

OSPAR CONVENTION FOR THE PROTECTION OF THE MARINE ENVIRONMENT OF THE NORTH-EAST ATLANTIC



OSPAR Recommendation 99/1
on the Best Available Techniques for the Manufacture of Emulsion PVC (e-PVC)
(Consolidated text¹)

[OSPAR Recommendation 99/1](#) adopted by OSPAR 1999 (OSPAR 99/15/1, Annex 8)
Amended by [OSPAR Recommendation 2006/1](#) (OSPAR 06/23/1, Annex 10)

RECALLING Article 2(1) of the Convention for the Protection of the Marine Environment of the North-East Atlantic ("OSPAR Convention");

RECALLING that paragraph 2 of Appendix 1 to the OSPAR Convention identifies factors to which special consideration shall be given in determining whether a set of processes, facilities and methods of operation constitute the best available techniques in general or individual cases;

RECALLING that the OSPAR Commission published, in 1999 an OSPAR Description on "Best Available Techniques for the Emulsion Polyvinyl Chloride Industry";

NOTING Council Directive 96/61/EC concerning integrated pollution prevention and control (IPPC Directive) and corresponding legislation of other Contracting Parties;

RECOGNISING that the vinyl chloride industry has the potential to release significant amounts of organohalogenes to the environment;

RECOGNISING that the release of chlorinated hydrocarbons arising in the manufacture of emulsion PVC can be minimised by applying Best Available Techniques and Best Environmental Practice;

The Contracting Parties to the Convention for the Protection of the Marine Environment of the North-East Atlantic RECOMMEND:

¹ The consolidated text integrates the basic OSPAR measure with subsequent amendments adopted by OSPAR in a single, non-official document to facilitate documentation. Only the basic OSPAR measure and the subsequent measures adopted by OSPAR to amend the basic measure are official documents.

1. Definitions

1.1 For the purposes of this Recommendation:

“Existing plant”	means plant the operation of which was authorised before 1 January 2000.
“New plant”	means plant the operation of which was authorised on or after 1 January 2000.
“VCM”	means vinyl chloride monomer.
“e-PVC”	means emulsion poly vinyl chloride
“Single plant”	means plant only manufacturing e-PVC.
“Combined plant”	means plant manufacturing e-PVC but being part of an industrial site, where: a. suspension-PVC is also being manufactured; and/or b. other chemical processes are being carried out; and some parts of the process/effluent treatment are in common.
“Fugitive emissions”	means releases of VCM into air due to leakages.
“OSPAR BAT Description on e-PVC”	means OSPAR Description on “Best Available Techniques for the Emulsion Polyvinyl Chloride Industry” as published in 1999.

2. Purpose and Scope

Purpose

2.1 The purpose of this Recommendation is to prevent and eliminate pollution of the marine environment by the application of Best Available Techniques for the manufacture of e-PVC from VCM with a view to limiting discharges and emissions of concern.

Scope

- 2.2 This Recommendation applies to single plant and combined plant.
- 2.3 This Recommendation applies to existing and new plant.
- 2.4 This Recommendation does not apply to the production of copolymer.

3. Programmes and Measures

Application of Best Available Techniques (BAT)

3.1 When considering how the BAT measures given in paragraphs 3.2 -3.18 below should be applied, the competent authorities of Contracting Parties should take into account, *inter alia*, the technical information provided in the OSPAR BAT Description on e-PVC as a guide.

3.2 As a minimum standard, the techniques outlined in paragraphs 3.4-3.18 below, or equally effective measures, should be applied to the relevant stages of manufacture of e-PVC in all new plant. An important aim of these techniques is the elimination of VCM emissions, as far as possible.

3.3 For existing plant, the competent authorities of the Contracting Parties should draw up, in consultation with the plant operators, an improvement programme so as to ensure that the plant performs at increasingly high standards, taking into account the criteria listed in paragraph 2 of Appendix 1 of the OSPAR Convention (Best Available Techniques). From 1 January 2004 the same standards should apply to existing plant as to new plant.

Unloading and Storage of VCM

3.4 Care should be taken in unloading and storing VCM to reduce VCM emissions to the minimum.

Polymerisation

3.5 During the polymerisation stage, procedures for the effective reduction of residual VCM emissions from the reactors after polymerisation should be in place. Procedures will depend upon whether a batch or a continuous polymerisation process is in use, and whether the reactors remain closed throughout more than one reaction and cleaning cycle, or if they are opened between each reaction but with a flushing/steaming system in place to minimise emissions. Such procedures could include:

- a. depressurising the reactor by venting to a VCM recovery system;
- b. draining the liquid contents of the reactor to closed vessels;
- c. routing water used for rinsing and cleaning of the reactor to the stripping system;
- d. steaming and/or flushing the reactor with inert gas to remove residual VCM, with transfer of the gases to a VCM recovery system;
- e. discharging the reactor, rinsing and cleaning the reactor, and recharging the reactor with fresh reaction ingredients including VCM, whilst the reactor remains closed;
- f. continuous polymerisation, in which fresh polymerisation ingredients including VCM, are continuously charged to the reactor, and PVC latex continuously removed;
- g. limiting foaming and foam carry over from the reactor during the venting of the autoclave at the end of each polymerisation reaction.

Stripping of VCM from the PVC Latex

3.6 The separation of VCM from the PVC latex in a stripping system is, in many cases, the most critical process in determining the level of VCM emission of the e-PVC process as a whole and should be carefully controlled, as the VCM remaining in the PVC latex after stripping can be lost to the environment in subsequent drying of the PVC latex to produce a powder.

3.7 Process parameters in the stripping system should be optimised to minimise the level of VCM remaining in the PVC latex, but without causing an undue level of coagulation and thus solid PVC waste. Batch stripping normally gives the lowest levels of residual VCM, but is not always appropriate. In particular, continuous stripping should be used in conjunction with continuous polymerisation. In a continuous stripping system the PVC latex should be presented as a thin film.

Latex Storage and Concentration

3.8 The vents from any stock tanks containing unstripped PVC latex should either be fitted with effective treatment or connected to a VCM recovery system.

3.9 In some cases PVC latex concentration may take place before drying. Membrane concentrators can reduce the total energy used in the separation process, but particular attention should be paid to the selection and cleaning of the membranes, which can become fouled. Thin film concentrators have little effect on total energy usage.

3.10 In either case, any effluent produced should pass to the water treatment plant.

Drying

3.11 Where e-PVC is separated from water by spray drying and where the dried resin is separated from air by multiple bag filters, the air exiting from the drier should therefore be monitored rigorously, preferably continuously, so that such failures are detected and corrected immediately.

VCM Recovery

3.12 The efficiency of the condensation of the VCM in the recovery system should be maximised by the optimisation of temperature and pressure. Flue gases from the VCM recovery system containing uncondensed VCM should either be incinerated or passed through a VCM absorption system.

Waste Water Treatment and Handling

3.13 In order to minimise discharges and emissions of VCM (*inter alia* from the aqueous effluent of the stripping system) into the environment, all water flows containing VCM should be collected in a closed system and passed to a waste water stripping system to minimise the concentration of the VCM in the water as far as is practicable. Dilution after the stripping system to meet limit values is not regarded as best practice.

3.14 All waste water which may contain suspended solids or colloidal PVC particles, should be directed to a solids removal system, normally a clariflocculator, but a flocculator with a latex press, or sedimentation processes, or filtration processes can be considered. The solids removal system is normally located after the water stripping system. The subsequent disposal of the PVC collected should take account of its VCM content.

Fugitive Emissions

3.15 Process equipment should be selected with a performance standard that will ensure the minimisation of fugitive emissions.

3.16 Process operational systems should be in place which ensure the immediate detection of leakage and immediate remedial action.

Re-use or Disposal of Solid PVC Waste

3.17 A number of options for the re-use or disposal of solid PVC waste is described in the OSPAR BAT Description on e-PVC. Where this waste is rich in VCM, special care should be taken for the re-use and disposal of solid PVC waste. The preferred options are:

- a. secondary processing of the PVC waste into a form suitable for subsequent beneficial use, with VCM removal and recovery either before or during this secondary process;

- b. conveyance to an incinerator designed and operated in accordance with the relevant EC Directives pertaining to the incineration of hazardous waste ².

3.18 When defining BAT for a specific plant, competent authorities should consider any VCM which may enter the environment directly or indirectly from the re-use or disposal of solid PVC waste together with discharges and emissions from the manufacture of e-PVC.

4. Entry into force

4.1 This Recommendation has effect from 24 June 1999 and applies to:

- a. existing plant:
 - i. from that date with respect to the improvement programmes as outlined in paragraph 3.3;
 - ii. from 1 January 2004 with respect to the standards to apply from that date in accordance with paragraph 3.3;
- b. new plant from 1 January 2000.

4.2 In the case of technical modifications to an existing single or combined e-PVC plant, the competent authorities should decide whether the provisions for existing plant in this Recommendation still apply to the modified plant.

5. Implementation reports

5.1 Reports on the implementation of this Recommendation should be submitted to the appropriate OSPAR subsidiary body for the first time in the intersessional period 2008/2009 for new and existing plants and every four years thereafter until this Recommendation is fully implemented unless otherwise specified by the Commission.

5.2 When reporting on implementation, the Appendix should apply.

² e.g. Directive 94/67/EC

Reporting format on the implementation and effectiveness of OSPAR measures relating to the vinyl chloride sector

Country: _____

I. Implementation

Measure	Reservation applies Yes ⁽¹⁾ /No	Is the measure applicable in your country? Yes/No ⁽²⁾	Is the measure fully implemented? Yes/No ⁽³⁾	Means of implementation ^{(4), (5)} 1. legislation 2. administrative action 3. negotiated agreement
PARCOM Decision 98/4 on Emission and Discharge Limit Values for the Manufacture of Vinyl Chloride Monomer (VCM) including the Manufacture of 1,2 dichloroethane (EDC)				
PARCOM Decision 98/5 on Emission and Discharge Limit Values for the Vinyl Chloride Sector, Applying to the Manufacture of Suspension-PVC (s-PVC) from Vinyl Chloride Monomer (VCM)				
OSPAR Recommendation 99/1 on the Best Available Techniques for the Manufacture of Emulsion PVC (e-PVC)				
OSPAR Recommendation 2000/3 on Emission and Discharge Limit Values for the Manufacture of Emulsion PVC (e-PVC) from Vinyl Chloride Monomer				

Note (1)

Please report on any progress towards lifting the reservation:

Note (2)

If the measure concerned is not applicable please state why (e.g. no relevant plant):

Note (3)

If the measure concerned is not fully implemented please state why and indicate when the measure is expected to be fully implemented:

Note (4)

Please specify the national measures taken to give effect to each of the measures:

Note (5)

Please specify any special difficulties encountered, such as practical or legal problems, in the implementation of each of the measures:

II. Effectiveness

Limit values for emissions and discharges

Please indicate the emissions and discharges of the substances and sum parameters listed in the tables for the following vinyl-chloride and PVC plants or installations. Where plants are operated in an integrated manner (an “installation”), plant-by-plant reporting is not required and reporting should cover the installation. Where an installation produced VCM and/or e-PVC and/or s-PVC, the reporting table should be combined ensuring that all parameters set out in the tables below were covered. Please give representative figure for each pollutant and- if possible- the observed range of figures from all plants.

Reporting on VCM and EDC parameters is on a voluntary basis.

Please also indicate - in brackets behind the figures – whether emission or discharge values are estimated (E), measured (M) or calculated (C). If data could not be made available, please indicate in the appropriate “remarks” section (e.g. if monitoring of substance in question is not specified in the permit for the plant or installation, and estimations or calculations are not available).

“Specific loads” are the amounts of emissions or discharges for each unit (usually tonne) of production that is produced in the year in question. “Total loads” are the amounts of emissions or discharges from the plant or installation in the year in question.

1. Vinyl Chloride Monomer (VCM) plants including manufacture of 1,2-dichloroethane (EDC) covered by OSPAR Decision 98/4

Please indicate number and capacity of VCM-plants/installations:

Total capacity (t VCM/year): _____

a. Emissions to air

Substances	Specific load ³ In reporting year ^{4*} kg/tonne of VCM produced	Alternatively: Total load in reporting year kg/year (comparison with the base year) **	Alternatively: Concentration mg/m ³ ***
VCM			
EDC			
Dioxins	a)	a)	a)

* Please indicate under “remarks” how specific loads were calculated.

** If reporting total loads, please add a baseline load for (2001) and please indicate associated actual production of VCM and report under “remarks” when installed production capacities have changed.

*** Please indicate the associated volumetric flow-rate and whether fugitive emissions are included.

a) mg (TEQ)/tonne of VCM produced **or** mg (TEQ)/year **or** ng (TEQ)/Nm³.

³ Wherever possible this parameter should be reported

⁴ The year for which data are to be reported in 2008/2009 is 2007.

b. Discharges to water

Substances	Specific load ⁵ In reporting year ^{6*} (°)	Alternatively: Total load in reporting year ** kg/year (°)	Alternatively: Concentration mg/l *** (°)
Chlorinated hydrocarbons (g/tonne EDC purification capacity) ^{a)}			
Copper (total) (g/tonne of oxychlorination capacity) ^{b)}			
Dioxins (µg TEQ/tonne oxychlorination capacity) ^{b)}			

- * Please indicate under “remarks” how specific loads were calculated.
- ** If reporting total loads, please add a baseline load for (2001) and please indicate associated actual production of VCM and report under “remarks” when installed production capacities have changed.
- *** Please indicate the associated volumetric flow-rate.

- a) To be sampled after stripper, before secondary treatment. Chlorinated hydrocarbons may alternatively be calculated from AOX or EOX if a correlation, on a plant-by-plant basis, has been established. The application of those alternatives should be described in the implementation report.
- b) To be sampled after final treatment.
- c) In brackets: (Number of samples).

c. Remarks: (i.e. explanation if change in production capacity in the country appeared, method to calculate specific loads)

⁵ Wherever possible this parameter should be reported
⁶ The year for which data are to be reported in 2008/2009 is 2007.

2. Suspension-PVC (s-PVC) covered by OSPAR Decision 98/5

Please indicate number and capacity of plants: _____

Total capacity (tonnes s-PVC/year): _____

a. Emissions to air

Substances	Specific load ⁷ In reporting year ^{8*} g/tonne of s-PVC produced	Alternatively: Total load in reporting year kg/year (comparison with the base year) **	Alternatively: Concentration mg/m ³ ***
VCM (point sources)			
VCM (fugitives)			

* Please indicate under "remarks" how specific loads were calculated.

** If reporting total loads, please add a baseline load for (2001) and please indicate associated actual production of VCM and report under "remarks" when installed production capacities have changed.

*** Please indicate the associated volumetric flow-rate.

b. Discharges to water

Substances	Specific load ⁹ In reporting year ^{10*} g/tonne of s-PVC produced	Alternatively: Total load in reporting year kg/year (comparison with the base year) **	Alternatively: Concentration mg/l ***
VCM ^{a), b)}			

* Please indicate under "remarks" how specific loads were calculated.

** If reporting total loads, please add a baseline load for (2001) and please indicate associated actual production of VCM and report under "remarks" when installed production capacities have changed.

*** Please indicate the associated volumetric flow-rate.

a) Please state correlation when VCM data are based on AOX or EOX measurements.

b) After effluent stripper, before secondary treatment.

c. **Remarks:** (i.e. explanation if change in production capacity in the country appeared, method to calculate specific loads)

⁷ Wherever possible this parameter should be reported

⁸ The year for which data are to be reported in 2008/2009 is 2007.

⁹ Wherever possible this parameter should be reported

¹⁰ The year for which data are to be reported in 2008/2009 is 2007.

3. Emulsion-PVC Plants (e-PVC) covered by the OSPAR Recommendations 99/1 and 2000/3

Please indicate number and capacity of plants: _____

Total capacity (tonnes e-PVC/year): _____

a. Emissions to air:

Substances	Specific load ^{11 a)} In reporting year ^{12*} g/tonne of e-PVC produced	Alternatively: Total load in reporting year ^{a)} kg/year (comparison with the base year) **	Alternatively: Concentration ^{a)} mg/m ³ ***
VCM (point sources)			
VCM (arising from PVC waste – all environmental routes)			

* Please indicate under “remarks” how specific loads were calculated.

** If reporting total loads, please add a baseline load for (2001) and please indicate associated actual production of VCM and report under “remarks” when installed production capacities have changed.

*** Please indicate the associated volumetric flow-rate and whether fugitive emissions are included.

a) In brackets: (Number of samples)

b. Discharges to water

Substances	Specific load ¹³ In reporting year ^{14*} g/tonne of PVC produced	Alternatively: Total load in reporting year kg/year (comparison with the base year) **	Alternatively: Concentration mg/l ***
VCM (producing only e-PVC) a), b)			
VCM (producing e-PVC and s-PVC at the same site) a), b)			

* Please indicate under “remarks” how specific loads were calculated.

** If reporting total loads, please add a baseline load for (2001) and please indicate associated actual production of VCM and report under “remarks” when installed production capacities have changed.

*** Please indicate the associated volumetric flow-rate.

a) Please state correlation when VCM data are based on AOX or EOX measurements.

b) After effluent stripper, before secondary treatment.

¹¹ Wherever possible this parameter should be reported

¹² The year for which data are to be reported in 2008/2009 is 2007.

¹³ Wherever possible this parameter should be reported

¹⁴ The year for which data are to be reported in 2008/2009 is 2007.

c. Remarks: (i.e. explanation if change in production capacity in the country appeared, method to calculate specific loads)
