

VF CORPORATION

CHEM-IQ^{SM}

Chemical Screening Method

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Introduction

The CHEM-IQ[SM] program is a proactive method for identifying and eliminating potentially harmful and banned chemicals before they enter VF's supply chain during the manufacturing process. Textile formulations and processing chemicals are currently screened for over 550 substances to avoid, many of which appear on VF's Restricted Substances List (RSL). The RSL defines limit values for restricted usage substances and identifies usage banned chemicals for all final products manufactured and sold under VF brands. The RSL is updated on a regular basis to reflect changes in international laws, including those set forth under CPSA (USA), California Proposition 65, and REACH (ECHA). Whereas the RSL sets limit values for final products, CHEM-IQ[SM] program sets limit values for substances to avoid in all textile formulations and processing chemicals during each stage of production.

CHEM-IQ[SM] program outlines a five-step process that provides actionable information on chemical selection for VF and its suppliers.

1. Each factory submits a chemical inventory list (CIL).
2. VF's CHEM-IQ[SM] program manager determines which chemicals from the factory require screening and informs the factory.
3. The factory submits a small sample of each formulation or chemical to an approved chemical laboratory.
4. The laboratory analyzes each submitted sample for over 550 hazardous substances, giving the chemical a rating of preferred (green), allowed (yellow), due diligence required (orange), or prohibited (red).
5. The factory receives a report on all chemicals submitted and is required to follow the VF CHEM-IQ[SM] Program guide.

The goal of the CHEM-IQ[SM] Program is to achieve responsible chemical management throughout the supply chain in a cost-effective manner and thereby improve workplace safety, environmental protection, and VF product quality. If you have any inquiries or require further assistance, kindly reach out to the VF CHEM-IQ team via email at chem_iq@vfc.com.

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1 Scope

This is a **screening method** for the semi-quantitative determination of substances to avoid (STA) in textile auxiliary samples using gas chromatography-mass spectrometry (GC-MS). Most of the chemicals used in textile formulations are organic substances with low to high volatility, allowing for efficient screening using GC-MS. For non-volatile organic substances, additional screening techniques, such as high performance liquid chromatography-mass spectrometry (HPLC-MS; LC-MS), are required. Additionally, non-volatile substances can be detected by GC-MS through the use of indicator substance, along with information provided by the factory on the composition of the textile auxiliaries (such as Safety Data Sheet /SDS and Technical Data Sheet/TDS). Indicator substances are volatile substances that are formed through degradation of a STA by heat and/or by chemical reaction and that can be used to semi-quantitatively calculate the initial concentration of the STA in the textile formulation or sample. When textile auxiliaries are produced, byproducts, impurities, residual starting materials, and/or intermediates are present and may also be used as indicator substances.

The purpose of this method is to determine whether detected STA's are within or exceed the permissible concentration ranges set forth by the CHEM-IQ^{SM} chemical screening program (see Annexes A and B). As GC-MS is capable of screening for thousands of substances, the VF Substances to Avoid list is regularly updated to incorporate new information gleaned from the screening process.

This method is applicable for the screening of:

- Auxiliaries and finishing agents for fibers and yarns
- Pre-treatment agents
- Textile auxiliaries for dyeing and printing
- Colorants: dyes
- Colorants: printing
- Finishing assistants
- Technical auxiliaries for multipurpose use in the textile industry
- Dry cleaning auxiliaries
- Processing chemicals in leather manufacturing
- Other chemical auxiliaries in textile, leather, footwear and equipment production

This method is not designed for the analysis of all STA's, including

- Metals
- Inorganic salts including chlorides, sulfates, sulfites, chlorites, hypochlorites, hydroxides, etc.
- Inorganic acids
- Permanganates
- Hydrogen peroxide
- Hydroxylamines

The screening of these compounds requires further due diligence, including the use of additional detection methods and instrumentation.

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2 Normative References

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application.

- VF CHEM-IQ[SM] Program Manual
- VF CHEM-IQ[SM] Appendix: Substances to Avoid List (STA List)
- VF CHEM-IQ[SM] Sample Submission Guidelines
- VF Restricted Substance List (RSL)

3 Terms and Definitions

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

3.1 California Proposition 65 (Prop 65)

Officially known as the Safe Drinking Water and Toxic Enforcement Act of 1986, protects the state's drinking water sources from being contaminated with chemicals known to cause cancer, birth defects or other reproductive harm, and requires businesses to inform Californians about exposures to such chemicals.

3.2 Chemical Abstract Service number (CAS number)

Unique number that identifies a particular chemical structure. There may be various synonyms and different naming conventions for a chemical, but it has only one CAS number.

3.3 United States Consumer Product Safety Improvement Act (CPSIA)

Law implemented in 2008 expanding the requirements for testing and setting limits for toxic substances in products made and distributed for sale throughout the United States of America. Regulated by the Consumer Product Safety Commission (CPSC)

3.4 European Chemicals Agency (ECHA)

Administering body for REACH, located in Helsinki, Finland

3.5 CHEM-IQ[SM] limit value

Concentration limits set for each substance as measured in the textile auxiliary or processing chemical

3.6 Processing Chemicals

The actual chemicals (liquid or powder) that are used throughout the VF supply chain, typically containing numerous unique chemical substances; includes textile formulations and textile auxiliaries

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3.7 Registration, Evaluation, Authorization and Restriction of Chemicals (REACh)

Regulation of the European Union that was adopted to improve the protection of human health and the environment from the risks that can be posed by chemicals

3.8 Relative Response Factor (RRF)

Ratio between the response factor of the standard and the response factor of the compound

3.9 Response Factor (RF)

Ratio between the quantity of analyte and the detector response which it produces

3.10 Safety Data Sheet (SDS)

Written or printed material for a hazardous chemical intended to provide workers and emergency personnel with procedures for handling or working with that substance in a safe manner; formerly known as material safety data sheet (MSDS)

3.11 Technical Data Sheet (TDS)

A document that provides detailed technical information about a product or material. In various industries, including manufacturing and chemistry, TDSs are used to communicate specific data and specifications about a product.

3.12 Skin or inhalation sensitizer (SIC)

Group of substances that induces an allergic reaction after skin contact or a substance that induces hypersensitivity of the airways following inhalation

3.13 Substance to Avoid (STA)

Chemical substances (or groups of chemicals) that are banned or have strict limit values in textile formulations due to known or suspected adverse effects on the environment and/or human health and/or due to regulatory requirements

3.14 Substance of Concern (SOC)

Substances that above a given a concentration may lead to non-compliance with worker safety, air emissions, waste water, and consumer safety regulations

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3.15 Substance of Special Interest (SSI)

Substance that is classified as carcinogenic, mutagenic or toxic for reproduction (category 1 or 2), as persistence, bioaccumulative and toxic, and/or as a substance of very high concern by REACH; or whose use is restricted or banned by CPSIA or Prop 65; or is of equivalent concern

3.16 Usage Ban

the prohibition of the intentional use of the respective substance during any stage of production of the VF Product or any raw material

3.17 Volatile organic compound (VOC)

Any organic compound having at 293.15 K a vapor pressure of 0.01 kPa or more, or having a corresponding volatility under the particular conditions of use (EU Directive 1999/13/EC)

4 Principle

An aliquot of each formulation or sample is collected as described in the *CHEM-IQ^{SM} Sample Submission Guidelines* to ensure proper homogenization prior to analysis.

All samples are analyzed by two complimentary GC-MS methods: headspace analysis and acetone extraction. For headspace analysis, an aliquot of the sample is heated at 120°C for 25 min in a sealed vial, and the resulting vapor is injected into the GC. A second aliquot of the sample is extracted in acetone by ultrasonication for 10 min at 40°C, is filtered, and is injected into the instrument.

The concentration of each STA is calculated and reported as being in the green, yellow, orange, or red range as defined in Annex B.

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5 Safety Precautions

5.1 Good laboratory practice should be followed. Wear safety glasses and gloves when working with all samples and standards. For powdered samples including colorants, a single-use dust respirator is recommended.

5.2 Avoid breathing gas/fumes/ vapor/spray from volatile organic compounds. Provide adequate ventilation to keep the airborne concentrations of vapors below their respective threshold limit values.

5.3 All compressed gas cylinders should be used and stored in accordance with local regulations and in accordance with best safety practices.

5.4 Follow all manufacturers' safety recommendations for GC-MS instrumentation as outlined in user manuals.

5.5 Use caution when removing sample vials from the GC sample oven as they may be hot and/or may be pressurized.

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6 Reagents

Unless otherwise stated, analytical grade reagents should be used.

6.1 Benzene

6.2 Dodecane

6.3 Acetone

6.4 Helium 5, ≥ 99.999 vol%

7 Apparatus and Materials

7.1 General

Standard laboratory supplies such as plastic syringes, transfer pipets, spatulas, and glass vials with caps are needed.

Other required equipment includes:

7.2 **Headspace vials,** crimp top, 20-22 mL, with PTFE/Silicone septa and aluminum caps.

7.3 **Crimper,** manual or electronic for headspace vials.

7.4 **Glass microsyringe,** 250-500 µL.

7.5 **Analytical balance** with an accuracy of 0.05 mg.

7.6 **Ultrasonication bath** with temperature control**.**

7.7 **Syringe Filters,** 0.45 µm PTFE.

7.8 **Vials,** ~2 mL with septa cap.

7.9 **Gas Chromatograph-Mass Spectrometer (GC-MS)** with liquid and headspace samplers and electron ionization (EI) MS source.

7.10 **FC-43,** (perfluorotributylamine) calibration compound for mass spectrometers or equivalent.

8 Sampling

An aliquot of each formulation or sample is collected as described in the *CHEM-IQ^{SM} Sample Submission Guidelines* and is given a unique qualifier. The sample is shipped to an approved laboratory for analysis.

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9 Standard Preparation

9.1 External standard for analysis of headspace samples

Using an analytical balance (7.5), tare the weight of a new capped and crimped headspace vial (7.2). Using a glass mircosyringe (7.4), inject a volume of benzene (6.1) into the vial such that the net weight of the benzene is between 40-80 µg. Record the weight. A fresh benzene standard should be prepared for each headspace analysis.

9.2 External standard for analysis of acetone extracts

Prepare a 50 ppm solution of dodecane (6.2) in acetone (6.3). A fresh dodecane standard should be prepared for each analysis.

10 Sample Preparation

All samples should be analyzed immediately after preparation.

10.1 Headspace analysis

Using an analytical balance (7.5), weigh approximately 10 mg of the sample into the bottom of a headspace vial (7.2), taking care to avoid getting material into the neck of the vial. Record the weight of the sample. Place a septa onto the vial, cap, and firmly crimp (7.3) the cap to seal the vial. Analyze the samples using GC-MS with headspace injection as described in Section 11.

10.2 Acetone extraction

Using an analytical balance (7.5), weigh approximately 100 mg of the sample into a glass vial and record the weight. Add 5.0 mL of acetone (6.3) to the sample and tightly cap. Sonicate the samples in a bath (7.6) at 40°C for 10 min, and filter an aliquot of the extract using a 0.45 µm PTFE syringe filter (7.7) into a vial (7.8) for analysis. Tightly cap the vial. Analyze the extracts using GC-MS with liquid injection as described in Section 11.

11 GC-MS Analysis

The GC-MS method described herein was developed using a Clarus® SQ 8T GC/MS with TurboMatrix™ 40/110 Trap (headspace sampler), manufactured by Perkin Elmer. This method can be adapted for use with comparable instrumentation.

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11.1 MS calibration

To correct for shifts in the mass spectrum, calibrate the instrument daily according to manufacturer's specifications over the mass range specified below (11.4) using an appropriate calibration standard, such as FC-43 (7.10).

11.2 GC parameters for headspace analysis

Recommended settings for headspace analysis by GC are summarized in Table 1 and Table 2. High pressure sampling is used to prevent pre-injection of the sample onto the column.

Table 1 - Headspace sampler parameters

Parameter	Setting
Vial Oven Temp	120°C
Vial Thermostatting Time	25 min
Transfer Line Temp	140°C
Needle Temp	125°C
Vial Pressure	21.7 psi
Pressurization Time	1.5 min
Injection Time	0.1 min
GC Cycle	40 min

Table 2 - GC parameters for headspace analysis

Parameter	Setting
Column	VF-624ms* 60 m x 0.32 mm x 1.8 µm
Column Carrier Gas	He 5
Injector Temp	150°C
Total Run Time	33.0 min
Equilibration Time	2.0 min
Carrier Pressure	17.4 psi
Injection Split	2.5:1
Oven Program:	
Initial Oven Temp	35°C
Maximum Oven Temp	280°C
Initial Temp Hold	5.0 min
Ramp	5.0°C/min to 120°C, 15°C/min to 270°C
* Manufactured by Agilent Technologies	

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11.3 GC parameters for acetone extract analysis

Recommended settings for the analysis of acetone extracts by GC with liquid injection are summarized in Table 3.

Table 3 - GC parameters for acetone extract analysis

Parameter	Setting
Column	VF-5ms* 60 m x 0.32 mm x 0.25 µm
Column Carrier Gas	He 5
Injector Temp	300°C
Total Run Time	30.00 min
Equilibration Time	2.00 min
Initial Flow	3.0 mL/min for 1.00 min
Run Flow	2.0 mL/min
Injection Split	4:1
Injection Volume	1.5 µL
Oven Program:	
Initial Oven Temp	40°C
Maximum Oven Temp	350°C
Initial Temp Hold	1.0 min
Ramp	10°C/min to 180°C 20°C/min to 320°C, hold for 8.00 min
*Manufactured by Agilent Technologies	

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11.4 MS parameters

Recommended MS settings are summarized in Table 4. Other MS parameters such as ion energies and repeller and lens voltages are system dependent and must be optimized for each instrument.

Table 4 - MS parameters

Parameter	Setting
Ion mode	Electron Ionization
Electron Energy	70 eV
Source Temp	200°C
Inlet Line Temp	250°C
Data Format	Centroid
Start Mass	28
End Mass	600
Scan Time	0.20 sec
Interscan Time	0.05 min
Scan Start Time	2.81 min for headspace 3.45 min for acetone extracts
Scan End Time	33.00 min for headspace 30 min for extraction

11.5 Injection sequence

For each analysis batch, inject the external standard, benzene for headspace analysis or dodecane for acetone extracts, at the beginning of the sequence. For an acetone extract sequence, also inject the standard after every 10 samples and/or at the end of the run. Additionally, for both headspace and acetone extracts, a blank sample must be injected in between each sample to minimize carry over effects. For headspace injections, a clean, blank vial must be inserted in between each sample vial in the headspace sampler tray. For acetone extracts, a single vial of acetone may be used and re-injected for each blank run. The instrument methods for blank injections are the same as for sample injections, except as noted in Table 5.

Table 5 - Blank injection parameters

Parameter	Setting	
	Headspace	Acetone Extracts
Initial Oven Temp	80°C	80°C
Initial Temp Hold	1.00 min	0 min
Ramp	20°C/min to 270°C, hold for 19.50 min	25°C/min to 320°C, hold for 16.20 min
Total Run Time	30.00 min	26.00 min

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12 Data Processing and Library Searching

Create a processing method to automatically detect and integrate peaks without peak smoothing and using polynomial background subtraction. The signal to noise threshold for integration should be set sufficiently high to minimize integration of artifacts in the baseline.

To assign chemical identities, the apex spectrum of each detected peak in the chromatogram is searched for a match against the NIST and Wiley MS reference libraries. The comparison of the spectra is made using a Euclidean distance algorithm, using both forward and reverse search parameters. The maximum value for a forward or reverse score is 999 for a perfect match. As a general guide, 900 or greater is an excellent match; 800–900 is a good match; 700–800 is a fair match; and less than 600 is a poor match. For each peak, a list of compounds with the highest scored matches will be generated. Generally, the higher ranked match provides better chemical identification, but the match should always be verified by a knowledgeable analyst. Recommended constraints for the library matching are summarized in Table 6.

Table 6 - MS library search constraints

Parameter	Setting
Search type	Similarity, simple
Background subtraction	Yes
Min abundance	10
Minimum m/z	29
Maximum m/z	600
Minimum MW	30
Maximum MW	1000
Minimum score	700
Maximum matches/peak	6

13 Calculation and Expression of Results

13.1 Calculation of response factors

The response factor (RF) of the standard must be calculated for every analysis batch to account for the day to day changes in absolute response of the instrument.

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13.1.1 Benzene RF

Calculate the RF of benzene (RF_{benz}) for the standard injection as follows.

$$RF_{benz} = \frac{ng_{benz}}{Area_{benzene}}$$

$$ng_{benz} = mass\ of\ benzene\ standard\ in\ ng$$
$$Area_{benzene} = TIC\ Peak\ Area\ of\ Benzene$$

13.1.2 Dodecane RF

Calculate the RF of dodecane (RF_{ddc}) for each standard injection as follows.

$$RF_{ddc} = \frac{ng_{ddc}}{Area_{ddc}}$$

$$ng_{ddc} = ng\ of\ dodecane\ injected$$
$$Area_{ddc} = TIC\ Peak\ Area\ of\ Dodecane$$

where

$$ng_{ddc} = Conc_{ddc} \times V$$

$$Conc_{ddc} = concentration\ of\ dodecane\ standard\ (\mu g/mL)$$
$$V = injection\ volume\ (\mu L)$$

Given that the concentration of the dodecane standard is 50 ppm and the injection volume is 1.5 µL,

$$ng_{ddc} = 50\ \frac{\mu g}{mL} \times 1.5\ \mu L\ \times \frac{1\ mL}{1000\ \mu L} \times \frac{1000\ ng}{1\ \mu g}$$

$$ng_{ddc} = 75\ ng$$

Therefore,

$$RF_{ddc} = \frac{75\ ng}{Area_{ddc}}$$

For calculation of compound concentration (13.2.2), an average RF (RF_{avg}) should be used. The RF_{avg} is the average of two RF_{dcc}'s calculated from the standard injections bracketing (i.e. dodecane injections made prior to and after) injection of the sample.

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13.2 Semi-quantitative calculation of concentration

Express all concentrations in milligrams per kilogram (mg/kg).

For both the headspace and acetone extractions, the following calculations assume that the relative response factor (RRF) of the standard to the compound is one.

13.2.1 Headspace analysis

For each sample, calculate the concentration of each identified compound in the chromatogram as described below.

$$C_x = \frac{Area_x \times RF_{benz}}{RRF} \times \frac{DV}{V\ x\ m}$$

where

$$\begin{aligned} C_x &= concentration\ of\ the\ compound\ (mg/kg) \\ Area_x &= TIC\ peak\ area\ of\ the\ compound \\ RF_{benz} &= response\ factor\ of\ benzenze\ (ng/unit\ area) \\ RRF &= relative\ response\ factor \\ DV &= dilution\ volume \\ V &= injection\ volume \\ m &= mass\ of\ the\ sample\ (mg) \end{aligned}$$

and

$$\begin{aligned} RRF &= 1 \\ DV &= 1 \\ V &= 1 \end{aligned}$$

This calculation assumes that the vapor pressure of the standard is the same as the vapor pressure of each compound.

13.2.2 Acetone extracts

For each sample, calculate the concentration of each identified compound in the chromatogram as shown below.

$$C_x = \frac{Area_x \times RF_{avg}}{RRF} \times \frac{DV}{V\ x\ m}$$

where

$$\begin{aligned} C_x &= concentration\ of\ the\ compound\ (mg/kg) \\ Area_x &= TIC\ peak\ area\ of\ the\ compound \\ RF_{avg} &= average\ response\ factor\ of\ dodecane\ (ng/unit\ area) \\ RRF &= relative\ response\ factor \\ DV &= dilution\ volume\ (\mu L) \\ V &= injection\ volume\ (\mu L) \end{aligned}$$

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$$m = mass\ of\ the\ sample\ (mg)$$

and

$$RRF = 1$$
$$DV = 5000\ \mu L$$
$$V = 1.5\ \mu L$$

14 Assignment of Chemical Rating

14.1 Use the CAS number of an identified compound to search against the CHEM-IQ[SM] Table of Substances to Avoid (Annex B) to determine whether it is a STA. If the compound is a STA, use the calculated concentration of the compound to assign a chemical a rating of preferred (green), allowed (yellow), due diligence required (orange), or prohibited (red).

14.2 Example assignment of chemical rating

For an injection of an acetone extract, a peak is identified as diphenylmethane diisothiocyanate (MDI). Given the following values,

$$\mathrm{Area_{MDI}} = 117242632\ \mathrm{units}$$
$$\mathrm{RF_{avg}} = 0.0000002349\ \mathrm{ng/unit}$$
$$\mathrm{RRF} = 1$$
$$\mathrm{DV} = 5000\ \mu\mathrm{L}$$
$$\mathrm{V} = 1.5\ \mu\mathrm{L}$$
$$\mathrm{m} = 99.9\ \mathrm{mg}$$

the concentration of MDI is calculated as shown.

$$\mathrm{C_{MDI}} = \frac{\mathrm{Area_{MDI}} \times \mathrm{RF_{avg}}}{\mathrm{RRF}} \times \frac{\mathrm{DV}}{\mathrm{V\ x\ m}}$$

$$\mathrm{C_{MDI}} = \frac{117242632\ \mathrm{units} \times 0.0000002349\ \mathrm{ng/unit}}{1} \times \frac{5000\ \mu\mathrm{L}}{1.5\ \mu\mathrm{L\ x\ 99.9\ mg}}$$

$$\mathrm{C_{MDI}} = 918\ \frac{\mathrm{ng}}{\mathrm{mg}} \times \frac{\mathrm{mg}}{10^6\ \mathrm{ng}} \times \frac{10^6\ \mathrm{mg}}{\mathrm{kg}}$$

$$\mathrm{C_{MDI}} = 918\ \mathrm{mg/kg}$$

From the STA table, concentrations of MDI <10 mg/kg are green, 10 to 500 mg/kg are yellow, and >500 mg/kg are orange. Therefore, the concentration of MDI in this sample is classified as orange or due diligene required.

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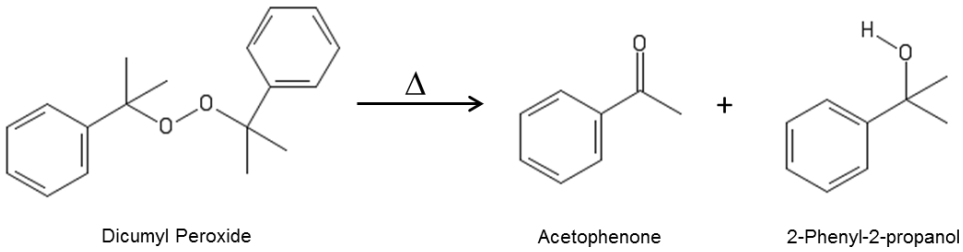
15 Indicator Methodology

For some STA's that are not readily detectable by GC-MS, indicator chemicals can be used to semi-quantitatively calculate the initial concentration of the STA in the textile formulation or sample (Annex C). Two examples of the use of indicators are shown below.

15.1 Heat degradation of dicumyl peroxide

Dicumyl peroxide (DCP, CAS: 80-43-3) cannot be directly detected with GC-MS screening, as DCP thermally decomposes in the GC injector into acetophenone (CAS 98-86-2) and 2-phenyl-2-propanol (CAS 617-94-7) (Figure 1).

Figure 1 – Thermal degradation of dicumyl peroxide



As the response of 2-phenyl-2-propanol is typically very low for this method, acetophenone is used as an indicator for the presence of DCP in textile auxiliaries using GC-MS screening. Given that the formation of acetophenone from DCP is a 1:1 molar ratio, and assuming complete thermal degradation, the concentration of DCP in a sample can be calculated from the concentration of acetophenone as shown below.

$$C_{DCP} = C_{AP} \times {}^{MW_{DCP}}/_{MW_{AP}}$$

where

$$C_{DCP} = \text{concentration of DCP (mg/kg)}$$
$$C_{AP} = \text{concentration of acetophenone (mg/kg)}$$
$$MW_{DCP} = \text{molecular weight of DCP (g/mol)}$$
$$MW_{AP} = \text{molecular weight of acetophenone (g/mol)}$$

If "free" acetophenone, not generated from the degradation of DCP, is present in the sample, the concentration of DCP may be over-estimated. Therefore, at concentrations requiring due diligence, additional tests to confirm the concentration of DCP in the sample must be conducted using LC-MS (17.3) or GC-MS at lower injection temperatures.

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15.2 Quaternary amines

Three quaternary ammonium compounds are currently listed as STA's: di(hydrogenated tallow alkyl) dimethylammonium chloride (DHTDMAC; CAS 61789-80-8), di(stearyl) dimethylammonium chloride (CAS 107-64-2) and di(tallow alkyl) dimethylammonium chloride (CAS 68783-78-8). These compounds cannot be directly detected by GC-MS and are commonly screened and quantified using HPLC. However, residual starting materials and impurities including alkyldimethylamines and chloroalkanes, which are detectable by GC-MS, are present in the technical formulations and can be used as indicators.

In the case of DHTDMAC, C_{16} and C_{18} alkyl amines and chloroalkanes detected in the GC-MS screening (listed in Table 7) are used to estimate the concentration of DHTDMAC. The concentrations of these impurities are summed, and the total is roughly estimated to be 10% of the concentration of DHTDMAC in the sample. Additionally, the ratio of concentrations of the impurities containing C_{18} to C_{16} groups is typically 3:1 for DHTDMAC and can be used as another indication of its presence in the sample (17.4). At estimated concentrations exceeding the allowable range, the chemical supplier should be contacted for further information about the concentration of DHTDMAC in the textile auxiliaries.

Table 7 – Indicators of DHTDMAC

Chemical Name	CAS No.
1-Hexadecanamine, N,N-dimethyl	112-69-6
1-Octadecanamine, N,N-dimethyl	124-28-7
Octadecane, 1-chloro	3386-33-2
Hexadecane, 1-chloro	4860-03-1

16 Test Report

Generate one report containing all sample results for each factory.

16.1 General information

Include the following information on the report

- Sample Identification No.
- Sample Name
- Factory Name
- Factory Address
- Analytical Testing Laboratory Name
- Analytical Testing Laboratory Address
- Date of sample received
- Date of sample analysis

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- Analytical Screening Results
    - Detected Substance(s)
    - Individual rating of detected substance(s)
    - Overall rating of the sample

16.2 Analytical screening results

Under the analytical screening results, list all compounds identified in the sample, including the CAS number and assigned chemical rating (if applicable) of each compound.

When a compound is identified in the headspace and acetone extraction, generally only the concentration from the acetone analysis is listed. However, depending on the chemical and physical properties of the compound in the sample matrix, the concentration determined from the headspace analysis may be preferential and be reported at the discretion of an experienced analyst.

Table 8 – List of STA's with preferential concentration determination from headspace analysis

Chemical Name	CAS No.
N-N-Dimethylformamide	68-12-2
n-Butanol	71-36-3
Benzene	71-43-2
Formamide	75-12-7
Trimethylamine	75-50-3
Benzyl Chloride	100-44-7
1-Methoxy-2-propanol	107-98-2
Vinyl acetate	108-05-4
Toluene	108-88-3
Chloroprene	126-99-8
Octamethylcyclotetrasiloxane	556-67-2
3-Choro-2-methylpropene	563-47-3
RF telomers	Various

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17.3 ASTM E1090-08, Standard Test Method for Dicumyl Peroxide and Dicumyl Peroxide Decomposition Products in Resins, May 2008, *American Society for Testing and Materials International*

17.4 EUR 20397 EN/3, Dimethyldioctadecylammonium chloride (DODMAC) Summary Risk Assessment Report, 2009, *JRC European Commission*

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Annex A - CHEM-IQ[SM] General Guidelines for Chemical Classification

A.1 General

The CHEM-IQ[SM] program implements a system of four (4) chemical ratings that apply to all factory chemical formulations. The four chemical ratings are Preferred (green), Allowed (yellow), Due Diligence Required (orange), and Prohibited (red). The concentration ranges for each rating vary according to whether the compound is a substance of special interest (SSI), a skin and inhalation sensitizer (SIC), or a substance of other concern (SOC). The allowable concentrations for each rating are summarized in Table A-1. Please refer to the VF Substances to Avoid (STA) table for a complete listing of classifications, as exceptions may occur.

Table A-1 – Chemical ratings of substances by concentration

Preferred		Allowed		Prohibited/Phase Out or Required Due Diligence	
SSI	< 10 mg/kg	SSI	10 - 500 mg/kg	SSI	> 500 mg/kg
SIC	< 250 mg/kg	SIC	250 - 1000 mg/kg	SIC	> 1000 mg/kg
SOC	< 2000 mg/kg	SOC	2000 - 50000 mg/kg	SOC	> 50000 mg/kg

A.2 Preferred Chemicals (Green Rating)

A green or “preferred” rating is assigned to a chemical formulation if

- it does not contain any component, by-product, or impurity classified as a SSI at concentrations >10 mg/kg
- it does not contain any component, by-product, or impurity classified as a SIC at concentrations > 250 mg/kg
- it does not contain any other SOCs at concentrations >2000 mg/kg or at a concentration that may lead to non-compliance with applicable restrictions regarding workers (TLV), air emissions (Clean Air Act USA, Technical Guidelines Air Germany), waste water (ARS concept TEGEWA association Europe) and/or consumer safety
- It does not contain any other STA substances with exceptional limits developed (e.g. fluorochemicals, cyclic siloxanes)

A.3 Allowed Chemicals (Yellow Rating)

A yellow or “allowed” rating is assigned to a chemical formulation if

- it contains any component, by-product or impurity classified as a SSI at concentrations between 10 mg/kg and 500 mg/kg
- it contains any component, by-product or impurity classified as a SSI in concentrations between 250 and 1000 mg/kg

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- it does not contain any other SOCs at concentrations between 2000 and 50000 mg/kg or at a concentration which may lead to non-compliance with applicable restrictions regarding workers (TLV), air emissions (Clean Air Act USA, Technical Guidelines Air Germany), waste water (ARS concept TEGEWA association Europe) and/or consumer safety.
- It does not contain any other STA substances at concentrations between specified limits (e.g. fluorochemicals, cyclic siloxanes)

A.4 Due Diligence Required (Orange Rating)

An orange or “due diligence required” rating is assigned to a chemical formulation if

- it contains substances at concentrations in the "prohibited" category but does not lead to an automatic "prohibited" classification of the formulation.

Orange-rated chemical formulations are allowed for use in the manufacture of VF products, provided the VF nominated third-party laboratory and the VF CHEM-IQ^{SM} Program Manager have conducted appropriate due diligence regarding the handling and application of such formulations within the factory. Their use should nonetheless be minimized. Orange-rated chemical formulations may contain a Substance to Avoid which, when handled and applied appropriately within the factory, does not result in an emission to the environment. In most cases, such a substance is converted to another substance through a chemical reaction during the application, and the original substance no longer poses its hazard to the environment. Should a green-rated chemical formulation be available to accomplish the same result during manufacture, the green-rated chemical formulation should nonetheless be selected. Vendors should refer to the VF CHEM-IQ^{SM} program guide for more information and actions to be taken for substances to avoid with orange ratings.

A.5 Prohibited Chemicals (Red Rating)

A red or “prohibited” rating is assigned to a chemical formulation if

- it contains any component, by-product or impurity classified as a SSI at concentrations >500 mg/kg
- it contains any component, byproduct or impurity classified as a SIC at concentrations >1000 mg/kg
- it contains any SOCs at concentrations >50000 mg/kg or at a concentration that will lead to non-compliance with applicable restrictions regarding workers (TLV), air emissions (Clean Air Act USA, Technical Guidelines Air Germany), waste water (ARS concept TEGEWA association Europe) and consumer safety
- it contains a substance that is expressly prohibited by VF at any concentration. Identification of such Prohibited Substance during a VF CHEM-IQ^{SM} screening results in the entire chemical formulation receiving a prohibited classification.

Chemical formulations containing SSIs, SICs, and/or SOCs at concentrations leading to a “Red” rating are not automatically classified as prohibited. Further review of the intended use by VF may result in a reclassification of the formulation to an “Orange” rating, allowing use with due diligence. Vendors should refer to the VF CHEM-IQ^{SM} program guide for more information and actions to be taken for Substances to Avoid with red ratings.

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A.6 Updates to CHEM-IQ^{SM}

The VF CHEM-IQ^{SM} Program will be regularly reviewed and updated to ensure changes in chemical hazard information, chemical regulations, and analytical capabilities (among other factors) are incorporated into the screening analysis and rating criteria. Regular re-evaluation of factories' chemical inventories, re-submission of chemical samples for screening analysis, and changes to the CHEM-IQ^{SM} corrective action plans and to the substances to avoid list will be necessary as the program (and the body of knowledge it generates through the screening method) evolves.

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Annex B - CHEM-IQ^{SM} Table of Substances to Avoid, Direct Detection by GC-MS

The table below includes only STA's that can be directly detected by GC-MS screening.

Substance Name	CAS No.	Preferred (mg/kg)	Allowed (mg/kg)	Prohibited / phase out (mg/kg)	Require due diligence (mg/kg)
Acetaldehyde	75-07-0	<2000	2000-50000	>50000	-
Acetic acid	64-19-7	<2000	2000-50000	-	>50000
Acetone	67-64-1	<2000	2000-50000	-	>50000
Acetophenone	98-86-2	<250	250-1000	-	>1000
Acrolein	107-02-8	<250	250-1000	>1000	-
Acrylamide	79-06-1	<10	10-500	>500	-
Acrylic acid	79-10-7	<250	250-1000	>1000	-
Acrylonitrile	107-13-1	<10	10-500	>500	-
2-(2-)-Aminoethylamino ethanol (AEEA, and related fatty acid esters and amides)	111-41-1	<10	10-500	-	>500
Amyl cinnamal	122-40-7	<250	250-1000	>1000	-
Amylcinnamyl alcohol	101-85-9	<250	250-1000	>1000	-
Aniline	62-53-3	<10	10-1000	>1000	>1000[1]
Anisyl alcohol	105-13-5	<250	250-1000	>1000	-
Azobenzene	103-33-3	<10	10-500	>500	-
Benzaldehyde	100-52-7	<250	250-1000	-	>1000
Benzene	71-43-2	<10	10-500	>500	-
1,2-Benzenedicarboxylic acid	88-99-3	<250	250-1000	-	>1000
1,2-benzenedicarboxylic acid, di-C7-11 branched and liearalkyl esters (DHNUP)	68515-42-4	<10	10-500	>500	-
1,2-Benzenedicarboxylic acid, dihexyl ester, branched and linear	68515-50-4	<10	10-500	>500	-
2-*2H*-Benzotriazol-2-yl-4-(*tert*-butyl)-6-(*sec*-butyl)phenol (UV-350)	36437-37-3	<10	10-500	>500	-
2-Benzotriazol-2-yl-4,6-di-*tert*-butylphenol (UV-320)	3846-71-7	<10	10-500	>500	-
2-*2H*-Benzotriazol-2-yl-4,6-di-*tert*-pentylphenol (UV-328)	25973-55-1	<10	10-500	>500	-
2-(2H-benzotriazol-2-yl)-p-cresol	2440-22-4	<250	250-1000	>1000	-

[1)] Aniline: Due diligence required for Indigo content of the preparation ≥ 30%.

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Substance Name	CAS No.	Preferred (mg/kg)	Allowed (mg/kg)	Prohibited / phase out (mg/kg)	Require due diligence (mg/kg)
Benzoic acid	65-85-0	<250	250-1000	-	>1000
Benzyl alcohol	100-51-6	<250	250-1000	-	>1000
Benzyl benzoate	120-51-4	<250	250-1000	-	>1000
Benzyl chloride	100-44-7	<10	10-500	>500	-
Benzyl cinnamate	103-41-3	<250	250-1000	>1000	-
Benzyl cyanide	140-29-4	<250	250-1000	>1000	-
Benzyl salicylate	118-58-1	<250	250-1000	>1000	-
Biphenyl	92-52-4	<250	250-1000	-	>1000
Bis(2,3-dibromopropyl ether) of tetrabromobisphenol	21850-44-2	≤10	-	>10	-
Bis(2,3-dibromopropyl) phosphate	5412-25-9	≤10	-	>10	-
1,2-Bis(2-methoxyethoxy)ethane (TEGDME, triglyme)	112-49-2	<10	10-500	>500	-
Bis(2-(2-methoxyethoxy)ethyl)ether	143-24-8	<10	10-500	>500	-
Bis(2-methoxyethyl)ether (Diglyme)	111-96-6	<10	10-500	>500	-
2,2-Bis(bromomethyl)-1,3-propanediol (BBMP)	3296-90-0	<10	10-500	>500	-
Bis(bromomethyl)-1-propanol (TBNPA)	1522-92-5	<10	10-500	>500	-
Bis(chloromethyl)ether	542-88-1	≤10	-	>10	-
4,4'-bis(dimethylamino)-4''-(methylamino)trityl alcohol	561-41-1	<10	10-500	>500	-
Bis(2-ethylhexyl)-2,3,4,5-tetrabromophthalate (TBPH)	26040-51-7	<10	10-500	>500	-
Bisphenol A	80-05-7	<10	10-500	>500	-
Bisphenol AF	1478-61-1	<10	10-500	>500	-
Bisphenol B	77-40-7	<10	10-500	>500	-
Bisphenol F	620-92-8	<10	10-500	>500	-
Bisphenol S	80-09-1	<10	10-500	>500	-
1-Bromopropane	106-94-5	<10	10-500	>500	-
Boric acid	10043-35-3 11113-50-1	<10	10-500	>500	-
But-2-yne-1,4-diol	110-65-6	<10	10-500	>500	-

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Substance Name	CAS No.	Preferred (mg/kg)	Allowed (mg/kg)	Prohibited / phase out (mg/kg)	Require due diligence (mg/kg)
1,3-Butadiene	106-99-0	<10	10-500	>500	-
n-Butanol	71-36-3	<2000	2000-50000	-	>50000
2-Butanone oxime	96-29-7	<10	10-500	-	>500
2-Butoxyethanol	111-76-2	<2000	2000-50000	-	>50000
2-Butoxyethylacetate	112-07-2	<2000	2000-50000	-	>50000
Butyl paraben	94-26-8	<10	10-500	>500	-
n-Butyl ether	142-96-1	250	250-1000	-	>1000
5-*tert*-Butyl-2,4,6-trinitro-*m*-xylene	81-15-2	<10	10-500	>500	-
4-(*tert*-butyl)phenyl diphenyl phosphate (MDPP)	56803-37-3	<10	10-500	>500	-
Butylacrylate	141-32-2	<250	250-1000	>1000	-
Butylated hydroxyanisol (BHA)	25013-16-5	<10	10-500	>500	-
2-Butyldiglycol	112-34-5	<2000	2000-50000	-	>50000
Butylmethacrylate	97-88-1	<250	250-1000	>1000	-
4-*tert*-Butylphenol	98-54-4	<250	250-1000	-	>1000
C9 Aromatic methyl, ethyl substituted hydrocarbons Group	526-73-8 95-63-6 108-67-8 25551-13-7 25550-14-5 611-14-3 620-14-4 622-96-8 64742-95-6	<10	10-500	-	>500
Caprolactam	105-60-2	<2000	2000-50000	-	>50000
Carbon disulphide	75-15-0	<10	10-500	>500	-
2-Chloracetamide	79-07-2	<250	250-1000	>1000	-

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Substance Name	CAS No.	Preferred (mg/kg)	Allowed (mg/kg)	Prohibited / phase out (mg/kg)	Require due diligence (mg/kg)
Chlorinated Paraffins (CP) of unspecific carbon chain length and degree of chlorination, various including: Alkanes, C12-13, chloro; Alkanes C6-18, chloro; Alkanes, chloro; Paraffin waxes and hydrocarbon waxes, chloro; Short-chain chlorinated paraffins (SCCP) with C10-C13; Medium-chain chlorinated paraffins (MCCP) with C14-C17; Long-chain chlorinated paraffins (LCCP) with C>17	Various including 71011-12-6 68920-70-7 61788-76-9 63449-39-8 85535-84-8 85535-85-9 85422-92-0	≤10	-	>10	-
3-Chloro-2-methylpropene	563-47-3	<10	10-500	>500	-
p-Chloro-α,α,α-trifluorotoluene (para-Chlorobenzotrifluoride, PCBTF)	98-56-6	<10	10-500	>500	-
2-Chlorobuta-1,3-diene (Chloroprene)	126-99-8	<10	10-500	>500	-
p-Chlorocresol	59-50-7	<10	10-500	-	>500
2-Chloroethanol	107-07-3	<2000	2000-50000	>50000	-
Cinnamal	104-55-2	<250	250-1000	>1000	-
Cinnamyl alcohol	104-54-1	<250	250-1000	>1000	-
Citral	5392-40-5	<250	250-1000	>1000	-
Citronellol	106-22-9	<250	250-1000	>1000	-
Coumarin	91-64-5	<250	250-1000	>1000	-
Cresol (p-, m-, o-Cresol)	1319-77-3 (isomer mix) 106-44-5 (p) 108-39-4 (m) 95-48-7 (o)	<10	10-500	>500	-
4-Cyanocyclohexene	100-45-8	<250	250-1000	>1000	-
Cyclamen alcohol	4756-19-8	<250	250-1000	>1000	-
Cyclohexane	110-82-7	<2000	2000-50000	>50000	-
Cyclohexanol	108-93-0	<2000	2000-50000	>50000	-
Cyclohexanone	108-94-1	<10	10-500	>500	-
p-Cymene	99-87-6	<250	250-1000	-	>1000

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Substance Name	CAS No.	Preferred (mg/kg)	Allowed (mg/kg)	Prohibited / phase out (mg/kg)	Require due diligence (mg/kg)
Decabromodiphenyl Ether (DecaBDE)	1163-19-5	<10	10-500	>500	-
6,6'-Di-*tert*-butyl-2,2'-methylenedi-p-cresol (DBMC)	119-47-1	<10	10-500	>500	-
Di-*tert*-butylphenyl phenyl phosphate (DBPP)	65652-41-7	<10	10-500	>500	-
Di(2-ethylhexyl) adipate	103-23-1	<2000	2000-50000	-	>50000
Di(2-ethylhexyl) phosphate	298-07-7	<250	250-1000	-	>1000
Di(2-ethylhexyl) phosphite	3658-48-8	<250	250-1000	>1000	-
Dibenzoyl peroxide	94-36-0	<250	250-1000	-	>1000
2,3-dibromo-1-propanol (2,3-DBPA)	96-13-9	<10	10-500	>500	-
1,3-Dichloro-2-propanol	96-23-1	<10	10-500	>500	-
1,2-Dichloroethane	107-06-2	<10	10-500	>500	-
1,1-Dichloroethylene	75-35-4	<10	10-500	>500	-
Dichlorophen	97-23-4	<2000	2000-50000	>50000	-
1,2-Diethoxyethane	629-14-1	<10	10-500	>500	-
Diethyl maleate	141-05-9	<250	250-1000	>1000	-
Diethyl sulfate	64-67-5	<10	10-500	>500	-
Diethylene triamine pentaacetic acid (DTPA), sodium salt	140-01-2	<10	10-500	>500	-
Diethylene glycol	111-46-6	<2000	2000-50000	-	>50000
Diethylene triamine	111-40-0	<250	250-1000	-	>1000
Dihydrocoumarin	119-84-6	<250	250-1000	>1000	-
2,4-Dihydroxy-3-methylbenzaldehyde	6248-20-0	<250	250-1000	>1000	-
Di-*iso*-octyl acid phosphate	27215-10-7	<250	250-1000	-	>1000
1,4-Dioxane	123-91-1	<10	10-500	>500	-
Dimethyl citraconate	617-54-9	<250	250-1000	>1000	-
4,4-Dimethyl-2-oxazolidine	51200-87-4	<250	250-1000	-	>1000
1,3-diphenylguanidine	102-06-7	<10	10-500	-	>500
3,5-Dimethyl pyrazole	67-51-6	<10	10-500	-	>500

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Substance Name	CAS No.	Preferred (mg/kg)	Allowed (mg/kg)	Prohibited / phase out (mg/kg)	Require due diligence (mg/kg)
Dimethyl sulfate	77-78-1	<10	10-500	>500	-
3,7-Dimethyl-2-octen-1-ol (6,7-Dihydrogeraniol)	40607-48-5	<250	250-1000	>1000	-
6,10-Dimethyl-3.5,9-undecatrien-2-one	141-10-6	<250	250-1000	>1000	-
7,11-Dimethyl-4.6,10-dodecatrien-3-one	26651-96-7	<250	250-1000	>1000	-
4,6-Dimethyl-8-*tert*-butylcoumarin	17874-34-9	<250	250-1000	>1000	-
N,N-Dimethylacetamide (*N,N*-DMAC)	127-19-5	<10	10-500	>500	-
4-Dimethylaminoazobenzene	60-11-7	<10	10-500	>500	-
N,N-Dimethylformamide (*N,N*-DMF)	68-12-2	<10	10-500	-	>500
Dimethyl fumarate (DMFu)	624-49-7	<1	1-10	>10	-
2,4-Dinitrotoluene	121-14-2	<10	10-500	>500	-
Diphenylamine	122-39-4	<250	250-1000	>1000	-
Disodium tetraborate, anhydrous	1303-96-4 1330-43-4 12179-04-3	<10	10-500	>500	-
2,4-Di-*tert*-butyl-6-(5-chlorobenzotriazol-2-yl) phenol (UV-327)	3864-99-1	<10	10-500	>500	-
Epichlorohydrin	106-89-8	<10	10-500	>500	-
7-Ethoxy-4-methylcoumarin	87-05-8	<250	250-1000	>1000	-
2-Ethoxyethanol acetate	111-15-9	<10	10-500	>500	-
2-Ethoxyethanol; Ethylene glycol monoethyl ether (EGEE)	110-80-5	<10	10-500	>500	-
4-Ethoxyphenol	622-62-8	<250	250-1000	>1000	-
Ethyl acrylate	140-88-5	<10	10-500	>500	-
N-Ethyl ethanamine	109-89-7	<250	250-1000	>1000	-
2-Ethylhexyl 2,3,4,5-Tetrabromobenzoate (TBB)	183658-27-7	<10	10-500	>500	-
Ethyl paraben	120-47-8	<10	10-500	>500	-
Ethylbenzene	100-41-4	<10	10-500	>500	-
Ethylene diamine tetraacetic acid (EDTA), sodium salt	60-00-4	<10	10-500	>500	-
Ethylene glycol	107-21-1	<2000	2000-50000	-	>50000

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Substance Name	CAS No.	Preferred (mg/kg)	Allowed (mg/kg)	Prohibited / phase out (mg/kg)	Require due diligence (mg/kg)
Ethylene oxide	75-21-8	<10	10-500	>500	-
Ethylenediamine	107-15-3	<250	250-1000	>1000	-
Ethyleneglycoldimethylether; 1,2-Dimethoxyethane (EGDME)	110-71-4	<10	10-500	>500	-
Ethyleneimine	151-56-4	<10	10-500	>500	-
2-Ethylhexanoic acid	149-57-5	<10	10-500	>500	-
2-Ethylhexanol	104-76-7	<2000	2000-50000	-	>50000
2-Ethylhexyl acrylate	103-11-7	<10	10-500	>500	-
Ethylhexyl diphenyl phosphate (EHDPP)	1241-94-7	<10	10-500	>500	-
2-Ethylhexyl-4-methoxycinnamate	5466-77-3	<10	10-500	>500	-
Ethylmethacrylate	97-63-2	<250	250-1000	>1000	-
1-Ethylpyrrolidone	2687-91-4	<10	10-500	-	>500
Eugenol	97-53-0	<250	250-1000	>1000	-
Farnesol	4602-84-0	<250	250-1000	>1000	-
Formaldehyde, oligomeric reaction products with aniline (Technical MDA)	25214-70-4	<10	10-500	>500	-
Formamide	75-12-7	<10	10-500	>500	-
Formic acid	64-18-6	<2000	2000-50000	-	>50000
Fumaric acid bis(2-ethylhexyl)ester	141-02-6	<2000	2000-50000	>50000	-
Geraniol	106-24-1	<250	250-1000	>1000	-
Glutaral	111-30-8	<10	250-1000	>1000 (non-biocide)	>1000 (biocide)
Glycerol	56-81-5	<2000	2000-50000	-	>50000
Glyoxal	107-22-2	<500	500-1000	>1000	-
Heptabromodiphenyl ether (HeptaBDE)	68928-80-3	<10	10-500	>500	-
trans-2-Heptenal	18829-55-5	<250	250-1000	>1000	-
Hexabromocyclododecane (HBCDD)	25637-99-4 3194-55-6 134237-50-6 134237-52-8	≤10	-	>10	-

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Substance Name	CAS No.	Preferred (mg/kg)	Allowed (mg/kg)	Prohibited / phase out (mg/kg)	Require due diligence (mg/kg)
Hexabromodiphenyl ether (HexaBDE)	36483-60-0	<10	10-500	>500	-
Hexachlorobutadiene	87-68-3	≤10	-	>10	-
Hexahydrocoumarin	700-82-3	<250	250-1000	>1000	-
Hexanal	66-25-1	<250	250-1000	-	>1000
Hexandioldiacrylat	13048-33-4	<250	250-1000	>1000	-
Hexamethylene tetramine	100-97-0	<250	250-1000	>1000	-
n-Hexane	110-54-3	<10	10-500	>500	-
trans-2-Hexenal diethyl acetal	67746-30-9	<250	250-1000	>1000	-
trans-2-Hexenal dimethyl acetal	18318-83-7	<250	250-1000	>1000	-
Hexyl cinnamaldehyde	101-86-0	<250	250-1000	>1000	-
Hydroabietyl alcohol	13393-93-6	<250	250-1000	>1000	-
4-Hydroxy-4-methylpentane-2-one	123-42-2	<2000	2000-50000	>50000	-
p-Hydroxybenzoic acid	99-96-7	<10	10-500	>500	-
Hydroxycitronellal	107-75-5	<250	250-1000	>1000	-
Hydroxymethylpentylcyclohexene-carboxaldehyde	31906-04-4	<250	250-1000	>1000	-
Imidazole	288-32-4	<10	10-500	>500	-
Isobutyl 4-hydroxybenzoate	4247-02-3	<10	10-500	>500	-
Isoeugenol	97-54-1	<250	250-1000	>1000	-
Isophorone	78-59-1	<10	10-500	>500	-
Lilial	80-54-6	<250	250-1000	>1000	-
Limonene	5989-27-5 138-86-3 5989-54-8	<250	250-1000	-	>1000
Linalool	78-70-6	<250	250-1000	>1000	-
6-Isopropyl-2-decahydronaphthalenol	34131-99-2	<250	250-1000	>1000	-
Maleic acid bis(2-ethylhexyl)ester	142-16-5	<2000	2000-50000	-	>50000
Mercaptobenzothiazole	149-30-4	<250	250-1000	>1000	-

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Substance Name	CAS No.	Preferred (mg/kg)	Allowed (mg/kg)	Prohibited / phase out (mg/kg)	Require due diligence (mg/kg)
Methacrylamide	79-39-0	<250	250-1000	>1000	-
Methanol	67-56-1	<2000	2000-50000	-	>50000
tris(2-methoxyethoxy) vinylsilane	1067-53-4	<10	10-500	>500	-
1-Methoxy-2-propanol	107-98-2	<2000	2000-50000	-	>50000
1-Methoxy-2-propanolacetate	108-65-6	<2000	2000-50000	>50000	-
7-Methoxycoumarin	531-59-9	<250	250-1000	>1000	-
2-Methoxyethanol; Ethylene glycol monomethyl ether (EGME)	109-86-4	<10	10-500	>500	-
2-Methoxyethanolacetate	110-49-6	<10	10-500	>500	-
2-(2-Methoxyethoxy) ethanol	111-77-3	<10	10-500	>500	-
4-Methoxyphenol	150-76-5	<250	250-1000	>1000	-
1-*p*-Methoxyphenyl-1-penten-3-one	104-27-8	<250	250-1000	>1000	-
4-*p*-Methoxyphenyl-3-butene-2-one	943-88-4	<250	250-1000	>1000	-
2-Methoxypropanol	1589-47-5	<10	10-500	>500	-
2-Methoxypropanol acetate	70657-70-4	<10	10-500	>500	-
Methylacrylate	96-33-3	<10	10-500	>500	-
Methylcyclohexane	108-87-2	<250	250-1000	-	>1000
Methyl butyl ketone	591-78-6	<10	10-500	>500	-
Methyl chloride	74-87-3	<10	10-500	>500	-
Methyl ethyl ketone	78-93-3	<10	10-500	-	>500
Methyl isobutyl ketone	108-10-1	<10	10-500	-	>500
Methyl isocyanate	624-83-9	<10	10-500	>500	-
Methyl paraben	99-76-3	<10	10-500	>500	-
Methyl trans-2-butenoate	623-43-8	<250	250-1000	>1000	-
5-Methyl-2,3-hexanedione	13706-86-0	<250	250-1000	>1000	-
3-Methyl-4-(2.6,6-trimethyl-2-cyclohexen-1-yl)-3-buten-2-one	127-51-5	<250	250-1000	>1000	-
N-Methylacetamide	79-16-3	<10	10-500	>500	-

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Substance Name	CAS No.	Preferred (mg/kg)	Allowed (mg/kg)	Prohibited / phase out (mg/kg)	Require due diligence (mg/kg)
N-Methylaniline	100-61-8	<2000	2000-50000	>50000	-
2-Methylaziridine (Propylenimine)	75-55-8	<10	10-500	>500	-
7-Methylcoumarin	2445-83-2	<250	250-1000	>1000	-
6-Methylcoumarin	92-48-8	<250	250-1000	>1000	-
Methylene chloride	75-09-2	<10	10-500	>500	-
Methylmethacrylate	80-62-6	<250	250-1000	>1000	-
1-Methylnaphthalene	90-12-0	<250	250-1000	>1000	-
2-Methylnaphthalene	91-57-6	<250	250-1000	>1000	-
N-Methylolacrylamide	924-42-5	<10	10-500	>500	-
N-Methylpyrrolidone (NMP)	872-50-4	<10	10-500	-	>500
α-Methylstyrene	98-83-9	<10	10-500	>500	-
Monobromodiphenylethers (MonoBDE)	Multiple	<10	10-500	>500	-
Mono-*iso*-octylphosphate	26403-12-3	<250	250-1000	>1000	-
Naphthalene	91-20-3	<10	10-500	-	>500
3-Nitrochlorobenzene	121-73-3	<10	10-500	>500	-
4-Nitrochlorobenzene	100-00-5	<10	10-500	>500	-
1-Nitropropane	108-03-2	<2000	2000-50000	>50000	-
2-Nitropropane	79-46-9	<10	10-500	>500	-
Nonabromodiphenyl ether (NonaBDE)	63936-56-1	<10	10-500	>500	-
Octabromodiphenyl ether (OctaBDE)	32536-52-0	<10	10-500	>500	-
Pentabromodiphenyl ether (PentaBDE)	32534-81-9	<10	10-500	>500	-
Pentachloroethane	76-01-7	≤10	-	>10	-
2-Pentylidene-cyclohexanone	25677-40-1	<250	250-1000	>1000	-
α-Pinene	80-56-8	<250	250-1000	-	>1000

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Substance Name	CAS No.	Preferred (mg/kg)	Allowed (mg/kg)	Prohibited / phase out (mg/kg)	Require due diligence (mg/kg)
Phenol	108-95-2	<500	500-1000	>1000	-
2-Phenoxyethanol	122-99-6	<250	250-1000	-	>1000
Phenyl dimethyl propanol	3835-64-1	<250	250-1000	-	>1000
4-Phenyl-3-buten-2-one	122-57-6	<250	250-1000	>1000	-
4-Phenylcyclohexene	4994-16-5	<10	10-500	>500	-
Phosphonates, e.g. Nitrilotri(methylphosphonic acid) Ethylenebis(nitrilodimethylene)tetraphosphonic acid Diethylenetriaminepenta(methylene-phosphonic acid) 1-Hydroxyethylidenediphosphonic acid	list not exhaustive 6419-19-8 1429-50-1 15827-60-8 2809-21-4	<10	10-500	-	>500
p-Phenylene diamine and its salts	106-50-3	<10	10-500	>500	-
o-Phenylene diamine and its salts	95-54-5	<10	10-500	>500	-
Phosphoric acid, 2-Ethylhexyl ester 2-Ethylhexylphosphate	12645-31-7 1070-03-07	<250	250-1000	>1000	-
Phthalic anhydride	85-44-9	<10	10-500	-	>500
Phthalate acid mono(2-ethylhexyl) ester	4376-20-9	<10	10-500	>500	-
2-Propanol	67-63-0	<2000	2000-50000	-	>50000
Propyl paraben	94-13-3	<10	10-500	>500	-
1,2-Propylene glycol	57-55-6	<2000	2000-50000	-	>50000
Propyleneoxide	75-56-9	<10	10-500	>500	-
Polyethoxylated tallow amine	61791-26-2	<10	10-500	-	>500
Quinoline	91-22-5	<500	500-1000	>1000	-

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Substance Name	CAS No.	Preferred (mg/kg)	Allowed (mg/kg)	Prohibited / phase out (mg/kg)	Require due diligence (mg/kg)
SAN Trimer 2-[1-(4-Cyano-1,2,3,4-tetrahydronaphthyl)]propanenitrile (isomers)	THNA: 57964-39-3; Cis-R-THNA: 142759-38-4; Trans-R-THNA: 142759-37-3; Cis-S-THNA: 142759-39-5; Trans-S-THNA: 142759-40-8; THNP: 57964-40-6; Cis-THNP: 142681-91-2; Trans-THNP: 142681-92-3	<10	10-500	-	>500
Silica (particles of respirable size)[2]	14464-46-1	-	-	-	-
Styrene	100-42-5	<10	10-500	-	>500
Tetraboron disodium heptaoxide, hydrate	12267-73-1	<10	10-500	>500	-
Tetrabrombisphenol A (TBBPA)	79-94-7	<10	10-500	>500	-
Tetrabromodiphenyl ether (TetraBDE)	40088-47-9	<10	10-500	>500	-
Tetrachloroethane (isomers)	630-20-6 79-34-5	<10	10-500	>500	-
Tetrachloroethylene (PERC)	127-18-4	<10	10-500	>500	-
Tetrachloromethane (Carbon tetrachloride)	56-23-5	<10	10-500	>500	-
Tetraethylene glycol	112-60-7	<2000	2000-50000	-	>50000
Tetrafluorethene	116-14-3	<10	10-500	>500	-
Tetrahydrofuran	109-99-9	<10	10-500	>500	-
2,2,4,4-Tetrahydroxybenzophenone	131-55-5	<10	10-500	>500	-
Titanium dioxide[2]	13463-67-7	-	-	-	-
Tribromodiphenylethers (TriBDEs)	Multiple	<10	10-500	>500	-
2-(Thiocyanatomethylthio)benzothiazole (TCMBT)	21564-17-0	<250	250-1000	-	>1000
Thiourea	62-56-6	<50	50-500	>500	-
Thiodiglycol	111-48-8	<10	10-500	>500	-

[2)] Silica and Titanium dioxide is required to be controlled due to their cancerogenic by inhalation, and applicable for solid products and specific particle size.

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Substance Name	CAS No.	Preferred (mg/kg)	Allowed (mg/kg)	Prohibited / phase out (mg/kg)	Require due diligence (mg/kg)
Triclosan	3380-34-5	<250	250-1000	>1000	-
Toluene	108-88-3	<10	10-500	-	>500
Tricresyl phosphate (TCP)	1330-78-5	<10	10-500	>500	-
Tri(2-ethylhexyl) phosphate	78-42-2	<250	250-1000	-	>1000
Trichloroethylene (TCE)	79-01-6	<10	10-500	>500	-
Trichloroethane (isomers)	71-55-6 79-00-5	<10	10-500	>500	-
Trichloromethane (Chloroform)	67-66-3	<10	10-500	>500	-
1,2,3-Trichloropropane	96-18-4	<10	10-500	>500	-
Triethylamine	121-44-8	<2000	2000-50000	-	>50000
Triethylene glycol	112-27-6	<2000	2000-50000	-	>50000
Tri-*iso*-butylphosphate	126-71-6	<250	250-1000	-	>1000
Tri-*n*-butylphosphate	126-73-8	<10	10-500	>500	-
Tri-*o*-cresyl phosphate	78-30-8	<10	10-500	>500	-
3,6,10-Trimethyl-3.5,9-undecatrien-2-one (*beta*-Ionone)	1117-41-5	<250	250-1000	>1000	-
Trimethylamine	75-50-3	<2000	2000-50000	>50000	-
Trimethylphosphate	512-56-1	<10	10-500	>500	-
Triphenylphosphate	115-86-6	<10	10-500	>500	-
Tris(1-aziridinyl)-phosphine oxide (TEPA)	545-55-1	≤10	-	>10	-
Tris(2,3-dibromopropyl) phosphate (TRIS)	126-72-7	≤10	-	>10	-
Tris(1-chloro-2-propyl) phosphate (TCPP)	13674-84-5	<10	10-500	>500	-
Tris(1,3-dichloro-isopropyl) phosphate (TDCP)	13674-87-8	<10	10-500	>500	-
Tris(2-chloroethyl) phosphate (TCEP)	115-96-8	<10	10-500	>500	-
Tris(4-tert-butylphenyl) phosphate (TBPP)	78-33-1 28777-70-0	<10	10-500	>500	-
Trixylyl phosphate	25155-23-1	<10	10-500	>500	-
Vinyl chloride	75-01-4	<10	10-500	>500	-
N-Vinyl-2-pyrrolidone	88-12-0	<10	10-500	>500	-

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Substance Name	CAS No.	Preferred (mg/kg)	Allowed (mg/kg)	Prohibited / phase out (mg/kg)	Require due diligence (mg/kg)
Vinyl acetate[3]	108-05-4	<10	10-3000	>3000	-
4-Vinylcyclohexene	100-40-3	<10	10-500	>500	-
Xylene (*m*-, *o*-, *p*-Xylene)	1330-20-7 (isomer mix) 95-47-6 (o) 108-38-3 (m) 106-42-3 (p)	<10	10-500	-	>500

[3)] Vinyl acetate: the residual vinyl acetate monomer content in homo- and copolymers depends on the polymer and its field of application. The quantitatively weighted median value of the residual monomer content amounts to 3000 ppm (EU RAR 2008).

ALKYLPHENOLS					
Substance Name	**CAS No.**	**Preferred (mg/kg)**	**Allowed (mg/kg)**	**Prohibited / phase out (mg/kg)**	**Require due diligence (mg/kg)**
Nonylphenols (NP), sum of: Nonylphenol (mixed isomers) 4-Nonylphenol 4-Nonylphenol (branched, industrial) *iso*-Nonylphenol	Various including 25154-52-3 104-40-5 84852-15-3 11066-49-2	<10	10-100	>100	-
Octylphenols (OP), sum of Octylphenol (mixed isomers) 4-*tert*-Octylphenol 4-Octylphenol	Various, including 27193-28-2 140-66-9 1806-26-4 85771-77-3	<10	10-100	>100	-

FORMALDEHYDE					
Substance Name	**CAS No.**	**Preferred (mg/kg)**	**Allowed (mg/kg)**	**Prohibited / phase out (mg/kg)**	**Require due diligence (mg/kg)**
Formaldehyde[1]	50-00-0	<500	500-1000	>2000	1000-2000

[1)] Test only needed for formaldehyde-based chemicals like urea-, melamine-, phenol resins and reactive polymers. These typically contain formaldehyde indicators like methanol, hexamethylene tetramine, phenol, urea, imidazolidones, melamines.

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AROMATIC AMINES					
Substance Name	**CAS No.**	**Preferred (mg/kg)**	**Allowed (mg/kg)**	**Prohibited / phase out (mg/kg)**	**Require due diligence (mg/kg)**
2-Amino-4-nitrotoluene	99-55-8	<1 (dyestuff) <10 (non-dyestuff)	1-10 (dyestuff) 10-500 (non-dyestuff)	>10 (dyestuff) >500 (non-dyestuff)	-
4-Aminoazobenzene	60-09-3	<1 (dyestuff) <10 (non-dyestuff)	1-10 (dyestuff) 10-500 (non-dyestuff)	>10 (dyestuff) >500 (non-dyestuff)	-
2-Aminoazotoluene	97-56-3	<1 (dyestuff) <10 (non-dyestuff)	1-10 (dyestuff) 10-500 (non-dyestuff)	>10 (dyestuff) >500 (non-dyestuff)	-
4-Aminodiphenyl	92-67-1	<1 (dyestuff) <10 (non-dyestuff)	1-10 (dyestuff) 10-500 (non-dyestuff)	>10 (dyestuff) >500 (non-dyestuff)	-
2-Aminotoluene (*o*-Toluidine)	95-53-4	<1 (dyestuff) <10 (non-dyestuff)	1-10 (dyestuff) 10-500 (non-dyestuff)	>10 (dyestuff) >500 (non-dyestuff)	-
2-Anisidine	90-04-0	<1 (dyestuff) <10 (non-dyestuff)	1-10 (dyestuff) 10-500 (non-dyestuff)	>10 (dyestuff) >500 (non-dyestuff)	-
Benzidine	92-87-5	<1 (dyestuff) <10 (non-dyestuff)	1-10 (dyestuff) 10-500 (non-dyestuff)	>10 (dyestuff) >500 (non-dyestuff)	-
4-Chloroaniline	106-47-8	<1 (dyestuff) <10 (non-dyestuff)	1-10 (dyestuff) 10-500 (non-dyestuff)	>10 (dyestuff) >500 (non-dyestuff)	-
4-Chloro-*o*-toluidine	95-69-2	<1 (dyestuff) <10 (non-dyestuff)	1-10 (dyestuff) 10-500 (non-dyestuff)	>10 (dyestuff) >500 (non-dyestuff)	-
4-Chloro-o-toluidinium chloride	3165-93-3	<1 (dyestuff) <10 (non-dyestuff)	1-10 (dyestuff) 10-500 (non-dyestuff)	>10 (dyestuff) >500 (non-dyestuff)	-
4-Cresidine (6-Methoxy-m-toluidine)	120-71-8	<1 (dyestuff) <10 (non-dyestuff)	1-10 (dyestuff) 10-500 (non-dyestuff)	>10 (dyestuff) >500 (non-dyestuff)	-
2,4-Diaminoanisole	615-05-4	<1 (dyestuff) <10 (non-dyestuff)	1-10 (dyestuff) 10-500 (non-dyestuff)	>10 (dyestuff) >500 (non-dyestuff)	-
4,4'-Diaminodiphenylmethane (MDA)	101-77-9	<1 (dyestuff) <10 (non-dyestuff)	1-10 (dyestuff) 10-500 (non-dyestuff)	>10 (dyestuff) >500 (non-dyestuff)	-
2,4-Diaminotoluene	95-80-7	<1 (dyestuff) <10 (non-dyestuff)	1-10 (dyestuff) 10-500 (non-dyestuff)	>10 (dyestuff) >500 (non-dyestuff)	-

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AROMATIC AMINES					
Substance Name	**CAS No.**	**Preferred (mg/kg)**	**Allowed (mg/kg)**	**Prohibited / phase out (mg/kg)**	**Require due diligence (mg/kg)**
3,3'-Dichlorobenzidine	91-94-1	<1 (dyestuff) <10 (non-dyestuff)	1-10 (dyestuff) 10-500 (non-dyestuff)	>10 (dyestuff) >500 (non-dyestuff)	-
3,3'-Dimethoxybenzidine (*o*-Dianisidine)	119-90-4	<1 (dyestuff) <10 (non-dyestuff)	1-10 (dyestuff) 10-500 (non-dyestuff)	>10 (dyestuff) >500 (non-dyestuff)	-
3,3'-Dimethyl-4,4'-diamino-diphenylmethane	838-88-0	<1 (dyestuff) <10 (non-dyestuff)	1-10 (dyestuff) 10-500 (non-dyestuff)	>10 (dyestuff) >500 (non-dyestuff)	-
3,3'-Dimethylbenzidine (*o*-Tolidine)	119-93-7	<1 (dyestuff) <10 (non-dyestuff)	1-10 (dyestuff) 10-500 (non-dyestuff)	>10 (dyestuff) >500 (non-dyestuff)	-
4-methoxy-m-phenylene diammonium sulphate / 2,4-diaminoanisole sulphate	39156-41-7	<1 (dyestuff) <10 (non-dyestuff)	1-10 (dyestuff) 10-500 (non-dyestuff)	>10 (dyestuff) >500 (non-dyestuff)	-
4,4'-Methylene-bis-(2-chloroaniline) (MOCA)	101-14-4	<1 (dyestuff) <10 (non-dyestuff)	1-10 (dyestuff) 10-500 (non-dyestuff)	>10 (dyestuff) >500 (non-dyestuff)	-
2-Naphthylamine	91-59-8	<1 (dyestuff) <10 (non-dyestuff)	1-10 (dyestuff) 10-500 (non-dyestuff)	>10 (dyestuff) >500 (non-dyestuff)	-
2-Naphthylammoniumacetate	553-00-4	<1 (dyestuff) <10 (non-dyestuff)	1-10 (dyestuff) 10-500 (non-dyestuff)	>10 (dyestuff) >500 (non-dyestuff)	-
4,4'-Oxydianiline	101-80-4	<1 (dyestuff) <10 (non-dyestuff)	1-10 (dyestuff) 10-500 (non-dyestuff)	>10 (dyestuff) >500 (non-dyestuff)	-
4,4'-Thiodianiline	139-65-1	<1 (dyestuff) <10 (non-dyestuff)	1-10 (dyestuff) 10-500 (non-dyestuff)	>10 (dyestuff) >500 (non-dyestuff)	-
2,4,5-Trimethylaniline	137-17-7	<1 (dyestuff) <10 (non-dyestuff)	1-10 (dyestuff) 10-500 (non-dyestuff)	>10 (dyestuff) >500 (non-dyestuff)	-
2,4,5-trimethylaniline hydrochloride	21436-97-5	<1 (dyestuff) <10 (non-dyestuff)	1-10 (dyestuff) 10-500 (non-dyestuff)	>10 (dyestuff) >500 (non-dyestuff)	-
2,6-Xylidine	87-62-7	<1 (dyestuff) <10 (non-dyestuff)	1-10 (dyestuff) 10-500 (non-dyestuff)	>10 (dyestuff) >500 (non-dyestuff)	-
2,4-Xylidine	95-68-1	<1 (dyestuff) <10 (non-dyestuff)	1-10 (dyestuff) 10-500 (non-dyestuff)	>10 (dyestuff) >500 (non-dyestuff)	-

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DISPERSE DYES					
Substance Name	**CAS No.**	**Preferred (mg/kg)**	**Allowed (mg/kg)**	**Prohibited / phase out (mg/kg)**	**Require due diligence (mg/kg)**
Disperse Blue 1	2475-45-8	<250	250-1000	>1000	-
Disperse Blue 102	12222-97-8	<250	250-1000	>1000	-
Disperse Blue 106	12223-01-7	<250	250-1000	>1000	-
Disperse Blue 124	61951-51-7	<250	250-1000	>1000	-
Disperse Blue 26	3860-63-7	<250	250-1000	>1000	-
Disperse Blue 291	56548-64-2	<250	250-1000	-	>1000
Disperse Blue 3	2475-46-9	<250	250-1000	>1000	-
Disperse Blue 35	12222-75-2 56524-77-7	<250	250-1000	>1000	-
Disperse Blue 7	3179-90-6	<250	250-1000	>1000	-
Disperse Brown 1	23355-64-8	<250	250-1000	>1000	-
Disperse Orange 1	2581-69-3	<250	250-1000	>1000	-
Disperse Orange 11	82-28-0	<250	250-1000	>1000	-
Disperse Orange 149	85136-74-9	<250	250-1000	>1000	-
Disperse Orange 3	730-40-5	<250	250-1000	>1000	-
Disperse Orange 37/59/76	12223-33-5 13301-61-6	<250	250-1000	>1000	-
Disperse Red 1	2872-52-8	<250	250-1000	>1000	-
Disperse Red 11	2872-48-2	<250	250-1000	>1000	-
Disperse Red 151	61968-47-6	<250	250-1000	>1000	-
Disperse Red 17	3179-89-3	<250	250-1000	>1000	-
Disperse Yellow 1	119-15-3	<250	250-1000	>1000	-
Disperse Yellow 23	6250-23-3	<250	250-1000	>1000	-
Disperse Yellow 3	2832-40-8	<250	250-1000	>1000	-
Disperse Yellow 39	12236-29-2	<250	250-1000	>1000	-
Disperse Yellow 49	54824-37-2	<250	250-1000	>1000	-
Disperse Yellow 56	54077-16-6	<250	250-1000	>1000	-

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DISPERSE DYES					
Substance Name	**CAS No.**	**Preferred (mg/kg)**	**Allowed (mg/kg)**	**Prohibited / phase out (mg/kg)**	**Require due diligence (mg/kg)**
Disperse Yellow 64	10319-14-9	<250	250-1000	-	>1000
Disperse Yellow 7	67701-38-6	<250	250-1000	>1000	-
Disperse Yellow 9	6373-73-5	<250	250-1000	>1000	-
Disperse Violet 1	128-95-0	<250	250-1000	-	>1000
Disperse Violet 93	122463-28-9 52697-38-8 268221-71-2	<250	250-1000	-	>1000

Other Dyes					
Substance Name	**CAS No.**	**Preferred (mg/kg)**	**Allowed (mg/kg)**	**Prohibited / phase out (mg/kg)**	**Require due diligence (mg/kg)**
Acid Red 26	3761-53-3	<250	250-1000	>1000	-
Acid Violet 49	1694-09-3	<250	250-1000	>1000	-
Basic Blue 26 (with >0.1% Michler's Ketone)	2580-56-5	<250	250-1000	>1000	-
Basic Green 4 (Malachite Green)	10309-95-2	<250	250-1000	>1000	-
Basic Green 4 (Malachite Green Chloride)	569-64-2	<250	250-1000	>1000	-
Basic Green 4 (Malachite Green Oxalate)	2437-29-8	<250	250-1000	>1000	-
Basic Violet 1	8004-87-3	<10	10-500	>500	-
Basic Violet 3	548-62-9	<250	250-1000	>1000	-
Basic Violet 14	632-99-5	<250	250-1000	>1000	-
Basic Red 9	569-61-9	<250	250-1000	>1000	-
C.I. Basic Green 4 Leuco Base	129-73-7	<250	250-1000	>1000	-
Direct Black 38	1937-37-7	<250	250-1000	>1000	-
Direct Blue 6	2602-46-2	<250	250-1000	>1000	-
Direct Blue 80	12222-00-3	<250	250-1000	>1000	-
Direct Brown 95	16071-86-6	<10	10-500	>500	-

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Other Dyes					
Substance Name	**CAS No.**	**Preferred (mg/kg)**	**Allowed (mg/kg)**	**Prohibited / phase out (mg/kg)**	**Require due diligence (mg/kg)**
Direct Red 28	573-58-0	<250	250-1000	>1000	-
Navy Blue/ Component 1: C39H23Cl-CrN7O12S 2Na	118685-33-9	<10	10-500	>500	-
Navy Blue/ Component 2: C46H-30CrN10O20S2 3Na	Not Allocated	<10	10-500	>500	-
Pigment Red 53:1 (D&C Red No. 9)	5160-02-1	<10	10-500	>500	-
Solvent Blue 4	6786-83-0	<10	10-500	>500	-

DIISOCYANATES					
Substance Name	**CAS No.**	**Preferred (mg/kg)**	**Allowed (mg/kg)**	**Prohibited / phase out (mg/kg)**	**Require due diligence (mg/kg)**
Diphenylmethane diisocyanate (MDI)	101-68-8	<10	10-500	-	>500
Hexamethylene diisocyanate (HDI)	822-06-0	<250	250-1000	-	>1000
Isophorone diisocyanate (IPDI)	4098-71-9	<250	250-1000	-	>1000
Naphthylene-1,5-diisocyanate (1,5-NDI)	3173-72-6	<10	10-500	-	>500
Tetramethylxylene diisocyanate (TMXDI)	2778-42-9	<250	250-1000	-	>1000
2,4- and 2.6-Toluene diisocyanate (2,4-TDI, 2,6-TDI)	584-84-9 91-08-7	<10 (sum)	10-500 (sum)		>500 (sum)

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BIOCIDES					
Substance Name	**CAS No.**	**Preferred (mg/kg)**	**Allowed (mg/kg)**	**Prohibited / phase out (mg/kg)**	**Require due diligence (mg/kg)**
Permethrin	52645-53-1	<10	10-500	>500 (non-biocide)	>500 (biocide)
1,2-Benzisothiazol-3(*2H*)-one (BIT)	2634-33-5	<250	250-1000	>1000 (non-biocide)	>1000 (biocide)
5-Chloro-2-methyl-4-isothiazolin-3-one (CMIT)	26172-55-4	<10	10-15	>15 (non-biocide)	>15 (biocide / in-can preservative)
Dichlorooctylisothiazolinone (DCOIT)	64359-81-5	<250	250-1000	>1000 (non-biocide)	>1000 (biocide)
2-Methyl-4-isothiazolin-3-one (MIT)	2682-20-4	<250	250-1000	>1000 (non-biocide)	>1000 (biocide)
2-*n*-Octyl-4-isothiazolin-3-one (OIT)	26530-20-1	<250	250-1000	>1000 (non-biocide)	>1000 (biocide)
o-Phenylphenol (OPP)	90-43-7	<10	10-500	>500	-

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CHLORINATED AROMATICS					
Substance Name	**CAS No.**	**Preferred (mg/kg)**	**Allowed (mg/kg)**	**Prohibited / phase out (mg/kg)**	**Require due diligence (mg/kg)**
Chlorobenzene	108-90-7	≤10 (sum)	10-500 (sum)	>500 (sum)	-
Dichlorobenzene	95-50-1 541-73-1 106-46-7				
Trichlorobenzene	108-70-3 120-82-1 87-61-6				
Tetrachlorobenzene	634-66-2 634-90-2 95-94-3 76057-12-0 875-40-1				
Pentachlorobenzene	608-93-5				
Hexachlorobenzene	118-74-1				
Chlorotoluene	106-43-4 108-41-8 95-49-8				
Dichlorotoluene	118-69-4 19398-61-9 25186-47-4 32768-54-0 95-73-8 95-75-0				
Trichlorotoluene	2077-46-5 23749-65-7 6639-30-1 7359-72-0 21472-86-6				
Tetrachlorotoluene	1006-32-2 29733-70-8 1006-31-1				
Pentachlorotoluene	877-11-2				

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CHLOROPHENOLS					
Substance Name	**CAS No.**	**Preferred (mg/kg)**	**Allowed (mg/kg)**	**Prohibited / phase out (mg/kg)**	**Require due diligence (mg/kg)**
Monochlorophenol (MCP), its salts and compounds (2-MCP, 3-MCP, 4-MCP)	95-57-8 108-43-0 106-48-9	≤10 (sum)	-	>10 (sum)	
Dichlorophenol (DCP), its salts and compounds (2,3-DCP, 2,4-DCP, 2,5-DCP, 2,6-DCP, 3,4-DCP, 3,5-DCP)	576-24-9 120-83-2 583-78-8 87-65-0 95-77-2 591-35-5				
Trichlorophenol (TriCP), its salts and compounds (2,3,4-TriCP, 2,3,5-TriCP, 2,3,6-TriCP, 2,4,5-TriCP, 2,4,6-TriCP, 3,4,5-TriCP)	15950-66-0 933-78-8 933-75-5 95-95-4 88-06-2 609-19-8				
Tetrachlorophenol (TeCP), its salts and compounds (2,3,5,6-TeCP; 2,3,4,6-TeCP; 2,3,4,5-TeCP)	25167-83-3 4901-51-3 58-90-2 935-95-5				
Pentachlorophenol (PCP), its salts and compounds	87-86-5				

FLUOROCHEMICALS (RF-TELOMERS)					
Substance Name	**CAS No.**	**Preferred (mg/kg)**	**Allowed (mg/kg)**	**Prohibited / phase out (mg/kg)**	**Require due diligence (mg/kg)**
RF-telomers ≤C6 (sum of RF-telomer alcohols, alkenes, iodides and acrylates)	various including 25291-17-2 647-42-7	<50	50-500	>500	-
RF-telomers ≥C8 (sum of RF-telomer alcohols, alkenes, iodides and acrylates)	various including 21652-58-4 678-39-7	<2	2-10	>10	-

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CYCLIC SILOXANES					
Substance Name	**CAS No.**	**Preferred (mg/kg)**	**Allowed (mg/kg)**	**Prohibited / phase out (mg/kg)**	**Require due diligence (mg/kg)**
Octamethylcyclotetrasiloxane (D4)	556-67-2	<1000 (sum)	1000-2000 (sum)	>2000 (sum)	-
Decamethylcyclopentasiloxane (D5)	541-02-6				
Dodecamethylcyclohexasiloxane (D6)	540-97-6				

POLYCYCLIC AROMATIC HYDROCARBONS (PAH)					
Substance Name	**CAS No.**	**Preferred (mg/kg)**	**Allowed (mg/kg)**	**Prohibited / phase out (mg/kg)**	**Require due diligence (mg/kg)**
Benzo[a]pyrene	50-32-8	≤10 (sum)	-	>10 (sum)	-
Benzo[e]pyrene	192-97-2				
Benzo[a]anthracene	56-55-3				
Chrysene	218-01-9				
Benzo[b]fluoranthene	205-99-2				
Benzo[j]fluoranthene	205-82-3				
Benzo[k]fluoranthene	207-08-9				
Benzo[ghi]perylene,	191-24-2				
Dibenzo[a,h]anthracene	53-70-3				
Indeno[1,2,3-cd]pyrene	193-39-5				
Acenaphthylene	208-96-8	≤100 (sum)	-	>100 (sum)	-
Acenaphthene	83-32-9				
Anthracene	120-12-7				
Fluoranthene	206-44-0				
Fluorene	86-73-7				
Phenanthrene	85-01-8				
Pyrene	129-00-0				

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PHTHALATES					
Substance Name	**CAS No.**	**Preferred (mg/kg)**	**Allowed (mg/kg)**	**Prohibited / phase out (mg/kg)**	**Require due diligence (mg/kg)**
Butyl benzyl phthalate (BBP)	85-68-7	<10 (sum)	10-500 (sum)	>500 (sum)	-
Dicyclohexyl phthalate (DCHP)	84-61-7				
Di(2-methoxyethyl) phthalate (DMEP)	117-82-8				
Di(ethylhexyl) phthalate (DEHP)	117-81-7				
Dibutyl phthalate (DBP)	84-74-2				
Di-*iso*-hexyl phthalate (DIHP)	71850-09-4				
Di-C6-8- branched, C7 rich Diisohexylphthalate (DIHP)	71888-89-6				
Di-C7-11- branched and linear (di-heptyl, nonyl, undecyl phthalate (DHNUP))	68515-42-4				
Di-*iso*-butyl phthalate (DIBP)	84-69-5				
Di-*iso*-decyl phthalate (DIDP)	26761-40-0 68515-49-1				
Di-*iso*-octyl phthalate (DIOP)	27554-26-3				
Di-*iso*-nonyl phthalate (DINP)	28553-12-0 68515-48-0				
Dinonyl phthalate (DNP)	84-76-4				
Diethyl phthalate (DEP)	84-66-2				
Di-*iso*-pentyl phthalate (DIPP)	605-50-5				
Dimethyl phthalate (DMP)	131-11-3				
Di-*n*-hexyl phthalate (DnHP)	84-75-3				
Di-*n*-octyl phthalate (DNOP)	117-84-0				
Di-n-propyl phthalate (DPRP)	131-16-8				
Dipentyl phthalate (DPP)	131-18-0				
Di-propylheptylphthalate (DPHP)	53306-54-0				
N-Pentyl-isopentylphthalate (NPIPP)	776297-69-9				
1,2-Benzenedicarboxylic acid, dipentylester, branched & linear	84777-06-0				
Other miscellaneous phthalates	Various				

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POLYBROMINATED BIPHENYLS (PBB)					
Substance Name	**CAS No.**	**Preferred (mg/kg)**	**Allowed (mg/kg)**	**Prohibited / phase out (mg/kg)**	**Require due diligence (mg/kg)**
Monobromobiphenyl	Various	≤10 (sum)	-	>10 (sum)	-
Dibromobiphenyl	Various				
Tribromobiphenyl	Various				
Tetrabromobiphenyl	Various				
Pentabromobiphenyl	Various				
Hexabromobiphenyl	Various				
Heptabromobiphenyl	Various				
Octabromobiphenyl	Various				
Nonabromobiphenyl	Various				
Decabromobiphenyl	13654-09-6				

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Annex C - CHEM-IQ[SM] Table of Substances to Avoid, Indirect Detection by GC-MS Using Indicator Chemicals

The table below lists STA's that cannot be detected directly by GC-MS, but can be screened through the use of indicator chemicals or other reference test methods. For more information on indicator methodology, please contact VF.

Substance Name	CAS No.	Preferred (mg/kg)	Allowed (mg/kg)	Prohibited / phase out (mg/kg)	Require due diligence (mg/kg)	Reference Test Method
2,2-Bis(chloromethyl)trimethylene bis(bis(2-chloroethyl)phosphate)	38051-10-4	<10	10-500	>500	-	LC-MS
Colophony (Rosin)	8050-09-7	<250	250-1000	-	>1000	LC-DAD
Di(hydrogenated tallow alkyl) dimethylammonium chloride (DHTDMAC)	61789-80-8	<10	10-500	>500	-	LC-MS / GC-MS (indicator substances, see Section 15.2)
Di(stearyl) dimethylammonium chloride (DSDMAC)	107-64-2	<10	10-500	>500	-	LC-MS / GC-MS (indicator substances, see Section 15.2)
Di(tallow alkyl) dimethylammonium chloride (DTDMAC)	68783-78-8	<10	10-500	>500	-	LC-MS / GC-MS (indicator substances, see Section 15.2)
Diazene-1,2-dicarboxamide (C,C'-azodi(formamide), Azodicarboxamide)	123-77-3	<10	10-500	>500	-	LC-DAD
Dicumyl peroxide	80-43-3	<250	250-1000	-	>1000	ASTM E1090 / GC-MS (decomposed acetophenone, see Section 15.1)
Diethanolamine (DEA, and related fatty acid esters and amides)	111-42-2	<10	10-500	-	>500	LC-MS
Fatty acids, C16-18, lead salts: leads dipalmitate (5773-56-5), lead distearate (7428-48-0), fatty acids C16-18 (67701-05-5)	91031-62-8	<10	10-500	>500	-	AAS / ICP-OES
Isopropylated triphenyl phosphate (IPTPP)	68937-41-7	<10	10-500	>500	-	LC-MS
Tris(nonylphenyl) phosphite (TNPP)	26523-78-4	<10	10-500	>500		LC-MS

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ALKYLPHENOL ETHOXYLATES						
Substance Name	**CAS No.**	**Preferred (mg/kg)**	**Allowed (mg/kg)**	**Prohibited / phase out (mg/kg)**	**Require due diligence (mg/kg)**	**Reference Test Method**
Nonylphenol ethoxylates (NPEO)	Various including 9016-45-9 26027-38-3 37205-87-1 68412-54-4 127087-87-0	<100	100-1000	>1000	-	ISO 18254-1
Octylphenol ethoxylates (OPEO)	Various, including 68987-90-6 9036-19-5 9002-93-1	<100	100-1000	>1000	-	ISO 18254-1

POLYCHLORINATED BIPHENYLS (PCB)						
Substance Name	**CAS No.**	**Preferred (mg/kg)**	**Allowed (mg/kg)**	**Prohibited / phase out (mg/kg)**	**Require due diligence (mg/kg)**	**Reference Test Method**
Monochlorobiphenyl	Various	≤10 (sum)	-	>10 (sum)	-	GC-MS and LC-MS
Dichlorobiphenyl	Various					
Trchlorobiphenyl	Various					
Tetrachlorobiphenyl	Various					
Pentachlorobiphenyl	Various					
Hexachlorobiphenyl	Various					
Heptachlorobiphenyl	Various					
Octachlorobiphenyl	Various					
Nonachlorobiphenyl	Various					
Decachlorobiphenyl	2051-24-3					

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FLUOROCHEMICALS (PFOS / PFOA)						
Substance Name	**CAS No.**	**Preferred (mg/kg)**	**Allowed (mg/kg)**	**Prohibited / phase out (mg/kg)**	**Require due diligence (mg/kg)**	**Reference Test Method**
Perfluorooctane sulphonate (PFOS) and PFOS metallic salt, halogenide, amide and other derivatives	2795-39-3 1763-23-1 56773-42-3	<0.05	0.05-0.5	>0.5	-	CEN/TS 15968
Perfluorooctanoic acid (PFOA) and its derivatives	335-67-1 3825-26-1 (NH4+)	<0.05	0.05-0.5	>0.5	-	CEN/TS 15968
4:2 Fluorotelomer alcohols (4:2 FTOH)	2043-47-2	<0.05	0.05-0.5	>0.5	-	CEN/TS 15968
6:2 Fluorotelomer alcohols (6:2 FTOH)	647-42-7	<0.05	0.05-0.5	>0.5	-	CEN/TS 15968
8:2 Fluorotelomer alcohols (8:2 FTOH)	678-39-7	<0.05	0.05-0.5	>0.5	-	CEN/TS 15968
10:2 Fluorotelomer alcohols (10:2 FTOH)	865-86-1	<0.05	0.05-0.5	>0.5	-	CEN/TS 15968
Perfluorobutane sulfonic acid (PFBS)	375-73-5	<0.05	0.05-0.5	>0.5	-	CEN/TS 15968
Perfluorobutanoic acid (PFBA)	375-22-4	<0.05	0.05-0.5	>0.5	-	CEN/TS 15968
Perfluorodecane sulfonic acid (PFDS)	335-77-3	<0.05	0.05-0.5	>0.5	-	CEN/TS 15968
Perfluorodecanoic acid (PFDA)	335-76-2	<0.05	0.05-0.5	>0.5	-	CEN/TS 15968
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	<0.05	0.05-0.5	>0.5	-	CEN/TS 15968
Perfluorohexanoic acid (PFHxA) and related substances	Multiple, including; 307-24-4	<0.05	0.05-0.5	>0.5	-	CEN/TS 15968

ORGANOTINS						
Substance Name	**CAS No.**	**Preferred (mg/kg)**	**Allowed (mg/kg)**	**Prohibited / phase out (mg/kg)**	**Require due diligence (mg/kg)**	**Reference Test Method**
Organotin compounds	Various	<10	10-100	>100	-	ISO 17353

Note: With total tin as indicator; in comparison with MSDS for PU, PVC, PFC, silicone-based chemicals

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INORGANIC ITEMS						
Substance Name	**CAS No.**	**Preferred (mg/kg)**	**Allowed (mg/kg)**	**Prohibited / phase out (mg/kg)**	**Require due diligence (mg/kg)**	**Reference Test Method**
Borate, zinc salt	1332-07-6	<500	500-1000	>1000	-	AAS / ICP-OES
Disodium octaborate	12008-41-2	<10	10-500	>500	-	AAS / ICP-OES
Diboron trioxide	1303-86-2	<10	10-500	>500	-	AAS / ICP-OES
Orthoboric acid, sodium salt	13840-56-7	<10	10-500	>500	-	AAS / ICP-OES
Potassium Permanganate	7722-64-7	<10	10-500	>500	-	AAS / ICP-OES
Perboric acid, sodium salt	11138-47-9 15120-21-5 7632-04-04 12267-73-1 16940-66-2 13517-20-9 125022-34-6 90568-23-3	<250	250-1000	>1000	-	AAS / ICP-OES

Note: above inorganic items are not screened in CHEM-IQ[SM] Program. However, suppliers are still required to make sure the use of their chemicals on VF products and/or materials, are compliance with the above requirement.

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HEAVY METALS						
Substance Name	**CAS No.**	**Preferred (mg/kg)**	**Allowed (mg/kg)**	**Prohibited/ Phase Out (mg/kg)**	**Requiring Due Diligence (mg/kg)**	**Reference Test Method**
Antimony (Sb)	7440-36-0	<25	25-100	>100	-	AAS / ICP-OES
Arsenic (As)	7440-38-2	<25	25-100	>100	-	AAS / ICP-OES
Barium (Ba)	7440-39-3	<25	25-100	>100	-	AAS / ICP-OES
Cadmium (Cd)	7440-43-9	<25	25-100	>100	-	AAS / ICP-OES
Chromium	7440-47-3	<25	25-100	>100	-	AAS / ICP-OES
Chromium (VI) / (Cr VI)	18540-29-9	<25	25-100	>100	-	AAS / ICP-OES
Cobalt (Co)	7440-48-4	<100	100-1000	>1000	-	AAS / ICP-OES
Copper (Cu)	7440-50-8	<100	100-1000	>1000	-	AAS / ICP-OES
Iron (Fe)	7439-89-6	<100	100-1000	>1000	-	AAS / ICP-OES
Lead (Pb)	7439-92-1	<25	25-100	>100	-	AAS / ICP-OES
Manganese (Mn)	7439-96-5	<100	100-1000	>1000	-	AAS / ICP-OES
Mercury (Hg)	7439-97-6	<25	25-100	>100	-	AAS / ICP-OES
Nickel (Ni)	7440-02-0	<100	100-1000	>1000	-	AAS / ICP-OES
Selenium (Se)	7782-49-2	<25	25-100	>100	-	AAS / ICP-OES
Silver (Ag)	7440-22-4	<100	100-1000	>1000	-	AAS / ICP-OES
Tin (Sn)	7440-31-5	<100	100-1000	>1000	-	AAS / ICP-OES
Zinc (Zn)	7440-66-6	<100	100-1000	>1000	-	AAS / ICP-OES

Note: Heavy metals are not screened in CHEM-IQ^{SM} Program. However, suppliers are still required to make sure the use of their chemicals on VF products and/or materials, are compliance with the metal restrictions as specified in the latest VF Corporation Restricted Substance List (RSL).

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