Work Package 2 “Identification of relevant target substances in BREFs”
of the HAZBREF project funded by Interreg Baltic Sea Region

Report

**Approaches for a better use of available data to prevent or reduce releases of substances of concern from industrial installations**

**Annex 3**

# Sector-specific assessment of chemicals (Strategy A)

## Use of ECHA database to derive lists of substances for BREFs (substance-based approach)

In the following the procedure to generate sector-specific substance lists based on the use descriptors in the ECHA database, specifically for the textile processing sector, is described (Strategy A).

Headers in the following two boxes and Figure A2-1 (e.g. “About\_this\_Substance\_6\_Uses\_ Industrial\_Sites” or “About\_this\_Substance\_4\_Professional\_Workers”) refer to the original Excel-files extracted from the ECHA database in May 2018, and respective columns therein (e.g. “About industrial … product, process, environment, Sector\_of\_Use”). The task is to select those use or application categories (use descriptions) which will provide chemicals relevant for the industrial textile sector, in this case. Tables for the life-cycle stage ‘manufacture’, 'formu­lation and repacking', ‘consumer uses’, and ‘article service life’ are outside of the scope of the IED, and are therefore omitted here.

About manufacture (process)

* The 'manufacture process' entries do not contain the keyword 'textile'; but a number of processes may refer to textile industry – cf. 'manufacture environment' and the TXT Questionnaire sheet 11 – textile activities.

About manufacture (environment)

* outdoor use in long-life materials with high release rate (e.g. … treated textile and fabric …)[[1]](#footnote-1);
* indoor use in long-life materials with high release rate (e.g. release from fabrics, textiles during washing, removal of indoor paints);
* industrial abrasion processing with low release rate (e.g. cutting of textile, cutting, machining or grinding of metal);
* indoor use in long-life materials with low release rate (e.g. … curtains, foot-wear, leather products …)[[2]](#footnote-2);

The life-cycle stage 'manufacture' relates directly to use at industrial sites and therefore to the topic of BREFs. However, in the use descriptors mentioned above (i.e. 'About manufacture (environment)'), the chemicals may (but must not) be intended for use in the textile industry; this results in too many chemicals and many, which are not relevant for the textile sector (only 81 out of 10.891 substance data sets contain the string 'textil\*').

The same issue applies to the life-cycle stage 'formulation and repacking'.

About formulation and repacking (product) (process 🡪 none)

* textile treatment products and dyes;
* leather treatment products;

About formulation and repacking (environment)

* outdoor use in long-life materials with high release rate (e.g. … treated textile and fabric …);
* indoor use in long-life materials with high release rate (e.g. release from fabrics, textiles during washing …);
* industrial abrasion processing with low release rate (e.g. cutting of textile …);
* indoor use in long-life materials with high release rate (e.g. release from fabrics, textiles during washing …);

It appears, that the two life-cycle stages 'manufacture' and 'formulation and repacking' might not be an appropriate starting point for selection of chemicals relevant for the textile sector. Nevertheless, 1.387 out of 8.108 substance data sets contain the string 'textil\*'.[[3]](#footnote-3)

About industrial sites (product) (process 🡪 none)

* textile treatment products and dyes;
* leather treatment products

About industrial sites (environment)

* outdoor use in long-life materials with high release rate (e.g. … treated textile and fabric …);
* indoor use in long-life materials with high release rate (e.g. release from fabrics, textiles during washing …);
* outdoor use, indoor use in long-life materials with low release rate (e.g. … curtains, foot-wear, leather products …);
* industrial abrasion processing with low release rate (e.g. cutting of textile …);

About industrial sites (sector of use)

* scientific research and development chemicals, plastic products, textile, leather or fur;
* textile, leather or fur;

The life-cycle stage 'use at industrial sites' will generally not refer to sites of manufacture and formulation of the chemicals, but rather to industrial sites, where such chemicals are used; this clearly falls into the realm of BREFs. 1.568 out of 13.907 substance data sets for industrial products contain the string 'textil\*', and 2.217 substance data sets refer to 'textile, leather or fur' in the 'industrial sector of use'. Again, chemicals selected according to the identified descrip­tions may occur in a broader use than only with textiles; the selection would require a secondary reality check (cf. concept figure above).

Several chemicals used at sites of the textile industry are process chemicals for the application of performance chemicals[[4]](#footnote-4), and process chemicals should therefore not attach to the textiles; on the other hand, they are exactly those, which are washed off of during industrial treatment of the textiles and will end up in the waste streams of the plant. **Regardless of their hazard potential, these chemicals in the waste stream are highly relevant with regard to appro­priate waste water treatment technologies (i.e. BATs).** To a certain extent performance chemicals, which are intended to stick to the textiles, will also be retained in the treatment facilities, and should therefore also be considered here.

About professional workers (product) (process 🡪 none)

* textile treatment products and dyes;

About professional workers (environment)

* outdoor use in long-life materials with high release rate (e.g. … treated textile and fabric …);
* indoor use in long-life materials with high release rate (e.g. release from fabrics, textiles during washing …);
* indoor use in long-life materials with low release rate (e.g. … curtains, foot-wear, leather products …);
* industrial abrasion processing with low release rate (e.g. cutting of textile …);

About professional workers (use sector)

* scientific research and development textile, leather or fur …;[[5]](#footnote-5)
* textile, leather or fur;
* formulation of mixtures and/or re-packaging building & construction work textile, leather or fur;
* municipal supply (…) and sewage treatment, … textile, leather or fur;[[6]](#footnote-6)

While the use descriptions in the previous life-cycle stage clearly refer to industrial sites, the use descriptions in this life-cycle stage (regarding release to the environment) refer more to the handling of textiles or, to a certain extent, to the secondary treatment of industrial textiles. This becomes obvious when looking at the 'use sectors' associated to professional workers. There­fore, a selection using these use descriptions might very well result in additional relevant chem­icals in the context of textile treatment at industrial sites, which may fall under the IED. With regard to professional uses, 851 out of 6.172 substance data sets contain the string 'textil\*'.

About consumer uses (product):

(…) textile treatment products and dyes; leather treatment products; (…)

About consumer uses (environment):

* outdoor use in long-life materials with high release rate (e.g. … treated textile and fabric …);
* indoor use in long-life materials with high release rate (e.g. release from fabrics, textiles during washing, …);
* indoor use in long-life materials with low release rate (e.g. … curtains, foot-wear, leather products …);
* industrial abrasion processing with low release rate (e.g. cutting of textile …);

Consumer use is clearly outside of the realm of the IED, even if the chemicals released from textiles used by consumers have had to be applied to these textiles at industrial sites first. In addition, the use descriptions are not limited to textile use (an issue also occurring in the stages above), and therefore selections at this life-cycle stage should only be used supportive to other approaches. Nevertheless, 1.056 out of 4.642 substance data sets for consumer products contain the string 'textil\*'.

About article service life (article category)

* fabrics, textiles and apparel (e.g. textiles and apparel used for large surface area articles …);
* fabrics, textiles and apparel used for large surface area articles (e.g. construction and building materials used on the floor or walls: carpets, rugs, tapestries)
* fabrics, textiles and apparel used for toys and other articles intended for children's use (e.g. stuffed toys, blankets, comfort objects);
* fabrics, textiles and apparel used for furniture & furnishings, including furniture cover­ings (e.g. sofa covers, car seat covers, fabric chair, hammock);
* vehicles fabrics, textiles and apparel;
* fabrics, textiles and apparel used for articles with intense direct dermal (skin) contact during normal use (e.g. clothing, shirts, pants, shorts)
* fabrics, textiles and apparel used for articles intended for food contact;
* fabrics, textiles and apparel used for packaging (excluding food packaging);
* fabrics, textiles and apparel used for bedding and mattresses articles with intense direct dermal (skin) contact during normal use (e.g. blankets, sheets);
* leather used for furniture & furnishings, including furniture coverings (e.g. sofas, car seats, chairs);
* leather (e.g. gloves, shoes, purses, furniture);
* leather (e.g. domestic articles such as decoration articles, leather boxes);

About article service life (environment) (process 🡪 none)

* industrial abrasion processing with low release rate (e.g. cutting of textile …);
* as processing aid indoor use in long-life materials with low release rate (e.g. … curtains, foot-wear, leather products …);
* outdoor use in long-life materials with high release rate (e.g. … treated textile and fabric …);
* indoor use in long-life materials with high release rate (e.g. release from fabrics, textiles during washing);
* indoor use in long-life materials with low release rate (e.g. … curtains, foot-wear, leather products …);

The categories for article service life are quite self-explanatory and illustrative (1.352 out of 2.957 substance data sets contain the string 'textil\*'). However, there is no relationship to industrial sites. It might be interesting to check the overlap of substances identified here (including those released to the environment) with those found in other life-cycle stages, in particular those used at industrial sites (cf. above).

Besides that, the strings presented here are in most cases a cutout from the ECHA CHEM entries of much longer use descriptions for various purposes; that is to say that the chemicals might not occur in textiles, but rather in other articles (note the "e.g." in the descriptions above). This has been a limitation mentioned already in the context of other life-cycle stages. Information for substances found at the stage of article service life should only be used supportive to other approaches. From 3.332 substances released to the environment during service life, 1.574 con­tain the string 'textil\*'.

An alternative approach to reducing long lists is to prioritise substances according to one or combined properties, e.g. persistence, mobility, and (eco-)toxicity. Then one would only have to set a cut-off for the ranking value (e.g. the top 20%) and one would have a shortened list of (for this sector) relevant substances.

**A practical example: Chemicals from the textile sector in use at industrial sites and by professional workers (Figure A2-1)**

The starting point are the roughly 21.000 substances in the ECHA CHEM database. From these, 13.907 substances have an entry for uses at industrial sites. If only those are filtered (follow the red arrows), which contain the string "textile" in the "Sector\_of\_Use", 1.798 remain. When these are combined with substances with “widespread use by professional workers” (no limita­tion of the industrial sector), 1.497 remain. Finally, when the string "textile" is also filtered from the professional use, only 937 substances remain. This means that **937 substances are used at industrial sites and by professional workers, which may also be used within textile industry**.

Many other combinations may be applied: We start with 6.172 substances which have wide­spread uses by professional workers (follow the green arrows). Again, with the textile sector, for example, proceeding from 6.172 substances to 317 substances with relevance for the envi­ronment at professional workers level, and combining this with 308 environmentally rel­evant substances in industrial sites, filtering will result in **157 environmentally relevant sub­stances, used at industrial sites and by professional workers in the textile sector**.

Both approaches require scrutiny with regard to the substance-specific outcome:

* Which kind of chemicals are selected?
* How large is the overlap of the two approaches?
* What is the meaning of the overlap or the differences?



Figure 1: Deriving substance lists with use descriptors from the ECHA Database – in this case for the textile processing sector

## Preliminary assessment of the metal surface treatment sector

Identification of relevant “Use descriptors” (R.12 REACH-Guidance)

* + Life cycle stage (LCS): Manufacture, Formulation or re-packing, use at industrial sites
	+ Sector of use (SU): SU 15: Manufacture of fabricated metal products, except machinery and equipment
	+ Product Category (PC): PC 14: Metal surface treatment products
	+ Process Category (PROC): PROC 7: Industrial spraying, PROC 13: Treatment of articles by dipping and pouring, PROC 23: Open processing and transfer operations at substantially elevated temperature (hot dip galvanizing)
	+ Article Categories (AC): AC 7a: Metal articles - large surface area articles
	+ Environmental release categories (ERC):
	+ ERC 2: Formulation into a mixture
	ERC 5: Use at industrial site leading to inclusion into/onto article
	ERC 7: Use of functional fluid at industrial site
	+ Descriptor list for technical function (TF): plating agent, solvent, surfactant, corro­sion inhibitor, adsorbent, anti-adhesive.
	Using the same approach as for the textile sector. Queries by ECHA data base are not completed yet.
	+ Formulation or re-packing, use at industrial sites: are clear LCS for surface treatment of metals
	+ Manufacture of fabricated metal products: important markets are automotive, con­struction, electric industry, containers, aerospace industry, industrial equipment etc.
	+ Metal surface treatment products: are the most appropriate category
	+ PROC 7: Industrial spraying: Metal spraying is known as Thermal Spraying : - involves covering a diverse range of surfaces with a metallic coating using a spray of molten particles.
	+ Industrial spraying, PROC 13: Treatment of articles by dipping and pouring,
	+ PROC 23: Open processing and transfer operations at substantially elevated tempera­ture (hot dip galvanizing)
	+ These process categories are typical to the STM, PROC 23 covers also hot dip galva­nizing

Of course there might be further use categories to be applied on STM.

For further use descriptors that apply for metal surface treatment metals, consider the Reach Guidance Document R.12!

Selecting relevant use descriptors that are linked to STM. Here not all categories are presented. Some others were found to be plausible for this sector.

* + STM implies metal articles as well as treatment of large surfaces
	+ Galvanisation means inclusion onto an article surface, plating agent is a typical product
	+ Various functional fluids are applied within the galvanization process
	+ The prevention of corrosion is a primary goal in STM

**STM Sector – first results (1)**

Apart from the approach with the Textile Sector there is no BREF-Questionnaire available (with chemical groups, or technical functions)!

* + Substance lists from case studies (PL, EE, FI) are used as data input
	+ Some companies did not disclose trade names or producers of chemicals
	+ Suppliers are not disclosing full composition of their chemicals
	+ Information on chemicals is mainly due to hazardous components

The identification of relevant substances used in the textile industry could be based on an extensive list of chemical substance classes typically associated with the technical processes in this sector. For other industries, this kind of structured information is not available.

Surface treatment does not create products, but changes the surface properties of compo­nents/products for subsequent use! Processes are:

* + Acid zinc-coating, chromium conversion coating, Ni- Cr-coating, Cr- and Ni- plating, Cr- and Ni-stripping
	+ Electrolytically processed metal surfaces
	+ Ultrasonic cleaning with surfactant, electrochemical cleaning with alkaline
	+ Activation, dissolving, wetting, etching, pH-adjustment, emulsifying, complexing, rinsing, washing, brightening etc.
	+ Most chemicals used in STM are inorganic substances: metals and metal salts, inor­ganic acids, bases, and salts
	+ the developed approach of defining chemical substance classes is not very well appli­cable
	+ only organic chemicals reported from the STM industry will be considered
	+ main purposes such of organics are degreasing, cleaning, paint removal, lowering of surface tension and sealing

What about the specific processes from the STM sector? The main processes are coating with non-iron heavy metals (Cr., Ni, Zn). Metallic surfaces are treated by various processes before, within and at the end of the galvanization process. For instance cleaning, stripping and coating.

**Organic chemicals used in STM case study (FIN)**

| **Process/application** | **Name** |
| --- | --- |
| **Biocide (preservative)** | 2-Methyl-2H-isotiazol-3-one5-Chlor-2-methyl-2H-isotiazol-3-one |
| **Nickel coating** | C12-14 alkylether sulfate with ethylene oxide, sodium salt |
|  | 3-(Amidinothio)propionic acid |
|  | Sodium propanesulfonate |
|  | Prop-2-yne-1-ol |
| **Nickel plating** | Prop-2-yne-1-ol, polymer with ethylene oxide  |
|  | But-2-yne-1,4-diol |
|  | 3-(Amidinothio)propionic acid |
|  | Prop-2-yne-1-ol |
| **Zinc coating** | 1-Methoxy-2-propanol |
|  | 4-Phenyl-3-butene-2-one |
|  | Sodium p-cumenesulphonate  |
|  | Sodium benzoate  |
|  | 1'-Acetonaphthone  |
|  | 2-Butoxyethanol |
|  | Alcohols, C9-11-iso-, C10-rich, ethoxylated  |
| **Aluminium washing** | Amines, coco alkyl, ethoxylated |
|  | Alcohols, C11-15-secondary, ethoxylated |
|  | (Z)-9-Octadecenoic acid, sulfonated, potassium salts |
| **Additive for alkaline zinc** | 1H-Imidazole, polymer with (chloromethyl)oxirane |

**Organic chemicals used in STM case study (PL)**

| **Process/application** | **Name** |
| --- | --- |
| **Anode sealing** | Formaldehyde, reaction products with sulfonated 1,1'-oxybis[methylbenzene], sodium salts |
| **Aluminium etching** | Polyoxyethylene isodecyl ether |
| 2-Mercaptobenzothiazole |
| **Paint removal** | Benzyl alcohol |
| Benzyl formate |
| Mercaptobenzothiazole, sodium salt |
| 2-(heptadecenyl)-4,5-dihydro-1H-imidazole-1-ethanol |
| Benzene, C10-C16 alkyl derivatives |
| **Degreasing** | Diethylene glycol butyl ether |
| 2-Mercaptobenzothiazole |
| Alcohols, C12-15, ethoxylated |
| Alcohols, C12-14, ethoxylated, propoxylated |
| 2,2'-(octadec-9-enylimino)bisethanol |
| **Degreasing (vapour phase)** | Tetrachloroethylene |
| tert-Butyl glycidyl ether ((tert-butoxymethyl)oxirane) |
| Dipropylene glycol N-butyl ether |
| N-Methylmorpholine |

**Organic chemicals listed in STM case studies that correspond to the textile sector**

|  |  |  |
| --- | --- | --- |
| **Substance class** | **Reference to textile chemicals** |  |
| **Non-ionic surfactants** |   |   |
| **Alcohols C9-11, ethoxylated**  | Fatty alcohol ethoxylates (1A.1) |   |
| **Alcohols, C11-15-secondary, ethoxylated** |   |
| **Alcohols, C12-14, ethoxylated, propoxylated** |   |
| **Alcohols, C12-15, ethoxylated** |   |
| **Alcohols, C6-18, ethoxylated** |   |
| **Alcohols, C9-11-iso-, C10-rich, ethoxylated**  |   |
| **Polyoxyethylene isodecyl ether** |   |
| **Isodecanol, ethoxylated**  |   |
| **Isotridecanol, ethoxylated** |   |
| **(Z)- 9-Octadecenylamine, ethoxylated** | Fatty amine ethoxylates (1A.4) |   |
| **Amines, coco alkyl, ethoxylated** |   |
| **Amines, tallow alkyl, ethoxylated** |   |
| **2,2'-(octadec-9-enylimino)bisethanol** |   |
|  |   |

**STM Sector – first results (2)**

* + some chemicals are listed in more than one case study and seem to be typical for this sector;
	+ descriptions of the technical processes in which the chemicals are used are quite dif­ferent in the various studies;
	+ description of technical functions is so heterogeneous within the four case studies;
	+ grouping of chemicals was performed based on their structure only (technical func­tions ignored so far).
1. ) long text: "outdoor use in long-life materials with high release rate (e.g. tyres, treated wooden products, treated textile and fabric, brake pads in trucks or cars, sanding of buildings (bridges, facades) or vehicles (ships))". [↑](#footnote-ref-1)
2. ) long text: "indoor use in long-life materials with low release rate (e.g. flooring, furniture, toys, construction materials, curtains, foot-wear, leather products, paper and cardboard products, electronic equipment)". [↑](#footnote-ref-2)
3. ) It might be necessary to do a cross-check to see if all chemicals found here also appear in the next category 'use at industrial sites'; see also the justification below and the corresponding figures. Everything that is needed for the processing of textiles has to be produced and formulated at some point. [↑](#footnote-ref-3)
4. ) Performance chemicals are those which give the textile a specific finishing, e.g. no-iron-property, water resistance, colour etc. Textile industry expects, that performance chemicals are attached to nearly 100% to the textile material during processing – thus should not appear in the industrial waste stream – but may be released during wear and tear, washing, disposal etc. while in the hands of consumers. [↑](#footnote-ref-4)
5. ) long text: "scientific research and development textile, leather or fur, wood and wood products, pulp, paper and paper products". [↑](#footnote-ref-5)
6. ) long text: "municipal supply (e.g. electricity, steam, gas, water) and sewage treatment, agriculture, forestry and fishing, textile, leather or fur". [↑](#footnote-ref-6)