bluesign® CRITERIA for production sites

ANNEX: Surface treatment of metals and plastics/non-textile substrates

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Contents

1 Scope

Comprehensive requirements for companies with production sites are determined in the *bluesign® CRITERIA for production sites*.

This document at hand defines additional provisions for surface treatment of metals and plastics/non-textile substrates with the processes mentioned in Table 2.1.

2 Definitions

The following table gives an overview of the relevant processes and their definitions in the framework of the bluesign® SYSTEM:

Group	Process	Description	Substrates				
			Iron alloys	Copper alloys	Zinc alloys	Aluminum alloys	Polymers
1) (Electro-)Chemical wet processes	Electroplating	Deposition of thin layers of metals from electrolyte by electric current	x	x	x	x	x
	Pickling	Removal of stains and impurity layers from surfaces, e.g. by acidic or caustic treatment	x	x	-	x	x
	Anodizing	Converting the metal surface into a decorative, durable, corrosion- and abrasion-resistant anodic finish; applied to aluminum alloys	-	-	-	x	-
	Black oxide finishing	Conversion coating to form an integral protective surface on steel and iron	x	-	-	-	-
	Chemical polishing	Removal of burrs and uneven surfaces by the application of chemicals	x	x	x	x	-
	Electro polishing	Removal of burrs and uneven surfaces by the application of chemicals and electric current	x	x	-	x	-
	Coloring of copper alloys	Changing the color of copper alloy surfaces by the application of different chemicals	-	x	-	-	-
	Electrophoretic deposition (e-coating)	Deposition of lacquers from an aqueous bath onto the surface of metal items by application of electric current and subsequent baking	x	x	x	x	-
2) Solvent based surface treatment processes	Solvent based cleaning	Removal of stains, oils, etc. by the application of solvents	x	x	x	x	x
	Painting/Varnishing/ Lacquering	Application of solvent based paints, lacquers or varnishes on various surfaces, e.g. by spray application	x	x	x	x	x
3) Other surface treatment processes	Hot dip galvanizing	Application of zinc, zinc-iron alloy or tin to steel or base metal to prevent corrosion	x	x	x	-	-
	Vitreous Enameling	Application of melted powdered glass to metals to improve hardness, durability and scratch resistance	x	x	x	x	-
	Powder coating	Application of dry polymer powder on conductive surfaces, assisted by electrostatic charge and subsequent baking	x	x	x	x	x
	Solvent free Painting/Varnishing/ Lacquering	Application of solvent free paints, lacquers or varnishes on various surfaces, e.g. by spray application	x	x	x	x	x

Table 2.1: Overview of surface treatment processes and typical substrates

For a comprehensive list of terms and abbreviations, please refer to the document *bluesign® glossary*.

3 Best Available Techniques (BAT)

A manufacturer carrying out the above-mentioned surface treatment processes shall be aware of Best Available Techniques (BAT) that are relevant for the industry (see for example http://eippcb.jrc.ec.europa.eu/reference/; surface treatment of metals and plastics).

4 Industry specific requirements

4.1 Input stream management for solvent based processes

- The possibility to switch to water based or low VOC systems shall be evaluated at regular intervals.

4.2 Input stream management for metal-based items

- The kind and quantity of impurities in metals (e.g. lead, arsenic or cadmium) used as raw materials may differ depending on the metal type and its source(s). A manufacturer shall ensure by means of appropriate input control (supplier evaluation and supplier selection, purchase conditions and testing program) that relevant limits according to legal requirements and the *bluesign® SYSTEM SUBSTANCES LIST (BSSL) - Consumer safety limits* are met

4.3 Input stream management for polymer-based items

Polymer based items which are sourced by the manufacturer are subject to a bluesign® CHEMICAL ASSESSMENT.

4.4 Wastewater limits

Considering the hazards associated with the chemicals used for the processes in the scope of this Annex, properly managed treatment of wastewater is indispensable.

Wastewater limits for system partners are described in the following chapters:

- Group 1 - (Electro-)Chemical wet processes; see Chapter 5.1
- Group 2 - Solvent based surface treatment processes; see Chapter 5.2
- Group 3 - Other surface treatment processes; see Chapter 5.3

National or local requirements that are stronger or more detailed than the limits and requirements defined in the bluesign® CRITERIA will supersede the BLUESIGN requirements.

In order to control the efficiency of the wastewater treatment plant, it is recommended that relevant parameters are measured not only in the treated (clean) stream but also in the untreated (raw) wastewater.

APEO can be introduced to the system in various ways. Therefore, for all sites with wet processing, APEO (NPEO, OPEO, NP and OP) shall be measured two times per year in the raw wastewater. If the concentrations in the raw wastewater exceed 5 µg/L, a system partner shall conduct a root cause analysis to identify the sources and phase out materials containing APEO or chemicals as soon as possible.

4.5 Air emissions

The processes in the scope of this document typically release hazardous substances to the air. These emissions have to be controlled by suitable and effective treatment systems. If no specific requirements are defined, compliance with local regulation is a minimum requirement.

4.6 Finished product

In addition to the input stream management measures, especially since the surface of items is changed, a suitable program to manage compliance of the finished products with the legal requirements of the local and target markets, as well as the *bluesign® SYSTEM SUBSTANCES LIST (BSSL) - Consumer safety limits,* shall be established and maintained.

5 Process specific requirements

5.1 Group 1 - (Electro-)chemical wet processes

5.1.1 General

The following general aspects shall be considered:

- Bath maintenance (e.g. by monitoring, process control, filtration, adding chemicals, etc.), to prolong operating life
- Minimizing water and chemical components discharged to the wastewater
- Re-use of chemicals employed in the surface treatment process
- Multiple use of rinsing baths; use counterflow rinsing cascades
- Phasing out solvents for degreasing that are characterized by the risk phrases/hazard statements H340, H350i, H360FD
- Cr VI based chromium plating systems shall be replaced by Cr III based systems as soon as technically and economically feasible. Regular substitution checks shall be conducted
- The replacement of cyanide-based plating systems by cyanide free systems shall be evaluated at regular intervals

5.1.2 OH&S

Mandatory:

- Training of operators for specific hazards of applied chemicals and electricity
- Training of first aiders for electroplating specific first aid (preferably in cooperation with the nearest suitable hospital)
- Risk assessments
- Local Exhaust Ventilation (LEV) systems at hazardous baths
- Regular check of the effectiveness of LEV systems
- Clear separation of incompatible chemicals (especially acids and cyanides)
- All treatment baths shall be clearly marked
- Explosion protection
- Emergency plan
- Regular workplace atmosphere measurements by a competent third party
- Storage, application and destruction of cyanides shall be monitored closely; detailed records shall be kept

Recommended:

- Antidotes for common toxic substances (e.g. cyanides, hydrofluoric acid)

5.1.3 Water emissions

The following limits shall be kept for wastewater from (electro-)chemical wet processing (indirect discharge limits apply if no local limits are defined for the respective parameters):

Parameter	Unit	Direct discharge	Indirect discharge	Electroplating	Pickling	Anodizing	Black oxide finishing	Coloring of brass alloys
Aluminum	mg/L	**x**	**-**	3	3	3	3	3
COD	mg/L	**x**	**-**	400	100	100	200	200
Fish egg toxicity	LID	**x**	**-**	6	4	2	6	6
Fluoride	mg/L	**x**	**-**	50	20	50	-	-
Hydrocarbons	mg/L	**x**	**-**	10	10	10	10	10
Iron	mg/L	**x**	**-**	3	3	-	3	3
Ammonium nitrogen (NH_4-N)	mg/L	**x**	**-**	100	30	-	30	30
NO_3-N	mg/L	**x**	**-**	-	5	5	5	5
Phosphorous (total)	mg/L	**x**	**-**	2	2	2	2	2
AOX	mg/L	**x**	**x**	1	1	1	1	1
Arsenic	mg/L	**x**	**x**	0.1	-	-	-	0.1
Cadmium	mg/L	**x**	**x**	0.2	-	-	-	-
Chromium (total)	mg/L	**x**	**x**	0.5	0.5	0.5	0.5	-
Chromium (VI)	mg/L	**x**	**x**	0.1	0.1	0.1	0.1	-
Cobalt	mg/L	**x**	**x**	-	-	1	-	-
Copper	mg/L	**x**	**x**	0.5	0.5	-	-	0.5
Cyanide	mg/L	**x**	**x**	0.2	-	-	-	-
Free chlorine	mg/L	**x**	**x**	0.5	0.5	-	0.5	-
Lead	mg/L	**x**	**x**	0.5	-	-	-	0.5
Mercury	mg/L	**x**	**x**	0.05	0.05	0.05	0.05	0.05
Nickel	mg/L	**x**	**x**	0.5	0.5	-	0.5	0.5
Selenium	mg/L	**x**	**x**	-	-	-	-	1
Silver	mg/L	**x**	**x**	0.1	-	-	-	-
Sulfide	mg/L	**x**	**x**	1	1	-	1	1
Tin	mg/L	**x**	**x**	2		2	-	2
Zinc	mg/L	**x**	**x**	2	2	2	-	2
EDTA	mg/L	**x**	**x**	shall not be present				

Table 5.1: Group 1: Wastewater limits (methods see Table 6.1)

Possibilities to destroy cyanides without the application of hypochlorite shall be evaluated (e.g. by applying UV/H_2O_2 process or potassium peroxymonosulfate).

5.1.4 Air emissions

All emissions from electroplating operations containing hazardous components and substances shall be subjected to suitable off-gas treatment measures:

- Emissions from different treatment baths shall be treated separately (e.g. from cyanide baths and acid baths)
- Water from aqueous scrubbing systems shall be sent to suitable wastewater treatment
- Assessment and identification of relevant off-gas parameters necessary for each emission port (e.g. TOC off-gas, dust, HCl, NOx, Cr (VI))
- Regular monitoring of relevant off- gas parameters is necessary

5.2 Group 2 - Solvent based surface treatment processes

5.2.1 General

- Reduction of overspray and paint loss
- Use of low VOC/high solid paint systems

5.2.2 OH&S

- Use of automated and closed spray paint and cleaning machines where feasible
- Spray painting units shall be equipped with effective Local Exhaust Ventilation (LEV) systems
- Regular check of the effectiveness of LEV systems
- Workplace measurements for aerosols and relevant solvents are necessary
- Explosion protection measures

5.2.3 Air emissions

- Regulations for VOC relevant production sites according to *bluesign® CRITERIA for production sites / Annex VOC management* shall be followed
- Fugitive emissions shall be minimized

5.2.4 Water emissions

The following limits shall be kept for wastewater from solvent based surface treatment processes (indirect discharge limits apply if no local limits are defined for the respective parameters):

Parameter	Unit	Direct discharge	Indirect discharge	Painting/ Varnishing/ Lacquering
COD	mg/L	**x**	**-**	300
Fish egg toxicity	LID	**x**	**-**	6
Hydrocarbons	mg/L	**x**	**-**	10
Iron	mg/L	**x**	**-**	3
Phosphorous (total)	mg/L	**x**	**-**	2
AOX	mg/L	**x**	**x**	1
Arsenic	mg/L	**x**	**x**	3
Cadmium	mg/L	**x**	**x**	0.2
Chromium (total)	mg/L	**x**	**x**	0.5
Chromium (VI)	mg/L	**x**	**x**	0.1
Copper	mg/L	**x**	**x**	0.5
Lead	mg/L	**x**	**x**	0.5
Mercury	mg/L	**x**	**x**	0.05
Nickel	mg/L	**x**	**x**	0.5
Zinc	mg/L	**x**	**x**	2
EDTA	mg/L	**x**	**x**	Shall not be present

Figure 5.2: Group 2: Wastewater limits (methods see Table 6.1)

5.3 Group 3 - Other surface treatment processes

5.3.1 OH&S

- Control of process emissions by suitable Local Exhaust Ventilation (LEV) systems is necessary (e.g. metal fumes, dusts and aerosols)
- Regular check of the effectiveness of LEV systems
- Explosion protection (air-dust mixtures)
- Powder coating (electrostatic): regular check of electrical installations and grounding

5.3.2 Air emissions

- Control of process emissions is necessary (e.g. metal fumes, dusts and aerosols)

5.3.3 Water emissions

The following limits shall be kept for wastewater from other surface treatment processes (indirect discharge limits apply if no local limits are defined for the respective parameters):

Parameter	Unit	Direct discharge	Indirect discharge	Hot-dip galvanizing	Enameling	Solvent free varnishing	Mechanical surface treatment
Aluminum	mg/L	**x**	**-**	-	2	-	3
COD	mg/L	**x**	**-**	200	100	300	400
Fish egg toxicity		**x**	**-**	6	4	6	6
Fluoride	mg/L	**x**	**-**	50	50	-	30
Hydrocarbons	mg/L	**x**	**-**	10	10	10	10
Iron	mg/L	**x**	**-**	3	3	3	3
Ammonium nitrogen (NH_4-N)	mg/L	**x**	**-**	30	20	-	30
NO_3-N	mg/L	**x**	**-**	-	5	-	5
Phosphorous (total)	mg/L	**x**	**-**	2	2	2	2
AOX	mg/L	**x**	**x**	1	1	1	1
Arsenic	mg/L	**x**	**x**	-	-	3	-
Cadmium	mg/L	**x**	**x**	0.1	0.2	0.2	0.1
Chromium (total)	mg/L	**x**	**x**	-	0.5	0.5	0.5
Chromium (VI)	mg/L	**x**	**x**	-	0.1	0.1	0.1
Cobalt	mg/L	**x**	**x**	-	1	-	-
Copper	mg/L	**x**	**x**	-	0.5	0.5	0.5
Cyanide	mg/L	**x**	**x**	-	-	-	0.2
Free chlorine	mg/L	**x**	**x**	-	-	-	0.5
Lead	mg/L	**x**	**x**	0.5	0.5	0.5	0.5
Mercury	mg/L	**x**	**x**	0.05	0.05	0.05	-
Nickel	mg/L	**x**	**x**	-	0.5	0.5	0.5
Selenium	mg/L	**x**	**x**	-	1	-	-
Sulfide	mg/L	**x**	**x**	-	1	-	-
Tin	mg/L	**x**	**x**	2	-	-	-
Zinc	mg/L	**x**	**x**	2	2	2	2
EDTA	mg/L	**x**	**x**	Shall not be present			

Figure 5.3: Group 3: Wastewater limits (methods see Table 6.1)

6 Test methods and sampling for wastewater

The measuring/sampling point for direct discharge is after wastewater treatment, before discharge to the aquatic body. For indirect discharge the measuring/sampling point is before discharge to third-party treatment.

The following shall be considered for sampling and testing:

- Sampling shall be conducted according to *ISO 5667-13:2011 (Parts 1, 3, 10, 13 and 15)*, *"Water Quality Sampling Guidance for the preservation and handling of water samples,"* either by qualified lab personnel or by the external lab which conducts the related analysis under representative conditions (i.e. not after production breaks, heavy rainfall, etc.)
- The system partner shall define a sampling/measuring plan to ensure analyses are conducted at regular intervals
- Sampling intervals depend on the dimensions and complexity of the plant as well as on the findings. The sampling plan shall include regular third-party measurements by an accredited laboratory
- A full measuring campaign shall be conducted at least two times per year with one of the following sampling methods:
    - Composite sampling (preferred): composite sampling should be performed for no less than six hours, with no more than one hour between discrete samples. Each discrete sample shall be of equal volume. Sampling using calibrated autosamplers is preferred.
    - Qualified spot sampling should be performed over two hours with samples taken at regular intervals of fifteen minutes using an automatic composite sampler;
      or
    - a minimum of five samples should be taken during a maximum of two hours, with at least two minutes between discrete samples.
- Compliance is present if four out of the five last measurements meet the above listed limits.

Parameter	Methods
Aluminum	ISO 11885, USEPA 200.7, USEPA 200.8, USEPA 6010c, USEPA 6020a, GB 7475, HJ 700
Ammonium nitrogen (NH_4-N)	DIN 38406-5, ISO 11732, ISO 7150, USEPA 350.1, APHA 4500 NH3N,HJ 535, HJ 536
AOX	ISO 9562, USEPA 1650, HJ/T 83-2001
Arsenic	ISO 11885, USEPA 200.7, USEPA 200.8, USEPA 6010c, USEPA 6020a GB 7475, HJ 700
Cadmium	ISO 11885,USEPA 200.7, USEPA 200.8, USEPA 6010c, USEPA 6020a GB 7475, HJ 700
Chromium (total)	ISO 11885, USEPA 200.7, USEPA 200.8, USEPA 6010c, USEPA 6020a, GB 7475, HJ 700
Chromium (VI)	DIN 38405-D24, ISO 18412, USEPA 218.6, GB 7467
Cobalt	ISO 11885, USEPA 200.7, USEPA 200.8, USEPA 6010c, USEPA 6020a HJ 700
COD	DIN 38409-41, ISO 6060, USEPA 410.4, APHA 5220D, GB/T 11914, validated cuvette methods (e.g. according to ISO 15705) can be used alternatively
Copper	ISO 11885, USEPA 200.7, USEPA 200.8, USEPA 6010c, USEPA 6020a, GB 7475, HJ 700
Cyanide	ISO 6703-1, 2&3, USEPA 335.2, APHA 4500-CN
EDTA	DIN EN ISO 16588
Fish egg toxicity	DIN EN ISO 15088
Fluoride	DIN 38405-D4-2
Free chlorine	DIN 38408-G4-1
Hydrocarbons	ISO 9377-2 EN / ISO 9377-2 ,USEPA 1664, HJ 637
Iron	ISO 11885, USEPA 200.7, USEPA 200.8, USEPA 6010c, USEPA 6020a GB 7475, HJ 700
Lead	ISO 11885, USEPA 200.7, USEPA 200.8, USEPA 6010c, USEPA 6020a GB 7475, HJ 700
Mercury	ISO 12846 / ISO 17852, EN ISO 18412, ISO 17852, USEPA 200.7. USEPA 200.8, USEPA 6010c. USEPA 6020a
Nickel	ISO 11885, USEPA 200.7, USEPA 200.8 USEPA 6010c, USEPA 6020a GB 11907, HJ 700
NO_3-N	DIN EN ISO 10304-2
Phosphor (total)	ISO 11885, ISO 6878, USEPA 365.4 APHA 4500 P-J,GB/T 11893
Selenium	ISO 11885, USEPA 200.7, USEPA 200.8, USEPA 6010c, USEPA 6020a GB 11907, HJ 700
Silver	ISO 11885, USEPA 200.7, USEPA 200.8, USEPA 6010c, USEPA 6020a GB 11907, HJ 700
Sulfide	DIN 38405-26,ISO 10530, APHA 4500-S2-D GB/T 16489
Tin	ISO 11885
Zinc	ISO 11885, USEPA 200.7, USEPA 200.8, USEPA 6010c, USEPA 6020a

Table 6.1: Overview of test methods for wastewater

7 Validity

This document comes into effect from 2020-03. It replaces the *bluesign® CRITERIA for production sites - ANNEX: Surface treatment of metals* version 2.0.
For all companies that signed an agreement for an assessment or for a bluesign® SYSTEM PARTNERSHIP before 2020-03 the adapted and newly introduced requirements are binding after a transition period of one year from the date of release.
This document is subject to revisions. Details on the revision procedure for regular and unscheduled revisions are compiled in the *bluesign® SYSTEM* document.

8 Other applicable documents

The following documents complement the document at hand:

- *bluesign® SYSTEM*
- *bluesign® glossary*
- *bluesign® CRITERIA for production sites*
- *bluesign® CRITERIA for production sites – ANNEX: Exclusion criteria*
- *bluesign® CRITERIA for production sites – ANNEX: Rating criteria*
- *bluesign® SYSTEM BLACK LIMITS (BSBL) - Threshold limits for chemical substances in chemical products*
- *bluesign® SYSTEM SUBSTANCES LIST (BSSL) - Consumer safety limits*

Current versions are available for download at www.bluesign.com/criteria.