

Release guidelines for Disperse Yellow 3 and 25 other azo disperse dyes in the textile sector

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Abstract

Azo disperse dyes represent a significant proportion of the textile dye market and are principally used for the dyeing of synthetic fibers such as polyester, polyester blends, cellulose acetate and nylon. The *Release guidelines for Disperse Yellow 3 and 25 other azo disperse dyes in the textile sector* (the guidelines) address 26 azo disperse dyes with molar weights below 360g/mol, including Disperse Yellow 3 (DY3). Exposures of concern for the 26 azo disperse dyes are from their release to water from textile dye formulation and textile dyeing activities.

DY3 is persistent and inherently toxic (PiT) to aquatic organisms, and was assessed under the *Canadian Environmental Protection Act, 1999* (CEPA) as being harmful to the environment. DY3 is not manufactured in Canada, but is imported. The other 25 azo disperse dyes were identified as having potential ecological effects of concern, but are not presently in commerce in Canada.

The guidelines recommend limits, expressed as concentrations or quantities, for the release of the 26 azo disperse dyes into the aquatic environment from textile dye formulation and textile dyeing activities. These guidelines cannot be used as a substitute for, or be in conflict with existing regulatory requirements.

The overall goal of these guidelines is to limit releases of DY3 and the 25 other azo disperse dyes with molar weights below 360 g/mol to levels below the Predicted No Effect Concentration (PNEC) of 2.3 µg/L at the final discharge point of textile facilities.

If you have any questions or require further information about these guidelines, please refer to the contact information in appendix 6.

Abbreviations used in the guidelines

CEPA *Canadian Environmental Protection Act, 1999*

CMP Chemicals Management Plan

DSL Domestic Substances List

DY3 Disperse Yellow 3

ECCC Environment and Climate Change Canada

FSAR Final Screening Assessment Report

ISO International Organization for Standardization

PECs Predicted Environmental Concentrations

PNEC Predicted No Effect Concentration

RMA Risk Management Approach

SNAc Significant New Activity

WWS Wastewater System

CAS RN Chemical Abstracts Service Registry Number

C.I. Colour Index

NA Not available

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1. Introduction

Textile manufacturing is one of Canada's oldest and most diverse industries. Textiles can be found in an array of applications such as clothing, transportation, medical, agriculture, packaging, protection (individual, environmental), and construction. Approximately 90% of textile mills in Canada are micro businesses (less than 5 employees) or small businesses (5 to 99 employees) (Industry Canada, 2012). They are part of a relatively small sector that, in 2010, constituted 0.05% of the Canadian Gross Domestic Product (Industry Canada 2011 and Statistics Canada 2011). The Canadian textile industry is mainly concentrated in Quebec and Ontario (Environment Canada 2005). Azo disperse dyes represent a significant proportion of the textile dye market. These dyes are used for textile dyeing, mainly of synthetic fibers, such as polyester, polyester blends, cellulose acetate and nylon.

Azo disperse dyes were assessed under CEPA. As a result of this assessment, Disperse Yellow 3 (DY3) and 25 other azo disperse dyes with molar weights below 360 g/mol (listed in appendix 1) were identified as having potential ecological effects when released to surface water during formulation and use of the textile dyes. Subsequently, it was determined that the most appropriate tool for managing the environmental concerns related to these substances would be the Release guidelines for Disperse Yellow 3 and 25 other azo disperse dyes in the textile sector (the guidelines).

These guidelines recommend standard release limits and daily use limits for 26 azo disperse dyes with molar weights below 360 g/mol used in specific textile activities.

2. Targeted textile activities

The textile activities subject to the guidelines are:

- dye formulation
- dyeing operations

3. Applicability

The guidelines apply to any person/entity who:

- owns or operates a textile dye formulation and/or textile dyeing facility
- uses any of the 26 azo disperse dyes listed in appendix 1, and
- releases an effluent containing any of the 26 azo disperse dyes at the final discharge point of the facility

4. Standards

4.1 Release limit

Overall release of the 26 azo disperse dyes at a facility's final discharge point should not be in a

concentration greater than:

- 146 520 µg/L (146.52 ppm) for textile dye formulation
- 240 000 µg/L (240.00 ppm) for textile dyeing processes

A recommended method for determining effluent concentration is included in appendix 2.

4.2 Daily use limit

Total daily use of the 26 azo disperse dyes should not be in a quantity greater than:

- 90 kg/day of azo disperse dyes for textile dye formulation
- 10 kg/day of azo disperse dyes for textile dyeing processes

5. Alternatives

Facilities are encouraged, when appropriate, to use alternatives that reduce or minimize human health or environmental risks. It is important that the chosen alternatives are not azo disperse dyes with a molar weight below 360g/mol. Information on the chosen alternative(s) should be reported through the Declaration of the operator included in appendix 3.

6. Declaration of the operator

The entities listed in section 3 should inform the Minister of Environment and Climate Change in writing of their intention to implement these guidelines by completing the Declaration of the operator no later than March 5, 2021 or for new users, six months before the initial use of any of the 26 azo disperse dyes.

7. Monitoring and analysis

Any person/entity subject to these guidelines should monitor their activities on an ongoing basis to ensure conformity with the guidelines by:

- determining the quantity used and/or the concentration of the 26 azo disperse dyes released at their facility's final discharge point for each day of use
- determining any other quantity released (spills, leak, etc.)
- determining effluent concentration either by laboratory analysis or by following the method for determining effluent concentration included in appendix 2, and
- recording the resulting information in the Conformity evaluation report included in appendix 4

Any analysis performed for the purposes of the guidelines must be conducted by a laboratory that is accredited under ISO and standard ISO/IEC 17025:2005, entitled General Requirements for the Competence of Testing and Calibration Laboratories, as amended from time to time.

8. Reporting

Any person/entity subject to these guidelines should provide the first Conformity evaluation report included in appendix 4 to the Minister of Environment and Climate Change no later than March 31, 2021 and should cover the previous calendar year's activities (2020). Subsequently, a Conformity evaluation report should be submitted if any of the 26 azo disperse dyes are still in use, every year by March 31 and should cover activities relevant to the previous calendar year.

Additionally, any person/entity subject to these guidelines should record in the Conformity evaluation report the quantity of azo disperse dye(s) released into the environment or to a wastewater system, each day the dyes are used, in order to verify conformity with the standards.

If the approach used to calculate the concentration at a facility's final discharge point differs from the method recommended in appendix 2, a facility should submit a copy of the method used and the results obtained (chemical analysis) with the report.

Conformity evaluation reports should include the following:

- the name and street address of the facility
- the name, title, telephone and email address of the technical contact
- the date of use
- the name and Chemical Abstract Service Registry Number (CAS RN) of the azo disperse dye(s) used
- the daily quantity used (kg) and/or the concentration of the 26 azo disperse dyes at the facility's final discharge point
- the estimated quantities of azo disperse dye(s) released accidentally (spills, leak, etc.) to the environment or to a wastewater system as a result of its storage, handling or disposal during the dye formulation or dyeing operations (that is other releases)

9. Record keeping

Any person/entity subject to these guidelines should retain all records pertaining to these guidelines for at least five years beginning on the date of their creation and make them available to the Minister of Environment and Climate Change upon request. It is important that the company keep all such records; as well as reported instances of spills, leak detection and repairs, annual estimates of releases, stock supply, quantity used, concentration estimated, laboratory analysis data, use dates, batch numbers, and any other relevant information.

10. Verification

Verification activities will be carried out six months after the facilities' annual reports have been received. Site visits of selected facilities by Environment and Climate Change Canada (ECCC) representatives will help confirm the accuracy of the reported data. ECCC will verify the current use/processes involving the 26 azo

disperse dyes and determine, if applicable, the end of use of any of them. This includes verifying the equipment and the machinery used inside the facility, as well as the implementation of the recommended best practices and record keeping activities in the facility, as outlined in these guidelines. Additionally, verifiers may ask to review records and auxiliary data, obtain information through interviews or ask for supplemental documentation.

11. Confidentiality

In accordance with section 313 of CEPA, any person who submits information under these guidelines may request, in writing, that the information be treated as confidential. However, under section 317 of the Act, the Minister may disclose information in respect of which a request for confidentiality has been made under section 313, if the Minister determines that the disclosure would not be prohibited under section 20 of the *Access to Information Act*.

12. Best practices

The following are the proposed best practices to mitigate releases of the 26 azo disperse dyes. These best practices should be implemented across the facility where chemicals are handled.

12.1 Training on operational procedures

A training program should be established by the facility to ensure that all employees and contractors are familiar with the various best practices to minimize environmental releases of the 26 azo disperse dyes. It is recommended that the training utilizes various communication methods such as videos, presentations, group discussions and e-learning to ensure employees and contractors are aware of operational procedures. This training could also provide employees and contractors with knowledge on other environmental policies and procedures.

The facility should include environmental responsibilities in job descriptions, incorporate environmental performance into job evaluations and look for ways to improve performance. Specific employee awareness campaigns and communication tools such as posters and flyers should be placed across the facility in strategic locations (cafeterias, washrooms, front desk, main entrance, etc.) where they will best capture the attention of employees and contractors.

12.2 Reception of chemicals

Only individuals with current training should be permitted to use, handle and transport chemicals including chemical waste. The facility's loading/unloading area should:

- be located within the site premises and not on public roads
- be located away from waterbodies or other possible sensitive areas

- have proper drainage and anti-slip flooring, and be frequently cleaned and kept free of snow, ice and tripping hazards
- have lighting adequate for discharge operations during the hours of darkness at the loading/unloading area, and
- be inspected by site operators before, during and after the loading/unloading to ensure all requirements are met

12.3 Use

The dates should be recorded and displayed on chemical containers once they are opened. This will help reduce waste by ensuring chemicals are used before they expire. Computer inventory control should be used to minimize the amount of stock purchased.

12.4 Storage

Chemicals should be stored according to need, with minimal product inventory kept on hand. Inventory information should be recorded and maintained up-to-date at all times. Chemical containers should be kept tightly sealed, covered and stored upright in order to reduce potential leaks, spills and evaporation.

Appropriate physical storage considerations may include specific temperature, pressure and humidity, incompatibilities with other potentially stored materials, etc. These considerations are usually described in Material Safety Data Sheets and/or are available from the supplier.

Chemicals should be stored away from sewers, drains, and other openings that may allow environmental releases in the event of an undetected leak.

12.5 Transfer of chemicals

Chemical substances transferred from storage containers into processing vessels for production operations can result in unintended releases. There is often precise handling guidelines outlined for specific substances or substance groups, and the facility operators should be cognizant of which practices should be applied within their facilities. Regardless of the type of container utilized, all employees and contractors involved in transferring of chemicals should be fully trained to understand the contents of containers and prevent spills.

Proper precautions should be exercised at all times to prevent spills during transfer operations. These precautions and procedures should be documented in work instructions or protocols. Some best practices for transferring chemicals may include the following:

- where possible, facilities should purchase pre-weighed chemicals in sealed polyethylene bags instead of manually weighing to reduce fugitive air emissions and spills, and
- adequate containment should be achieved by using drip pans to prevent residual product drips from valves and connections from entering the environment

12.6 Production operations

Production processes within the facility are potentially key sources of releases of the 26 azo disperse dyes into the environment. Owners and operators of facilities should contact their respective industry association and, if available, review relevant references, and consult with technology vendors and experts to gather information on best practices and controls related to individual production processes.

Overall, facilities in the textile sector should review their individual wastewater systems and make any necessary modifications to ensure that they are operating at peak performance.

12.7 Packaging, loading and shipping

Facilities should engage with transportation partners and logistics service providers to ensure that they have properly implemented chemical spill prevention procedures, as losses can occur at transport interfaces (loading, unloading, and handling) during transport from the distributor to end-user.

Chemicals should be received in sealed containers. The condition of packaging should be inspected and documented before offloading to detect any potential leaks. If the shipment is significantly damaged, notify the transporter and importer and/or consider refusing to accept delivery. Punctured packages should be repaired or replaced immediately and any spills should be cleaned-up immediately to prevent environmental releases. Packaging should be designed to minimize the possibility of breakage and subsequent chemical leakage. Proper bags should be selected to help reduce damage.

12.8 Container/tank cleaning

There are a number of methods for cleaning drums and totes, but a method that produces the least waste is normally environmentally and economically advantageous.

If tanks or containers are cleaned with water at the facility, the aqueous rinsate from this process should be collected for on-site disposal and meet proposed discharge limitations prior to being discharged to the municipal wastewater system or transferred to an off-site disposal facility.

Equipment that may require cleaning includes weigh scales, blenders, transfer bins, metering devices, melt processor hoppers, etc.

12.9 On-site waste management and handling

Facilities should develop and implement a waste management plan covering all aspects of waste management at their site. This waste management plan should address opportunities for recycling/reuse of waste materials as well as the disposal of waste materials.

A designated safe storage area should be made available for hazardous and liquid waste. Waste should also be designated, clearly labelled and kept in appropriate containers in closed areas. Efforts should be made to ensure waste containers are suitable for the specific chemicals they contain.

Waste should be transported in completely sealed containers to avoid possible releases into the environment. Facilities should routinely inspect and confirm the proper handling and storage procedures are in place. If an outside carrier/collector is used for waste removal to an off-site disposal facility, the disposal company should provide a written confirmation that the waste will be disposed of in the manner agreed to.

Totes and drums can be reused, recycled, or disposed of depending on the supplier and user's circumstances. After the contents are used, and before the packaging is returned to a designated handler, it is important to properly seal the empty package by closing valves, caps, lids, etc. This will prevent losses of residual product from the package into the environment.

12.10 Maintenance & housekeeping operations

In regards to maintenance of equipment, an effective maintenance program should be in place. This program should require all equipment (owned, leased or subcontracted) to be adequately maintained to prevent and detect defects before they cause spills/leaks. Employees and contractors should repair leaks and other problems immediately to reduce cleaning efforts, extend the life of the equipment and reduce the consumption of raw materials/avoid loss of manufactured product.

Facility operators should establish a schedule for maintaining and cleaning equipment employed at the facility and ensure that the schedule is adhered to. Maintenance procedures should control chemical losses, disposal of fugitive process materials and proper handling of personal protective equipment and tools that may have come into contact with various chemicals.

12.11 Spills and leaks

In the event of a spill of any of the 26 azo disperse dyes, the facility should immediately take all necessary measures to contain and prevent releases into the environment. The first priority is to minimize the amount of the spill and to cover all drains in the surrounding area. Isolate or interrupt the flow by immediately closing valves, rotating drums or transferring the contents to minimize the spill.

Spill kits with materials (for example absorbents, neutralizing agents, clean-up tools, etc.) should be immediately available and easily accessible to contain, clean-up and securely store the spilled materials. These kits should be made available in areas where a risk of spills occurring has been identified (for example, chemical storage rooms). These spill kits should be maintained on a regular basis to ensure that they are

always available and fit for the intended purpose. This ensures that the most appropriate measure is available to deal with a spill in the most effective way.

All persons or entities are encouraged to track all spills and to document the cause, response, and steps taken to prevent their recurrence. Advanced planning to prevent such incidents, in the form of written procedures for spill prevention, containment and cleanup, should be undertaken by all facilities (for example, a spill prevention and management plan).

12.12 Risk communication and transparency

It's recommended that dye manufacturers, distributors and formulators include information on the ecological risks of the 26 azo disperse dyes and the guidelines, upon transfer of dye products containing any of the 26 azo disperse dyes to another person or entity, such as a textile dyeing facility. Information could include, but is not limited to, package labelling, information sheets or inclusion in substance Material Safety Data Sheets.

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Appendix 1 – list of the 26 azo disperse dyes with molar weights below 360 g/mol

Chemical Abstract Service Registry Number (CAS RN) and Domestic Substance List (DSL) name of azo disperse dyes with molar weights below 360 g/mol			
CAS RN	C.I. Name	Molar weight (g/mol)	Assessed under Subgrouping/ Initiative
2832-40-8	Disperse Yellow 3 ^{ab}	269	Azo Disperse Dyes/ Azo Solvent Dyes
6250-23-3	Disperse Yellow 23 ^b	302	Azo Disperse Dyes
65122-05-6	n/a ^b	306	Azo Disperse Dyes
6300-37-4	Disperse Yellow 7 ^b	316	Azo Disperse Dyes
21811-64-3	Disperse Yellow 68	318	Azo Disperse Dyes
27184-69-6	n/a	346	Azo Disperse Dyes
6657-00-7	n/a	346	Azo Disperse Dyes
69472-19-1	Disperse Orange 33	351	Azo Disperse Dyes
6253-10-7	Disperse Orange 13	352	Azo Disperse Dyes
842-07-9	Solvent Yellow 14/ Disperse Yellow 97 ^b	248	Azo Solvent Dyes
730-40-5	Disperse Orange 3	242	Not Assessed
6054-48-4	Disperse Black 1	262	Not Assessed
4314-14-1	Disperse Yellow 16	278	Not Assessed
12222-69-4/ 20721-50-0	Disperse Black 9	300	Not Assessed
31464-38-7	Disperse Orange 25:1	309	Not Assessed
2872-52-8	Disperse Red 1	314	Not Assessed
2581-69-3	Disperse Orange 1	318	Not Assessed
43047-20-7	Disperse Orange 138	321	Not Assessed
31482-56-1	Disperse Orange 25/Disperse Orange 36	323	Not Assessed
6439-53-8	Disperse Yellow 5	324	Not Assessed
2734-52-3	Disperse Red 19	330	Not Assessed
83249-52-9	Disperse Yellow 241	337	Not Assessed
3179-89-3	Disperse Red 17	345	Not Assessed
16889-10-4	Disperse Red 73	348	Not Assessed
3180-81-2	Disperse Red 13	349	Not Assessed
40880-51-1	Disperse Red 50	358	Not Assessed

^a Meets one or more criteria under section 64 of CEPA

^b Substance with both ecological and human health effects of concern

Appendix 2 - recommended method for estimating effluent concentrations

Textile dye formulation and textile dyeing activities

The effluent concentrations of DY3 and 25 other azo disperse dyes at the facility final discharge point should be calculated as follows:

$$C = \frac{DRQS}{N_b \times V_b}$$

DRQS = Daily Release Quantity to the Sewer system (kg/day)

$$= DUQ \times EF \times (1-WTR)$$

$$= DUQ \times 0.011 \times (1-0.262)$$

DUQ = Daily Use Quantity (kg/day)

EF = Emission factor to wastewater = 1.1% = 0.011 (see [appendix E of the FSAR](#))

WTR = Wastewater treatment removal = 26.2% = 0.262 (see appendix E of the FSAR)

C = Concentration at the facility final discharge point ($\mu\text{g/L}$ or mg/L)

N_b = Number of batches/day

V_b = Volume of each batch (L)

Appendix 3 - declaration of the operator

This form may be used as a template for the purpose of section 6 of the guidelines.

Name and street address of the mill/facility:

Declaration:

- Our mill/facility is not using any of the substances subject to the guidelines.
- Our mill/facility will no longer be using substances subject to the guidelines starting (year/month/day) _____.
- Our mill/facility currently uses at least one of the substances subject to the guidelines for textile dyeing and textile dye formulation and we intend to conform to the guidelines.
 - A list of substances used is attached.
- Our mill/facility currently uses alternatives to the substances subject to the guidelines for textile dyeing and textile dye formulation **and we intend to conform to the guidelines.**
 - A list of alternatives used, along with their CAS RNs and the supplier(s), is attached.
- Our mill/facility does not intend to conform to the guidelines.

Operator name (print)

Title

Telephone

Email

Operator signature

Date of signature

Please return this form to:

Products Division
Environment and Climate Change Canada
351 St. Joseph Blvd
Gatineau QC K1A 0H3

Fax number: 819-938-4480 / 1-888-391-3695

Email address: ec.produits-products.ec.@canada.ca

Subject: Release guidelines for Disperse Yellow 3 and 25 other azo disperse dyes

Appendix 4 - conformity evaluation report

This form may be used as a template for the purpose of section 8 of the guidelines.

Name and street address of the mill/facility:

Period covered by the report: from _____ to _____

Please provide information for each day of using any of the 26 azo disperse dyes in a textile dye formulation or textile dyeing operation.

Date (DD/MM/YY)	Name of the substance	CAS RN	Quantity used (kg)	Other quantity (spills, leaks) released (kg)	Emission factor ⁽¹⁾	On Site WWS (yes/no)	If yes: Removal efficiency by the WWS system	Concentration ⁽²⁾ at facility final discharge point	Environmental release compliance (yes/no). If no, specify the PEC ⁽³⁾

(1) Each facility should consider its own emission factor to wastewater, if available. If not, refer to the emission factors included in [appendix E of the FSAR](#)

(2) Refer to the recommended method for estimating effluent concentrations included in appendix 2. If the method used differs from this approach, include a copy of the method used with the report

(3) The method to calculate a facility's Predicted Environmental Concentration (PEC) is included in appendix 5

I declare this report to be accurate and complete.

Operator Name (print)

Operator Title

Telephone

Email

Operator Signature

Date of Signature

Please return this form to:

Products Division, Environment and Climate Change Canada

351 St. Joseph Blvd, Gatineau, Quebec, K1A 0H3

Fax number: 819-938-4480 / 1-888-391-3695

Email address: ec.produits-products.ec@canada.ca

Subject: Release Guidelines for Disperse Yellow 3 and 25 other azo disperse dyes

Appendix 5 - method to calculate a facility-specific predicted environmental concentration (PEC) in surface water

$$\text{PEC} = \left(\frac{\text{DRQS} \times (1 - 0.262)}{\text{Flow}} \right) / \text{Receiving water dilution factor}$$

PEC = Predicted Environmental Concentration ($\mu\text{g/L}$)

DRQS = Daily release quantity to the sewer system (see appendix 2)

WTR = wastewater treatment removal = 0.262 (see [appendix E of the FSAR](#))

Receiving water dilution factor = 10 (see appendix E of the FSAR)

Flow: Each mill/facility should consider the flow (L/day) related to its off-site wastewater treatment system receiving the treated wastewater, if available. If not, refer to the flow estimated in appendix E of the FSAR

Appendix 6 - Contact information

Please send your comments to the below, indicating that the comments relate to these Release Guidelines for Disperse Yellow 3 and 25 other azo disperse dyes in the textile sector:

Products Division
Environment and Climate Change Canada
351 Saint-Joseph Blvd 9th Floor
Gatineau QC K1A 0H3

Phone number: 819-938-4483 / 1-888-391-3426 (information)

Fax number: 819-938-4480 / 1-888-391-3695

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Subject: Release Guidelines for Disperse Yellow 3 and 25 other azo disperse dyes