Table 2N: Volatile Organic Compounds (VOC)

Test Methods for Targeted (Conventional and ZDHC MRSL) Parameters

Table 3: Sludge

Table 1:

Conventional parameters showing foundational, progressive, and aspirational limits; and the standard test methods for measurement.

It is expected that suppliers will use the standard methods that best apply to their region. When reporting data, state the standard test methods used to obtain the data.

Sum parameters + metals (mg/L unless otherwise noted)	Limits			Standard Test Method			
	Foundational	Progressive	Aspirational	ISO	European Union	United States	China
Temperature [°C] *	Δ15 / max. 35	Δ10 or 30	Δ5 or 25	No standard		USEPA 170.1	GB/T 13195
TSS	50	15	5	ISO 11923		USEPA 160.2, APHA 2540D	GB/T 11901
COD	150	80	40	ISO 6060**		USEPA 410.4. APHA 5220D**	GB/T 11914**
Total-N	20	10	5	ISO 5663, ISO 29441		USEPA 351.2. APHA 4500P-J. APHA 4500N-C	HJ 636. GB 11891
pH	6-9			ISO 10523	EN ISO 10523	USEPA 150.1	GB/T 6920
Colour [m^{-1}] (436nm; 525; 620nm)	7; 5; 3	5; 3; 2	2; 1; 1	ISO 7887-B	-	-	-
BOD_5	30	15	5	ISO 5815-1, -2 (5 days)	EN 1899-1 (5days)	USEPA 405.1 (5 days), APHA 5210B (5 days)	HJ 505
Ammonium-N	10	1	0.5	ISO 11732. ISO 7150	EN ISO 11732	USEPA 350.1, APHA 4500 NH_3-N	HJ 535. HJ 536
Total-P	3	0.5	0.1	ISO 11885, ISO 6878	EN ISO 11885	USEPA 365.4, APHA 4500P-J	GB/T 11893
AOX	5	1	0.1	ISO 9562	EN ISO 9563	USEPA 1650	HJ/T 83-2001
Oil and Grease	10	2	0.5	ISO 9377-2	EN ISO 9377-2	USEPA 1664	HJ 637
Phenol	0.5	0.01	0.001	ISO 14402	EN ISO 14402	APHA 5530 B, C&D	HJ 503
Coliform [bacteria/100 ml]	400	100	25	ISO 9308-1	EN ISO 9308-1	USEPA 9132	GB/T 5750.12
Persistent Foam	Not visible			N/A			
Anions							
Cyanide	0.2	0.1	0.05	ISO 6703-1,2,-3. ISO 14403-1,-2		USEPA 335.2, APHA 4500-CN	HJ 484
Sulfide	0.5	0.05	0.01	ISO 10530		APHA 4500-S2-D	GB/T 16489
Sulfite	2	0.5	0.2	ISO 10304-3	EN ISO 10304-3	USEPA 377.1	**
Metals							
Antimony***	0.1	0.05	0.01	ISO 11885	EN ISO 11885	USEPA 200.7. USEPA 200.8. USEPA 6010c. USEPA 6020a	GB7475. HJ700
Chromium, total	0.2	0.1	0.05				GB 7466. HJ700
Cobalt	0.05	0.02	0.01				HJ700
Copper	1	0.5	0.25				GB7475. HJ700
Nickel	0.2	0.1	0.05				GB 11907. HJ700
Silver	0.1	0.05	0.005				GB11907.HJ700
Zinc	5.0	1.0	0.5				GB 7472. GB 7475. HJ 700
Arsenic	0.05	0.01	0.005	ISO 11885	EN ISO 11885	USEPA 200.7. USEPA 200.8. USEPA 6010c. USEPA 6020a	GB7475. HJ700
Cadmium	0.1	0.05	0.01	ISO 11885	EN ISO 11885	USEPA 200.7. USEPA 200.8. USEPA 6010c. USEPA 6020a	GB7475. HJ700
Chromium (VI)	0.05	0.005	0.001	ISO 18412	EN ISO 18412	USEPA 218.6	GB 7467
Lead	0.1	0.05	0.01	ISO 11885	EN ISO 11885	USEPA 200.7. USEPA 200.8. USEPA 6010c. USEPA 6020a	GB7475. HJ700
Mercury	0.01	0.005	0.001	ISO 12846 or ISO 17852	EN ISO 18412 or ISO 17852	USEPA 200.7. USEPA 200.8. USEPA 6010c. USEPA 6020a	HJ 597

*Degrees above ambient temperature of receiving water body.

** validated cuvette methods can be used alternatively

*** we aknowledge that for polyester production it will take time to reach this limit.

Table 2A:

Alkylphenol (AP) and Alkylphenol Ethoxylates (APEOs): Including All Isomers

Reporting limits mentioned in the following tables apply to each single chemical substance of the respective substance group

Substance or Substance Group	CAS	Reporting Limit (µg/L)	Standard Test Method
Nonylphenol (NP), mixed isomers	104-40-5 11066-49-2 25154-52-3 84852-15-3	5	NP/OP: ISO 18857 -2 (modified dichloromethane extraction) or ASTM D7065 (GC/MS or LC/MS(-MS) OPEO/NPEO (n>2): ISO 18254-1 OPEO/NPEO (n=1,2): ISO 18857-2 or ASTM D7065
Octylphenol (OP), mixed isomers	140-66-9 1806-26-4 27193-28-8		
Octylphenol ethoxylates (OPEO)	9002-93-1 9036-19-5 68987-90-6		
Nonylphenol ethoxylates (NPEO)	9016-45-9 26027-38-3 37205-87-1 68412-54-4 127087-87-0		

Table 2B:

Chlorobenzenes and Chlorotoluenes

Substance or Substance Group	CAS	Reporting Limit (µg/L)	Standard Test Method
Monochlorobenzene	108-90-7	0,2	USEPA 8260B, 8270D. Dichloromethane extraction followed by GC/MS
1,2-Dichlorobenzene	95-50-1		
1,3-Dichlorobenzene	541-73-1		
1,4-Dichlorobenzene	106-46-7		
1,2,3-Trichlorobenzene	87-61-6		
1,2,4-Trichlorobenzene	120-82-1		
1,3,5-Trichlorobenzene	108-70-3		
1,2,3,4-Tetrachlorobenzene	634-66-2		
1,2,3,5-Tetrachlorobenzene	634-90-2		
1,2,4,5-Tetrachlorobenzene	95-94-3		
Pentachlorobenzene	608-93-5		
Hexachlorobenzene	118-74-1		
2-Chlorotoluene	95-49-8		
3-Chlorotoluene	108-41-8		
4-Chlorotoluene	106-43-4		
2,3-Dichlorotoluene	32768-54-0		
2,4-Dichlorotoluene	95-73-8		
2,5-Dichlorotoluene	19398-61-9		
2,6-Dichlorotoluene	118-69-4		
3,4-Dichlorotoluene	95-75-0		
3,5-Dichlorotoluene	25186-47-4		
2,3,4-Trichlorotoluene	7359-72-0		
2,3,6-Trichlorotoluene	2077-46-5		
2,4,5-Trichlorotoluene	6639-30-1		
2,4,6-Trichlorotoluene	23749-65-7		
3,4,5-Trichlorotoluene	21472-86-6		
2,3,4,5-Tetrachlorotoluene	76057-12-0		
2,3,5,6-Tetrachlorotoluene	29733-70-8		
2,3,4,6-Tetrachlorotoluene	875-40-1		
Pentachlorotoluene	877-11-2		

Table 2C:

Chlorophenols

Substance or Substance Group	CAS	Reporting Limit (µg/L)	Standard Test Method
2-chlorophenol	95-57-8	0.5	USEPA 8270 D. Solvent extraction, derivatisation with KOH, acetic anhydride followed by GC/MS ISO 14154:2005
3-chlorophenol	108-43-0		
4-chlorophenol	106-48-9		
2,3-dichlorophenol	576-24-9		
2,4-dichlorophenol	120-83-2		
2,5-dichlorophenol	583-78-8		
2,6-dichlorophenol	87-65-0		
3,4-dichlorophenol	95-77-2		
3,5-dichlorophenol	591-35-5		
2,3,4-trichlorophenol	15950-66-0		
2,3,5-trichlorophenol	933-78-8		
2,3,6-trichlorophenol	933-75-5		
2,4,5-trichlorophenol	95-95-4		
2,4,6-trichlorophenol	88-06-2		
3,4,5-trichlorophenol	609-19-8		
2,3,4,5-tetrachlorophenol	4901-51-3		
2,3,4,6-tetrachlorophenol	58-90-2		
2,3,5,6-tetrachlorophenol	935-95-5		
Pentachlorophenol	87-86-5		

Table 2D:

Dyes – Azo (Forming Restricted Amines)

Substance or Substance Group	CAS	Reporting Limit (µg/L)	Standard Test Method
4,4′-methylene-bis-(2-chloro-aniline)	101-14-4	0.1	EN 14362-1 EN 14362-3 Reduction step with Sodiumdithionite, solvent extraction, GC/MS or LC/MS
4,4′-methylenedianiline	101-77-9		
4,4′-oxydianiline	101-80-4		
4-chloroaniline	106-47-8		
3,3′-dimethoxylbenzidine	119-90-4		
3,3′-dimethylbenzidine	119-93-7		
6-methoxy-m-toluidine	120-71-8		
2,4,5-trimethylaniline	137-17-7		
4,4′-thiodianiline	139-65-1		
4-aminoazobenzene	60-09-3		
4-methoxy-m-phenylenediamine	615-05-4		
4,4′-methylene-di-o-toluidine	838-88-0		
2,6-xylidine	87-62-7		
o-anisidine	90-04-0		
2-naphthylamine	91-59-8		
3,′3-dichlorobenzidine	91-94-1		
4-aminodiphenyl	92-67-1		
Benzidine	92-87-5		
o-toluidine	95-53-4		
2,4-xylidine	95-68-1		
4-chloro-o-toluidine	95-69-2		
4-methyl-m-phenylene-diamine	95-80-7		
o-aminoazotoluene	97-56-3		
5-nitro-o-toluidine	99-55-8		

Table 2E:

Dyes – Carcinogenic or Equivalent Concern

Substance or Substance Group	CAS	Reporting Limit (µg/L)	Standard Test Method
C.I. Direct Black 38	1937-37-7	500	Liquid extraction, LC/MS
C.I. Direct Blue 6	2602-46-2		
C.I. Acid Red 26	3761-53-3		
C.I. Basic Red 9	569-61-9		
C.I. Direct Red 28	573-58-0		
C.I. Basic Violet 14	632-99-5		
C.I. Disperse Blue 1	2475-45-8		
C.I. Disperse Blue 3	2475-46-9		
C.I. Basic Blue 26 (with Michler's Ketone > 0.1%)	2580-56-5		
C.I. Basic Green 4 (malachite green chloride)	569-64-2		
C.I. Basic Green 4 (malachite green oxalate)	2437-29-8		
C.I. Basic Green 4 (malachite green)	10309-95-2		
Disperse Orange 11	82-28-0		

Table 2F:

Dyes – Disperse (Sensitizing)

Substance or Substance Group	CAS	Reporting Limit (µg/L)	Standard Test Method
Disperse Yellow 1	119-15-3	50	Liquid extraction, LC/MS
Disperse Blue 102	12222-97-8		
Disperse Blue 106	12223-01-7		
Disperse Yellow 39	12236-29-2		
Disperse Orange 37/59/76	13301-61-6		
Disperse Brown 1	23355-64-8		
Disperse Orange 1	2581-69-3		
Disperse Yellow 3	2832-40-8		
Disperse Red 11	2872-48-2		
Disperse Red 1	2872-52-8		
Disperse Red 17	3179-89-3		
Disperse Blue 7	3179-90-6		
Disperse Blue 26	3860-63-7		
Disperse Yellow 49	54824-37-2		
Disperse Blue 35	12222-75-2		
Disperse Blue 124	61951-51-7		
Disperse Yellow 9	6373-73-5		
Disperse Orange 3	730-40-5		
Disperse Blue 35	56524-77-7		

Table 2G:

Flame Retardants

Substance or Substance Group	CAS	Reporting Limit (µg/L)	Standard Test Method
Tris(2-chloroethyl)phosphate (TCEP)	115-96-8	5	US EPA 8270 ISO 22032, USEPA 527 and USEPA 8321B. Dichloromethane extraction GC/MS or LC/MS(-MS)
Decabromodiphenyl ether (DecaBDE)	1163-19-5		
Tris(2,3,-dibromopropyl)-phosphate (TRIS)	126-72-7		
Pentabromodiphenyl ether (PentaBDE)	32534-81-9		
Octabromodiphenyl ether (OctaBDE)	32536-52-0		
Bis(2,3-dibromopropyl)phosphate (BIS)	5412-25-9		
Tris(1-aziridinyl)phosphine oxide) (TEPA)	545-55-1		
Polybromobiphenyls (PBB)	59536-65-1		
Tetrabromobisphenol A (TBBPA)	79-94-7		
Hexabromocyclododecane (HBCDD)	3194-55-6		
2,2-bis(bromomethyl)-1,3-propane-diol (BBMP)	3296-90-0		
Tris(1,3-dichloro-isopropyl) phosphate (TDCP)	13674-87-8		
Short-chain chlorinated Paraffins (SCCP) (C10-C13)	85535-84-8		

Table 2H:

Glycols

Substance or Substance Group	CAS	Reporting Limit (µg/L)	Standard Test Method
Bis(2-methoxyethyl)-ether	111-96-6	50	US EPA 8270 Liquid extraction, LC/MS GC-MS
2-ethoxyethanol	110-80-5		
2-ethoxyethyl acetate	111-15-9		
Ethylene glycol dimethyl ether	110-71-4		
2-methoxyethanol	109-86-4		
2-methoxyethylacetate	110-49-6		
2-methoxypropylacetate	70657-70-4		
Triethylene glycol dimethyl ether	112-49-2		

Table 2I:

Halogenated Solvents

Substance or Substance Group	CAS	Reporting Limit (µg/L)	Standard Test Method
1,2-dichloroethane	107-06-2	1	USEPA 8260B Headspace GC/MS or Purge-and-Trap-GC/MS
Methylene chloride	75-09-2		
Trichloroethylene	79-01-6		
Tetrachloroethylene 127-18-4			

Table 2J:

Organotin Compounds

Substance or Substance Group	CAS	Reporting Limit (µg/L)	Standard Test Method
Mono-, di- and tri-methyltin derivatives		0.01	ISO 17353 Derivatisation with NaB(C2H5) GC/MS
Mono-, di- and tri-butyltin derivatives	Multiple		
Mono-, di- and tri-phenyltin derivatives	Multiple		
Mono-, di- and tri-octyltin derivatives	Multiple		

Table 2K:

Perfluorinated and Polyfluorinated Chemicals (PFCs)

Substance or Substance Group	CAS	Reporting Limit (µg/L)	Standard Test Method
PFOS	355.46-4. 432-50-7	0.01	DIN 38407-42 (modified) Ionic PFC: Concentration or direct injection, LC/MS(-MS); Non-ionic PFC (FTOH): derivatisation with acetic anhydride followed by GC/MS
PFOA	335-67-1		
PFBS	29420-49-3. 29420-43-3		
PFHxA	307-24-4		
8:2 FTOH	678-39-7	1	
6:2 FTOH	647-42-7		

Table 2L:

Otho-Phthalates – Including all ortho esters of phthalic acid

Substance or Substance Group	CAS	Reporting Limit (µg/L)	Standard Test Method
Di(ethylhexyl) phthalate (DEHP)	117-81-7	10	US EPA 8270D, ISO 18856 Dichloromethane extraction GC/MS
Bis(2-methoxyethyl) phthalate (DMEP)	117-82-8		
Di-n-octyl phthalate (DNOP)	117-84-0		
Di-iso-decyl phthalate (DIDP)	26761-40-0		
Di-isononyl phthalate (DINP)	28553-12-0		
Di-n-hexyl phthalate (DnHP)	84-75-3		
Dibutyl phthalate (DBP)	84-74-2		
Butyl benzyl phthalate (BBP)	85-68-7		
Dinonyl phthalate (DNP)	84-76-4		
Diethyl phthalate (DEP)	84-66-2		
Di-n-propyl phthalate (DPRP)	131-16-8		
Di-isobutyl phthalate (DIBP)	84-69-5		
Di-cyclohexyl phthalate (DCHP)	84-61-7		
Di-iso-octyl phthalate (DIOP)	27554-26-3		
1,2-benzenedicarboxylic acid, di-C7-11-branched and linear alkyl esters (DHNUP)	68515-42-4		
1,2-benzenedicarboxylic acid, di-C6-8-branched alkyl esters, C7-rich (DIHP)	71888-89-6		

Table 2M:

Polycyclic Aromatic Hydrocarbons (PAHs)

Substance or Substance Group	CAS	Reporting Limit (µg/L)	Standard Test Method
Benzo[a]pyrene (BaP)	50-32-8	1	US EPA 8270 DIN 38407-39 Solvent extraction GC/MS
Anthracene	120-12-7		
Pyrene	129-00-0		
Benzo[ghi]perylene	191-24-2		
Benzo[e]pyrene	192-97-2		
Indeno[1,2,3-cd]pyrene	193-39-5		
Benzo[j]fluoranthene	205-82-3		
Benzo[b]fluoranthene	205-99-2		
Fluoranthene	206-44-0		
Benzo[k]fluoranthene	207-08-9		
Acenaphthylene	208-96-8		
Chrysene	218-01-9		
Dibenz[a,h]anthracene	53-70-3		
Benzo[a]anthracene	56-55-3		
Acenaphthene	83-32-9		
Phenanthrene	85-01-8		
Fluorene	86-73-7		
Naphthalene	91-20-3		

Table 2N:

Volatile Organic Compounds (VOC)

Substance or Substance Group	CAS	Reporting Limit (µg/L)	Standard Test Method
Benzene	71-43-2	1	ISO 11423-1 Headspace- or Purge-and-Trap-GC/MS US EPA 8260
Xylene	1330-20-7		
o-cresol	95-48-7		
p-cresol	106-44-5		
m-cresol	108-39-4		

Table 3: Sludge

For information on single substances and CAS numbers please refer to table 2A - table 2N

*Limit value column left blank pending further study and data collection over next year

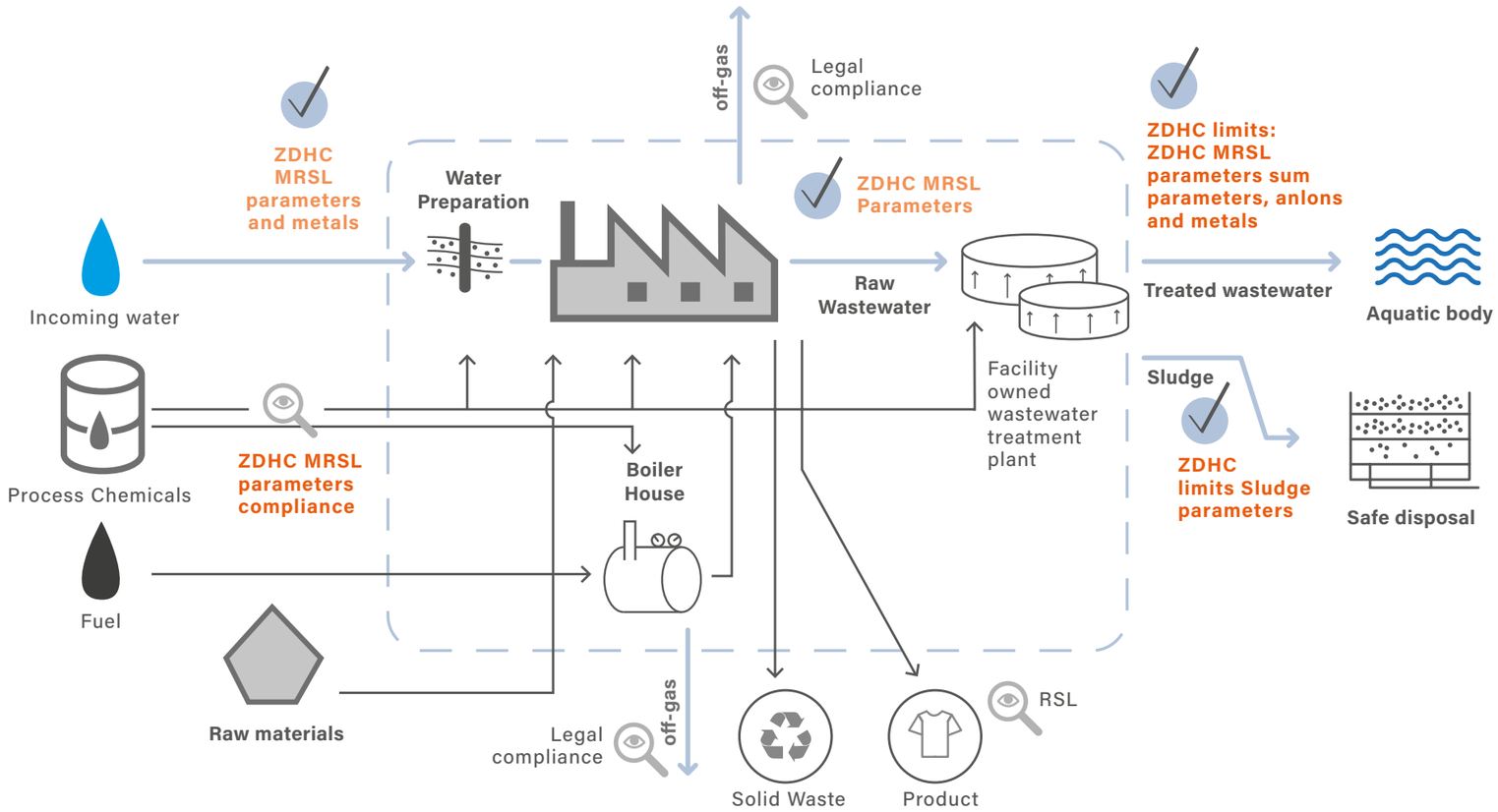
Presence of the listed substances in sludge significantly above reporting limits in tables 2A-2N indicates the need for additional investigation of the complete chemical inventory and raw materials used in production processes to ensure MRSL compliance.

Substance or Substance Group	Reporting limit [mg/kg] dry matter*	Method
Arsenic		Acid digestion. ICP or ICP/MS
Cadmium		Acid digestion. ICP or ICP/MS
Chromium VI		Extraction in buffer solution. Derivatisation and UV or IC-ICP/MS
Lead		Acid digestion. ICP or ICP/MS.
Mercury		Acid digestion. ICP or ICP/MS
Cyanide		ISO 14403-1,-2. ISO 11262
AP/APEO		NP/OP: ISO 18857 -2(modified dichloromethane extraction) or ASTM D7065 (GC/MS or LC/MS(-MS)) OPEO/NPEO (n>2): ISO 18254-1 OPEO/NPEO (n=1,2): ISO 18857-2 or ASTM D7065
Chlorobenzenes and Chlorotoluenes		USEPA 8260B, 8270D. Dichloromethane extraction followed by GC/MS
Chlorophenols		USEPA 8270 D. Solvent extraction, derivatisation with KOH, acetic anhydride followed by GC/MS iSO 14154:2005
Dyes-azo		EN 14362-1 EN 14362-3 Reduction step with Sodiumdithionite, solvent extraction, GC/MS or LC/MS

Substance or Substance Group	Reporting limit [mg/kg] dry matter*	Method
Dyes – Carcinogenic or Equivalent Concern		Liquid extraction, LC/MS
Dyes – Disperse (Sensitizing)		Liquid extraction, LC/MS
Flame retardants		US EPA 8270 ISO 22032, USEPA 527 and USEPA 8321B. Dichloromethane extraction GC/MS or LC/MS(-MS)
Glycols		US EPA 8270 Liquid extraction, LC/MS GC-MS
Halogenated Solvents		USEPA 8260B Headspace GC/MS or Purgeand-Trap
Organotin		ISO 17353 Derivatisation with NaB(C2H5) GC/MS
Perfluorinated and Polyfluorinated Chemicals (PFCs) PFOS PFOA PFBS PFHxA 8:2 FTOH 6:2 FTOH		DIN 38407-42 (modified) Ionic PFC: Concentration or direct injection, LC/MS(-MS); Non-ionic PFC (FTOH): derivatisation with acetic anhydride followed by GC/MS
Phthalates – Including all other esters of phthalic acid		US EPA 8270D, ISO18856 Dichloromethane extraction GC/MS
Polycyclic Aromatic Hydrocarbons (PAHs)		US EPA 8270 DIN 38407-39 Solvent extraction GC/MS
Volatile Organic Compounds (VOC)		ISO 11423-1 Headspace- or Purge-and- Trap-GC/MS US EPA 8260

Appendix B. Fig 1.

Sampling points for facility with own WWTP and direct discharge

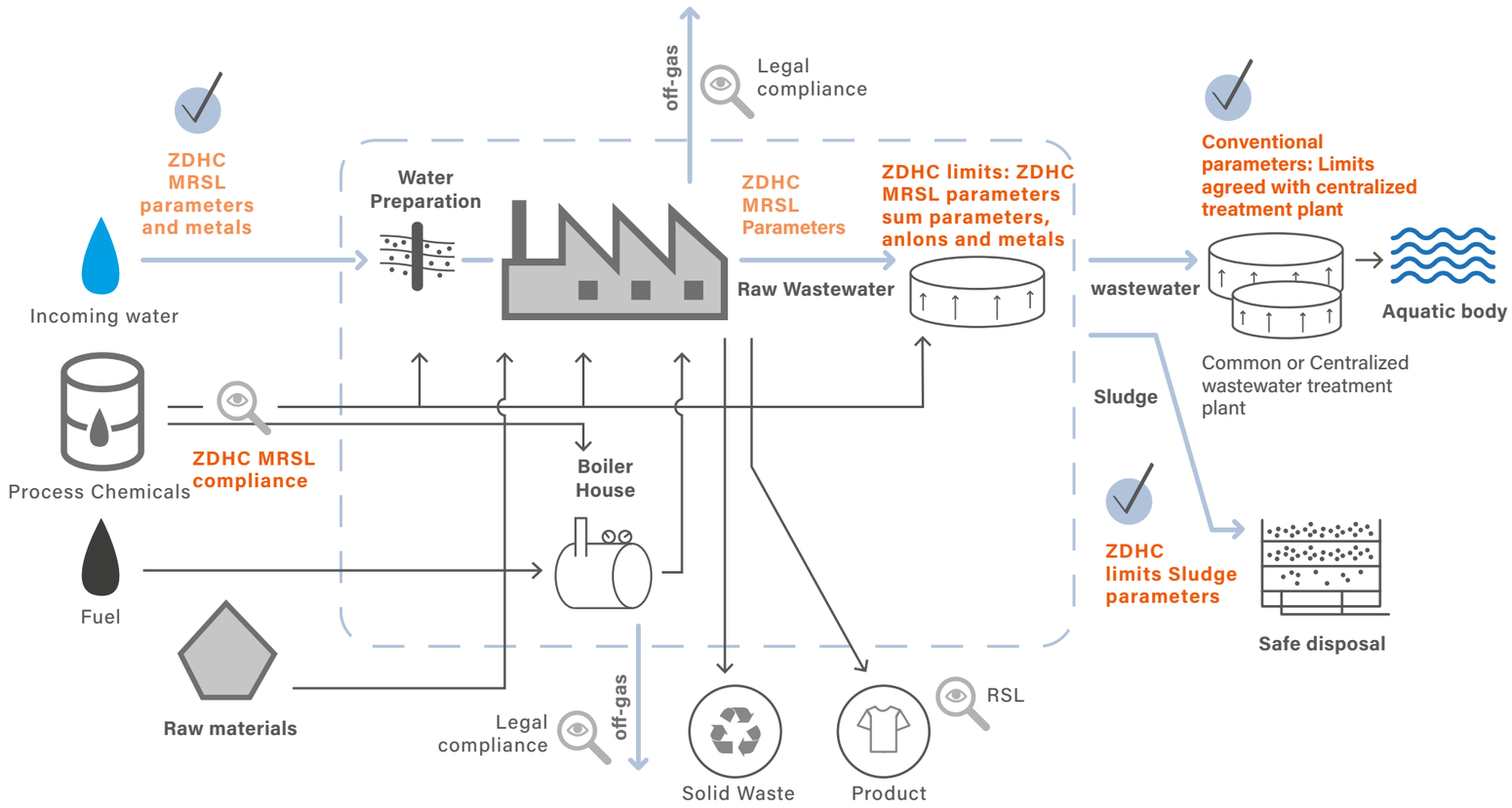


Check point

Measuring point

Appendix B. Fig 2.

Sampling points for facility with indirect discharge; WWTP is managed by third-party, or, optionally, company has pre-treatment (equalisation, buffering etc) on-site.



Check point

Measuring point

Appendix C

Process Flowchart for Testing