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EXECUTIVE BODY FOR THE CONVENTION ON
LONG-RANGE TRANSBOUNDARY AIR POLLUTION

Working Group on Strategies
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Item 2 of the provisional agenda

DRAFT ANNEX ON LIMIT VALUES (LVs) FOR EMISSIONS FROM STATIONARY SOURCES */

I. SULPHUR

1. Limit value means the maximum quantity of a gaseous substance contained in the waste gases from an installation which is not to be exceeded. Unless otherwise specified, it shall be calculated in terms of mass of pollutant per volume of the waste gases (expressed as mg/m^3), assuming standard conditions for temparature and pressure for dry gas (volume at 273.15 K, 101.3 kPa). With regard to the oxygen content of the exhaust gas, the values given in the tables below for each source category shall apply. No dilution for the purpose of lowering concentrations of pollutants in waste gases is permitted. Start-up, shutdown, maintenance of equipment are excluded.

2. Emissions shall be monitored[1/] in all cases. Compliance with limit values shall be verified. The methods of verification can include continuous, discontinuous measurements, type approval, or any other technically sound method.

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*/ Proposal prepared by the group of technical experts during the twenty-ninth session of the Working Group on Strategies.

This document has not been formally edited.

3. Sampling and analysis of pollutants, as well as reference measurement methods to calibrate any measurement system, shall be carried out according to the standards laid down by the Comité Européen de Normalisation (CEN). If no CEN standards are given, the standards set by the International Organization for Standardization (ISO) shall apply. While awaiting the development of CEN or ISO standards, national standards shall apply.

4. Measurements of emissions [shall] [should] be carried out continuously when emissions exceed [1000] [1800] kg SO_x/day and/or [30] [60] kg/h [for new plants].

5. In the case of continuous measurements [for new plants], compliance with the emission standards is achieved [if [100]% of the [calculated 24-hour average] values do not exceed the limit value] and if no other value exceeds the limit value by 100%.

6. In the case of discontinuous measurements, as a minimum requirement, compliance with the emission standards is achieved if the mean value [based on an appropriate number of measurements under representative conditions] does not exceed the value of the emission standard [average value of one-hour measurements, appropriate number of hours of operation, as a rule 24 hours, at least three readings per check].

7. [Where one operator carries out several activities falling under the same subheading at the same installation or the same site, the capacities of such acitivites are added together.]

LIMIT VALUES FOR SO_x EMISSIONS [2/]

A. Boilers and process heaters with a rated thermal input exceeding 50 MW[b/]

	MW_{th}	Limit value(mg $SO_2(Nm^3)$[a/]	Alternative for domestic solid fuels removal efficiency
Solid and liquid fuels, new installations	50 - 100 100 - 300 > 300	850 850- 200[*/] (linear decrease) 200 [*/]	90% [**/] 92% [**/] 95% [**/]
Solid fuels, existing installations	50 - 100 100 - 300 300 -500 > 500	[1000][850][2000] {850-400][1000-700] [2000-1200] [400][700-400] [1200-400] 400	linear decrease for all ranges
Liquid fuels, existing installations	50-100 100-300 300-500 > 500	[850] [1700] [850-400] [850-625] [1700-1050] [400] [625-400] [1050-400] 400	linear decrease for all ranges
Gaseous fuels in general, new and existing installations		35	

Liquefied gas, new and existing installations		5	
Low calorific gases from new and existing gasification plants of refinery residues, coke oven gas, blast-furnace gas		new 400 existing [400][800]	
New and existing combustion plants in refineries (Average of all combustion installations)	> 50 (total refinery capacity)	[450] [1700]	

a/ O_2 reference content 6% for solid fuels, 3% for others.

b/ In particular, the limit values shall not apply to the following plants:

- Plants in which the products of combustion are used for direct heating, drying, or any other treatment of objects or materials, e.g. reheating furnaces, furnaces for heat treatment;
- Post-combustion plants, i.e. any technical apparatus designed to purify the waste gases by combustion which is not operated as an independent combustion plant;
- Facilities for the regeneration of catalytic cracking catalysts;
- Facilities for the conversion of hydrogen sulphide into sulphur;
- Reactors used in the chemical industry;
- Coke battery furnaces;
- Cowpers;
- Waste incinerators;
- Plants powered by diesel, petrol and gas engines or by gas turbines, irrespective of the fuel used.

*/ 400 with heavy fuel oil S <0.25%.

**/ If an installation reaches 300 mg/Nm^3 SO_2, it may be exempted from applying the removal efficiency.

B. Gas oil

Sulphur content (per cent) Diesel for on-road vehicles	0.35 since 2000 0.005 since 2005
Other types	0.2 since 2000 [0.05], 0.1 since 2005-2007

[C. The Claus Plants

8. For plants > 50 t S/day , sulphur recovery 99.5 % for new and existing plants.

D. The sintering plants

9. For new zinc and lead sintering plants 99 % of sulphur removal for poor gases. For new and existing titanium oxide sintering plants limit value of 7 kg SO2/ton.

E. The sulphuric acid plants

10. For new sulphuric acid plants limit value of 2 kg SO2/t of H2SO4.]

II. NITROGEN OXIDES

11. Limit value means the maximum quantity of a gaseous substance contained in the waste gases from an installation which is not to be exceeded. If not otherwise specified it shall be calculated in terms of mass of pollutant per volume of the waste gases (expressed as mg/m^3), assuming standard conditions for temperature and pressure for dry gas (volume at 273.15 K, 101.3 kPa). With regard to the oxygen content of the exhaust gas, the values given in the tables below for each source category shall apply. Any dilution for the purpose of lowering concentrations of pollutants in waste gases is not permitted. Limit values generally address NO together with NO_2, commonly named NO_x, expressed as NO_2. Start-up, shutdown, and maintenance of equipment are excluded.

12. Emissions shall be monitored[1/] in all cases. Compliance with limit values shall be verified. The methods of verification can include continuous, discontinuous measurements, type approval, or any other technically sound method.

13. Sampling and analysis of pollutants, as well as reference measurement methods to calibrate any measurement system, shall be carried out according to the standards laid down by the Comité Européen de Normalisation (CEN). If no CEN standards are given, the standards set by the International Organization for Standardization (ISO) shall apply. While awaiting the Development of CEN or ISO standards, national standards shall apply.

14. Measurements of emissions should be carried out continuously, when emissions exceed [1800 kg NO_x/day][30 kg NO_x/hr][60 kg No_x/hr][for new plants].

15. In the case of continuous measurements [for new plants], compliance with the emission standards is achieved if 100% of the calculated 24-hour average values do not exceed the limit value and if no hourly value exceeds the limit value by 100%.

16. In the case of discontinuous measurements, as a minimum requirement, compliance with the emission standards is achieved if the mean value [based on an appropriate number of measurements under representative conditions] does not exceed the values of the emission standard [average value of one-

hour measurements, appropriate number of hours of operation, as a rule 24 hours, at least three readings per check].

17. [Where one operator carries out several activities falling under the same subheading at the same installation or the same site, the capacities of such activities are added together.]

SPECIFIC EMISSION LIMIT VALUES FOR SELECTED MAJOR STATIONARY SOURCES[3/]

A. Boilers and process heaters with a rated thermal input exceeding 50 MW

18. Limit values for NO_x emissions released from boilers:

	Limit value (mg/Nm^3)[a/]
Solid fuels, new installations:	
- Boilers 50 - 100 MW_{th}	[300][400]
- Boilers 100 - 300 MW_{th}	[200][300]
- Boilers >300 MW_{th}	[200][300]
Solid fuels, existing installations:	
- Boilers 50 - 100 MW_{th}	[650][500]
- Boilers 100 - 300 MW_{th}	400
- Boilers >300 MW_{th}	[300][400]
Liquid fuels, new installations:	
- Boilers 50 - 100 MW_{th}	400
- Boilers 100 - 300 MW_{th}	[150][300]
- Boilers >300 MW_{th}	[150][200][300]
Liquid fuels, existing installations:	
- Boilers 50 - 100 MW_{th}	[400][450][500]
- Boilers 100 - 300 MW_{th}	[150][350][450]
- Boilers >300 MW_{th}	[150][250][400]
Gaseous fuels, new installations	
Boilers; fuel: natural gas	[70][150]
Boilers; unstable fuel, coke oven gas	[200][400]
- Boilers, fuel: all other gas	[100][200]
Gaseous fuels, existing installations:	
Fuel: natural gas:	
- Boilers 50 - 300 MW_{th}	[150][200]
- Boilers >300 MW_{th}	150
- Boilers; unstable fuel, coke oven gas	[600]
Fuel: all other gas:	
- Boilers 50 - 300 MW_{th}	[200][250]
- Boilers >300 MW_{th}	200

a/ These values do not apply to boilers running less than 500 hours a year. O_2 reference content 6% for solid fuels, 3% for others.

B. [On-shore] gas turbines with a rated thermal input exceeding 50 MW

19. Limit values for NO_x emissions released from gas turbines:

	Limit value (mg/Nm^3)[a/, b/]
- New installations natural gas	[50][75]
- New installations all other gaseous and liquid fuels	[100][120]

a/ These values do not apply to gas turbines running less than [500 hours a year][70 percent load] O_2 reference content 15%.

b/ Exception possible for high efficiency turbines (>35%)

[**C. Mineral oil refineries**

20. Limit values for NO_x emissions released from mineral oil refineries (steam and power generation are covered in para.7).

	Limit value (mg/Nm^3)
[New combustion installations (3% O_2)	
- Liquid fuels	250
- Gaseous fuels	150
Existing combustion installations (3% O_2)	
- Liquid fuels	350
- Gaseous fuels	250]
[Existing and new installations	
- Fluid catalytic cracker (FCC)	[250][500]]

D. Cement production

21. Limit values for NO_x emissions released from cement production:

	Limit value (mg/Nm^3)
New installations (10% O_2)	
Co-incineration	[300][800]
All others	[300][500]
Existing installations (10% O_2)	
Co-incineration	[1000][1200]
All others	[500][800]

E. Stationary engines with a rated thermal input exceeding 1 MW

22. Limit values for NO_x emissions released from stationary engines (as defined in table 1, category 3) are:

Table 4: NO_x limit values for new stationary engines

Capacity, technique, fuel specification	**Limit valuea a/ (mg/Nm^3)**
Spark ignition (= Otto) engines, 4-stroke	
- Lean burn engine	[250; 400]
- All other engines	[400; 500]
Compression ignition (= Diesel) engines	
- Fuel: natural gas (jet ignition engines)	[500]
- Fuel: heavy fuel oil	[600; 1,000; 2,000]
- Fuel: diesel oil	[500; 800]

a/ These values do not apply to engines running less than 500 hours a year. O_2 reference content 5%.

F. Production and processing of metals

23. Limit values for NO_x emissions released from primary iron and steel production (as defined in table 1, category 5) are:

Table 6. NO_x limit values for primary iron and steel production

Capacity, technique, fuel specification	Limit value (mg/Nm^3)
[Solid, liquid and gaseous fuels	
- Existing installations, reheating and heat treatment only, excluding coke oven gas (5% O_2)	[500; 1100]
- New installations, reheating and heat treatment only, excluding coke oven gas (5% O_2)	[200][300][500][950]
- Existing installations, sinter plants	[250; 400]
- New installations, sinter plants (O_2)]]	[100; 400]

G. Glass production

24. Limit values for NO_x emissions released from glass production (as defined in table 1, category 7) are:

Table 8. NO_x limit values for glass production

Capacity, technique, fuel specification	Limit value (mg/Nm^3)	Limit value (kg/Mg glass)
Solid, liquid and gaseous fuels (at 8% O_2), for tank furnaces (13% of O_2 for pot furnaces and day tanks) [oxycombustion] a/		
New installations b/		
- Regenerative furnaces, end-fired	[500; 800]	
- Regenerative furnaces, cross-fired	[500; 1,000]	
- Recuperative furnaces	[500]	
Existing installations		
- Regenerative furnaces, end-fired	[800; 1,000]	
- Regenerative furnaces, cross-fired	[800; 1,400]	
- Recuperative furnaces	[800]	
Electric furnaces/[oxycombustion]		[0.75; 1]

a/ Related to mass flow for comparison

b/ For the distinction between new and existing installations, see para. 2 (e)

25. If nitrate refining is required for reasons of product quality, and in the case of special glass, emissions shall not exceed more than twice the above values.

H. Nitric acid production

26. Limit values for NO_x emissions released from nitric acid production (as defined in table 1, category 8) are:

Table 9. NO_x limit values for nitric acid production

Capacity, technique, fuel specification	Limit value (mg/Nm^3)
All capacities	
- New installations	[250; 450]
- Existing installations	[450]
[The given limit value refers to an oxygen content of 3%.]	

III. VOLATILE ORGANIC COMPOUNDS

27. This draft annex covers the stationary sources of non-methane volatile organic compound (NMVOC) emissions listed in table 1. Installations or parts of installations for research, development and testing of new products and processes are not covered.

Table 1[a/]:

Source categories
1. Mineral oil refineries
2. Storage and distribution of [fossil fuels] [petrol]
3. Installations for the production of basic organic chemicals
4. Adhesive coating
5. Wood and plastic lamination
6. Coating processes (metal and plastic surfaces in: passenger cars, truck cabins, trucks, buses, wooden surfaces)
7. Coil coating
8. Dry-cleaning
9. Manufacturing of coatings, varnishes, inks and adhesives
10. Manufacturing of pharmaceutical products
11. Printing (flexography, heat set web offset, publication, rotogravure, rotary screen printing)
12. Conversion of natural or synthetic rubber
13. Surface cleaning
14. Vegetable oil extraction and fat and vegetable oil refining processes
15. Vehicle refinishing
16. Impregnation of wooden surfaces
17. Man-made mineral fibers
Definitions of the given categories
Category 1: All petroleum products process steps in mineral oil refineries are included in this category.
Category 2: Loading of trucks, railway wagons, barges and seagoing ships at depots and mineral oil refinery dispatch stations (excluding car refuelling at service stations covered by relevant documents on mobile sources).
Category 3: All processes for the production of organic basic chemicals are covered, including storage and handling.
Category 4: Adhesive coating comprises any process in which an adhesive is applied to a surface, with the exception of adhesive coating and laminating associated with printing processes and wood and plastic lamination.
Category 5: This category comprises any process to adhere together wood and/or plastic to produce laminated products.

Source categories
a/ Threshold values are given in the sector-specific tables below. They generally refer to solvent consumption or emission mass flow. Where one operator carries out several activities falling under the same subheading at the same installation of the same site. If no threshold value is indicated, the given limit value applies to all repective installations.
Category 6: This category covers any process in which a single or multiple application of a continuous film of coating is laid onto: (a) New cars, defined as vehicles of category M1, and of category N1 inso far as they are coated at the same installation as M1 vehicles; (b) Truck cabins, defined as the housing for the driver, and all integrated housing for the technical equipment, of category N2 and N3 vehicles.; (c) Vans and trucks defined as category N1, N2, and N3 vehicles , but excluding truck cabins; (d) Buses, defined as category M2 and M3 vehicles; (e) Trailers, defined as category 0 vehicles; (f) Other metallic and plastic surfaces including airplanes, ships, trains, etc., wooden surfaces, textile, fabric, film and paper surfaces; This category does not include the coating of substrates with metals by electrophoretic and chemical spraying techniques. If the coating process includes a step in which the same article is printed, that printing step is considered part of the coating process. However, printing processes operated as a separate activity are not included. M1: vehicles used for the carriage of passengers and comprising not more than eight seats in addition to the driver's seat M2: vehicles used for the carriage of passengers and comprising more than eight seats in addition to the driver's seat, and having a maximum mass not exceeding 5 Mg. M3: vehicles used for the carriage of passengers and comprising more than eight seats in addition to the driver's seat, and having a maximum mass exceeding 5 Mg. N1: vehicles used for the carriage of goods and having a maximum mass not exceeding 3.5 Mg. N2: vehicles used for the carriage of goods and having a maximum mass exceeding 3.5 Mg but not exceeding 12 Mg. N3: vehicles used for the carriage of goods and having a maximum mass exceeding 12 Mg. O: trailers
Category 7: Coil coating comprises any processes where coiled steel, stainless steel, coated steel, copper alloys or aluminium strip is coated with either a film forming or laminate coating in a continuous process.
Category 8: Dry-cleaning represents any industrial or commercial process using VOCs in an installation to clean garments, furnishings and similar consumer goods with the exception of the manual removal of stains and spots in the textile and clothing industry.
Category 9: This category includes the manufacture of coating preparations, varnishes, inks and adhesives, and of intermediates as far as they are produced in the same installation by mixing pigments, resins, and adhesive materials with organic solvents or other carriers. This category also includes dispersion, predispersion, realization of a certain viscosity or colour and packing the final products in containers.

Source categories
Category 10: This category covers chemical synthesis, fermentation, extraction, formulation, and finishing of pharmaceutical products and, where carried out at the same site, the manufacture of intermediate products.
Category 11: Printing covers any process of text and/or images in which, with the use of an image carrier, ink is transferred onto a surface. It includes related varnishing, coating and laminating techniques. Here, only the following subprocesses are considered: (a) Flexography: a printing process using an image carrier of rubber or elastic photopolymers on which the printing inks are above the non-printing areas, using liquid inks that dry through evaporation; (b) Heat set web offset: a web-fed printing process using an image carrier in which the printing and non-printing areas are in the same plane, where web-fed means that the material to be printed is fed to the machine from a reel as distinct from separate sheets. The non-printing area is treated to attract water and thus reject ink. The printing area is treated to receive and transmit ink to the surface to be printed. Evaporation takes place in an oven where hot air is used to heat the printed material; c) Publication rotogravure: rotogravure used for printing paper for magazines, brochures, catalogues or similar products, using toluene-based inks; (d) Rotogravure: a printing process using a cylindrical image carrier in which the printing area is below the non-printing area, using liquid inks that dry through evaporation. The recesses are filled with ink and the surplus is cleaned off the non-printing area before the surface to be printed contacts the cylinder and lifts the ink from the recesses; (e) Rotary screen printing: a web-fed printing process in which the ink is passed onto the surface to be printed by forcing it through a porous image carrier, in which the printing area is open and the non-printing area is sealed off, using liquid inks that dry only through evaporation. Web-fed means that the material to be printed is fed to the machine from a reel as distinct from separate sheets; f) Laminating associated to a printing process: the adhering of two or more flexible materials to produce laminates; g) Varnishing: a process by which a varnish or an adhesive coating for the purpose of later sealing the packaging material is applied to a flexible material.
Category 12: Conversion of natural or synthetic rubber covers any process of mixing, crushing, blending, calendering, extruding and vulcanization of natural or synthetic rubber and additionally processes for the processing of natural or synthetic rubber to derive an end product.
Category 13: Surface cleaning comprises any process except dry-cleaning using organic solvents to remove contamination from the surface of material including degreasing. A cleaning process consisting of more than one step before or after any other processing step shall be considered as one surface cleaning process. This process refers to the cleaning of the surface of products and not to the cleaning of process equipment.
Category 14: Extraction of vegetable oil and animal fat and refining of vegetable oil comprises the extraction of vegetable oil from seeds and other vegetable matter, the processing of dry residues to produce animal feed, the purification of fats and vegetable oils derived from seeds, vegetable matter and/or animal matter.

Source categories
Category 15: Vehicle refinishing activities comprise all coating and surface cleaning processes of a road vehicle, or a part of it, carried out as part of vehicle repair, conservation or decoration outside of manufacturing installations, and the original coating of vehicles with refinishing-type materials where this is carried out away from the original manufacturing line.
Category 16: Impregnation of wooden surfaces covers any process impregnating the timber with preservative.
Category 17: Production of man-made mineral fibres (MMMF) from silicate melts and the production of mats, felts, sheets, mouldings, fibre belts, yarns and fleeces from these fibres.

[Besides the source categories listed in table 1, other categories are known in different countries. The importance of these other categories may differ from country to country. Furthermore, new processes might be introduced in the future.]

28. Further definitions for this draft annex are:

(a) Emission means any discharge of substances or preparations from an installation or process into the environment;

(b) Standard conditions means a temperature of 273.15 K and a pressure of 101.3 kPa;

(c) NMVOCs comprise all organic compounds except methane which at 293.15 K show a vapour pressure of at least 0.01 kPa or which show a comparable volatility under the given application conditions;

(d) Waste gas means the final gaseous discharge containing NMVOCs or other pollutants from a stack or from emission abatement equipment into air. The volumetric flow rates shall be expressed in m^3/h at standard conditions;

(e) Fugitive emission means any emission, not in waste gases, of VOC into air, soil and water as well as, unless otherwise stated, solvents contained in any product. It includes uncaptured emissions released to the outside environment via windows, doors, vents and similar openings. If fugitive limit values are mentioned below, these are calculated based on a solvent management plan (see appendix 1);

(f) Total emissions means the sum of fugitive emissions and emissions in waste gases;

(g) Input means the quantity of organic solvents and their quantity in preparations used when carrying out a process, including the solvents recycled inside and outside the installation, and which are counted every time they are used to carry out the activity;

(h) Limit value means the maximum quantity of a gaseous substance contained in the waste gases from an installation which is not to be exceeded under normal operating conditions. Unless otherwise specified, it shall be calculated in terms of mass of pollutant per volume of the waste gases (expressed as mg/m^3), assuming standard conditions for temperature and

pressure for dry gas. For solvent-using installations, limit values are given as mass unit per characteristic unit of the respective activity. Gas volumes that are added to the waste gas for cooling or dilution purposes shall not be considered when determining the mass concentration of the pollutant in the waste gas. Limit values generally address all volatile organic compounds except methane, commonly named NMVOC (no further distinction is made, e.g. in terms of reactivity or toxicity);

[(i) Fugitive limit value means a quantity of NMVOC emitted in the form of fugitive emissions which is not to be exceeded;]

(j) Normal operation means all periods of operation except start-up and shutdown operations and maintenance of equipment;

(k) Substances harmful to human health are subdivided into two categories:

- Halogenated VOC which are assigned the risk phrase: possible risk of irreversible effects;
- Hazardous substances classified as carcinogens, mutagens or toxic to reproduction and which are assigned the following risk phrases: may cause cancer/may cause heritable genetic damage/may cause cancer by inhalation/may impair fertility/may cause harm to the unborn child;

(l) The purpose of a reduction scheme is to allow the operator the possibility to achieve by other means emission reductions equivalent to those achieved if the limit values were to be applied. To that end, the operator may use any reduction scheme, specially designed for his installation, provided that in the end an equivalent emission reduction is achieved (see appendix).

(m) A substantial change to an installation means a change in the nominal capacity leading to an increase in emissions of more than 10 % for major sorce categories. In the case this can be considered as a new installation.

29. Requirements:

(a) Emissions shall be monitored[1/] in all cases. Compliance with limit values shall be verified in all cases. The methods of verification could include continuous, discontinuous measurements, type approval, or any other technically sound method. Furthermore, they shall be economically viable;

(b) The concentrations of air pollutants in gas-carrying ducts have to be measured in a representative way. Sampling and analysis of all pollutants, as well as reference measurement methods to calibrate any measurement system, shall be carried out according to the standards laid down by the Comité Européen de Normalisation (CEN). If no CEN standards are given, the standards set by the International Organisation for Standardization (ISO) shall apply. While awaiting the development of CEN or ISO standards, national standards shall apply;

(c) If measurements of emissions are required, these should be carried out continuously if emissions exceed 10 kg of total organic carbon (TOC)/h in

the exhaust duct downstream an emission reduction installation. For all other installations concerned, discontinuous measurement is required as a minimum. For the approval of compliance, own approaches may be used provided that they result in equal stringency;

(d) In the case of continuous measurements, as a minimum requirement, compliance with the emission standards is achieved if the daily mean does not exceed the limit value under normal operating conditions and no hourly average exceeds 150% of the limit values. For the approval of compliance, own approaches may be used provided that they result in equal stringency;

(e) In the case of discontinuous measurements, as a minimum requirement compliance with the emission standards is achieved if the mean value of all readings does not exceed the limit value and no hourly mean exceeds 150% of the limit value. For the approval of compliance, own approaches may be used provided that they result in equal stringency;

(f) All appropriate precautions shall be taken to minimize emissions during start-up and shutdown, and in case of deviations from normal operation;

(g) Measurements are not required in the case where end-of-pipe abatement equipment is not needed to comply with the limit values below and where it can be shown that limit values are not exceeded.

30. [In general, the following limits should be applied for waste gases, unless stated otherwise below:

- 50 mg C/m^3 for incineration;

- 150 mg C/m^3 for other abatement techniques;]

- 20 mg substance/m^3 for discharges of halogenated volatile organic compounds (which are assigned the risk phrase: possible risk of irreversible effects), where the mass flow of the sum of the considered compounds is greater than or equal to 100 g/h;

- [2] mg substance/m^3 (values to be defined case by case depending on substances) for discharges of volatile organic compounds (which are assigned the following risk phrases: may cause cancer/may cause heritable genetic damage/may cause cancer by inhalation/may impair fertility/may cause harm to the unborn child), where the mass flow of the sum of the considered compounds is greater than or equal to 10 g/h.]

31. For the source categories 4 to 16 (as given in table 1), the following provisions shall be applied:

(a) Instead of applying the limit values for existing installations given in paragraphs 9 to 21, the operators of the respective installations may be allowed to use a reduction scheme (see appendix 2). The purpose of a reduction scheme is to give the operator the possibility to achieve by other means emission reductions equivalent to those achieved if given limit values were to be applied;

[(b) For fugitive emissions, the fugitive limit values given in paragraphs 9 to 21 shall be applied as a limit value. However, in the case where it is demonstrated to the satisfaction of the competent authority that for an individual installation this value is not technically and economically feasible, the competent authority can make an exemption for that installation provided that significant risks to human health or the environment are not expected. For each derogation, the operator must demonstrate to the satisfaction of the competent authority that the best available technique is used;]

[(c) Existing installations that operate existing abatement equipment and comply with the following limit value

- 50 mg C/m³ in the case of incineration
- 150 mg C/m³ in the cases of any other abatement equipment

are exempted from the limit values given in paragraphs 9 to 21 until [1 January 2013], provided the total emissions of the whole installations do not exceed those that would have resulted if all the requirements of paragraphs 9 to 21 were met.]

(d) With the exception of the sectors 8 to 13 as given in Table 1, the Parties may define and implement national plans for reducing emissions from the existing plants of these categories. These plans shall result in a reduction of the annual emissions of non-halogenated VOCs by at least the same amount and within the same time frame as would have been achieved by applying the emissin limits.

SPECIFIC EMISSION STANDARDS FOR SELECTED MAJOR STATIONARY SOURCES

[A. Mineral oil refineries

32. Limit values for NMVOCs released from mineral oil refineries (as defined in table 1, category 1) are:

Table 2: NMVOC limit values for mineral oil refineries (except fugitive emissions)

Capacity, technique, further specification	Threshold value	Limit value
Existing and new installations	[> 0.1 kg/h emission]	[20][50] mg NMVOC/Nm³
- Petroleum coke production		[50] [150] mg NMVOC/ Nm³
- Incineration facilities	[> 3 kg/h emission]	[50][150][300] mg NMVOC/ Nm³]
- All other	[> 3 kg/h emission]	

B. Storage and distribution of [fossil fuels][petrol]

33. For the storage and distribution of [fossil fuels][petrol] (as defined in table 1, category 2), limit values for NMVOCs are:

Table 3: NMVOC limit values within distribution of petrol (excluding car refuelling at service stations covered by EB.AIR/WG.6/1998/13/Rev.1)

Capacity, technique, further specification	Threshold values	Limit value
- Existing and new installations: transport and depots - New installations: mineral oil refinery dispatch station during loading of trucks and railway wagons - New installations: mineral oil refinery dispatch station during loading of ships - Existing installations: mineral oil refinery dispatch station	> 3 kg/h emission	[35 g VOC/Nm^3]; [150 mg NMVOC/Nm^3] [35 g C/Nm3] [hourly mean: 10 g total NMVOC/Nm^3]; [150 mg NMVOC/Nm^3] [hourly mean: 20 g total NMVOC/Nm^3]; [150 mg NMVOC/Nm^3] [hourly mean: 35 g total NMVOC/Nm^3]; [150 mg NMVOC/Nm^3]

[C. <u>Organic chemical industries</u>

34. [Limit values for NMVOCs released from organic chemical industries (as defined in table 1, category 3) are:

Table 4: NMVOC limit values for organic chemical industries

Capacity, technique, further specification	Threshold value	Limit value
Existing and new installations	[> 3 kg/h emission] [> 2 kg/h emission]	[2][20 for halogenated compounds];[50 for incineration]; [150 for others] mg NMVOC/Nm^3]

D. <u>Adhesive coating</u>

35. limit values for NMVOCs released from adhesive coating (as defined in table 1, category 4) are:

Table 5: NMVOC limit values for adhesive coating

Capacity, technique, further specification	Threshold value for solvent consumption (Mg/a)	Limit value	Limit value for fugitive emissions (% of solvent input)
Footwear manufacture; new and existing installations	>5	25 g solvent per pair	
Other adhesive coating, except footwear; new and existing installations	5 - 15	50[a/] mg C/Nm^3	25
	> 15	50[a/] mg C/Nm^3	20
[a/] If techniques are used which allow reuse of recovered solvent, the limit value shall be 150 mg C/Nm^3			

E. Wood and plastic lamination

36. Limit values for NMVOC released from wood and plastic lamination (as defined in table 1, category 5) are:

Table 6: NMVOC limit values for wood and plastic lamination

Capacity, technique, further specification	Threshold value for solvent consumption (Mg/a)	Limit value
Wood and plastic laminating; new and existing installations	> 5	30 g NMVOC/m^2[a/]
[a/] Limit value for total emissions (including fugitive).		

F. Coating processes (metal and plastic surfaces: passenger cars, truck cabins, trucks, buses; wooden surfaces)

37. Limit for NMVOCs released from coating processes (as defined in table 1, category 6) are given in tables 7 and 8:

Table 7: NMVOC limit values for coating processes in the car industry

Capacity, technique, further specification	Threshold value for solvent consumption (Mg/a)[b/]	Limit value[a/]
New installations, car coating (M1, M2)	> 15 (and > 5,000 coated items/a)	45 g NMVOC/m^2 or 1.3 kg/item & 33 g NMVOC/m^2
Existing installations, car coating (M1, M2)	>15 (and > 5,000 coated items/a)	60 g NMVOC /m^2 or 1.9 kg/item & 41 g NMVOC/m^2
New and existing installations, car coating (M1, M2)	>15 (≤ 5,000 coated items/a mono-coque or >3,500 items/a chassis built)	90 g NMVOC/m^2 or 1.5 kg/item & 70 g NMVOC/m^2

Capacity, technique, further specification	Threshold value for solvent consumption (Mg/a)[b/]	Limit value[a/]
New installations, coating of new truck cabins (N1, N2, N3)	> 15 (≤ 5,000 coated items/a)	65 g NMVOC/m^2
New installations, coating of new truck cabins (N1, N2, N3)	> 15 (> 5,000 coated items/a)	55 g NMVOC/m^2
Existing installations, coating of new truck cabins (N1, N2, N3)	> 15 (≤ 5,000 coated items/a)	85 g NMVOC/m^2
Existing installations, coating of new truck cabins (N1, N2, N3)	> 15 (> 5,000 coated items/a)	75 g NMVOC/m^2
New installations, coating of new trucks and vans (without cabin) (N1, N2, N3, 0)	> 15 (≤ 2,500 coated items/a)	90 g NMVOC/m^2
New installations, coating of new trucks and vans (without cabin) (N1, N2, N3, 0)	> 15 (> 2,500 coated items/a)	70 g NMVOC/m^2
Existing installations, coating of new trucks and vans (without cabin) (N1, N2, N3, 0)	> 15 (≤ 2,500 coated items/a)	120 g NMVOC/m^2
Existing installations, coating of new trucks and vans (without cabin) (N1, N2, N3, 0)	> 15 (> 2,500 coated items/a)	90 g NMVOC/m^2
New installations, coating of new buses (M3)	> 15 (≤ 2,000 coated items/a)	210 g NMVOC/m^2
New installations, coating of new buses (M3)	> 15 (> 2,000 coated items/a)	150 g NMVOC/m^2
Existing installations, coating of new buses (M3)	> 15 (≤ 2,000 coated items/a)	290 g NMVOC/m^2
Existing installations, coating of new buses (M3)	> 15 (> 2,000 coated items/a)	225 g NMVOC/m^2

a/ Limit values for total emissions. The total limit values are expressed in terms of mass of solvent (g) emitted in relations to the surface area of product (m^2). The surface area of the product is defined as the surface area calculated from the total electrophoretic coating area and the surface area of any parts that might be added in successive phrases of the coating process which are coated with the same coatings. The surface of the electrophoretic coating area is calculated using the formula: (2 x total weight of product shell): (average thickness of metal sheet x density of metal sheet).

b/ For a solvent consumption ≤ 15 Mg/a (coating of cars), paragraph 20 on car refinishing applies

Table 8: NMVOC limit values for coating processes in various industrial sectors

Capacity, technique, further specification	Threshold value for solvent consumption (Mg/a)	Limit value	Limit value for fugitive emissions (% solvent input)
New and existing installations: other coating, incl. metal, plastics, textile[a/], fabric, foil and paper (excl. web screen printing for textiles, cf. printing)	5 - 15	100[b/] mg C/Nm³	25
	> 15	50/75[c/d/] mg C/Nm³	20
New and existing installations: wood coating	15 - 25	100[b/] mg C/Nm³	25
	> 25	50/75[c/] mg C/Nm³	20

[a/] Rotary screen printing of textiles is considered under printing.
[b/] Limit value applies to coating applications and drying processes operated under contained conditions.
[c/] If contained coating conditions are not possible (boat construction, aircraft coating, etc.) Installations may be derogated from these values. The reduction scheme of item 5a) is then to be used, unless it is demonstrated to the satisfaction of the competent authority that this option is not technically and economically feasible. In this case, the operator must demonstrate to the satisfaction of the competent authority that the best available technique is used.
_d/The first value applies to drying processes, the second to coating application processes.
[e/] If for textile coating, techniques are used which allow reuse of recovered solvents, the limit value shall be 150 mg C/Nm³ together for drying and coating.

G. Coil coating

38. Limit values for NMVOCs released from coil coating (as defined in table 1, category 7) are:

Table 9: NMVOC limit values for coil coating

Capacity, technique, further specification	Threshold value for solvent consumption (Mg/a)	Limit value (mg C/Nm³)	Limit value for fugitive emissions (% of solvent input)
New installations	> 25	50[a/]	5
Existing installations	> 25	50[a/]	10

[a/] If techniques are used which allow reuse of recovered solvent, the limit value shall be 150 mg C/Nm³.

VIII. Dry-cleaning

39. limit values for NMVOCs released from dry-cleaning (as defined in table 1, category 8) are:

Table 10: NMVOC limit values for dry-cleaning

Capacity, technique, further specification	Threshold value for solvent consumption (Mg/a)	Limit value
New and existing installations		20 g NM VOC/kg[a/]
[a/] Limit value for total emissions calculated as mass of emitted solvent per mass of cleaned and dried product.		

I. Manufacturing of coatings, varnishes, inks and adhesives

40. Limit values for NMVOCs released from manufacturing of coatings, varnishes, inks and adhesives (as defined in table 1, category 9) are:

Table 11: NMVOC limit values for manufacturing of coatings, varnishes, inks and adhesives

Capacity, technique, further specification	Threshold value for solvent consumption (Mg/a)	limit value (mg C/Nm³)	Limit value for fugitive emissions (% of solvent input)
New and existing installations	100 - 1,000	150 [a/]	5 [a/] [c/]
	> 1,000	150 [b/]	3 [b/] [c/]
[a/] A total limit value of 5% of solvent input may be applied instead of using the waste gas concentration limit and the limit value for fugitive emissions. [b/] A total limit value of 3% of solvent input may be applied instead of using the waste gas concentration limit and the limit value for fugitive emissions. [c/] The fugitive limit value does not include solvents sold as part of a preparation in a sealed container.			

J. Manufacturing of pharmaceutical products

41. Limit values for NMVOCs released from manufacturing of pharmaceutical products (as defined in table 1, category 10), are:

Table 12: NMVOC limit values for manufacturing of pharmaceutical products

Capacity, technique, further specification	Threshold value for solvent consumption (Mg/a)	Limit value (mg C/Nm³)	Limit value for fugitive emissions (% of solvent input)
New installations	> 50	20 [a/] [b/]	5 [b/] [d/]
Existing installations	> 50	20 [a/] [c/]	15 [c/] [d/]
[a/] If techniques are used which allow reuse of recovered solvents, the limit value shall be [150] mg C/Nm³. [b/] A total limit value of 5% of solvent input may be applied instead of using the waste gas concentration limit and the limit value for fugitive emissions. [c/] A total limit value of [15]% of solvent input may be applied instead of using the waste gas concentration limit and the limit value for fugitive emissions. [d/] The fugitive limit value does not include solvents sold as part of a coatings preparation in a sealed container.			

K. Printing (flexography, heat set web offset, publication

42. Limit values for NMVOC emissions released from printing processes (as defined in table 1, category 11) are:

Table 13: NMVOC limit values for printing processes

Capacity, technique, further specification	Threshold value for solvent consumption (Mg/a)	Limit value (mg C/Nm³)	Limit value for fugitive emissions (% of solvent input)
New and existing installations: heat set web offset	15 - 25	100	30[a/]
	> 25	20	30[a/]
New installations: publication rotogravure	> 25	75	10
Existing installations: publication rotogravure	> 25	75	15
New and existing installations: other rotogravure, flexography, rotary screen printing, lamination and varnishing units	15 - 25	100	25
	> 25	100	20
New and existing installations: rotary screen printing on textiles, paperboard	> 30	100	20

[a/] Solvent residue in finished products is not to be considered as part of fugitive emissions.

L. Conversion of natural or synthetic rubber

43. Limit values for NMVOCs released from conversion of natural or synthetic rubber (as defined in table 1, category 12) are:

Table 14: NMVOC limit values for conversion of natural or synthetic rubber

Capacity, technique, further specification	Threshold value for solvent consumption (Mg/a)	Limit value (mg C/Nm³)	Limit value for fugitive emissions (% of solvent input)
New and existing installations: conversion of natural or synthetic rubber	> 15	20 [a/] [b/]	25 [a/] [c/]

[a/] A total limit value of 25% of solvent input may be applied instead of using the waste gas concentration limit and the limit value for fugitive emissions.

[b/] If techniques are used which allow reuse of recovered solvent, the limit value shall be 150 mg C/Nm³.

[c/] The fugitive limit does not include solvents sold as part of a preparation in a sealed container.

M. Surface cleaning

44. limit values for NMVOCs released from surface cleaning (as defined in table 1, category 13) are:

Table 15: NMVOC limit values for surface cleaning

Capacity, technique, further specification	Threshold value for solvent consumption (Mg/a)	Limit value	Limit value for fugitive emissions (% of solvent input)
New and existing installations: surface cleaning using substances mentioned in paragraph 2 (k)	1 - 5	20 mg compound/Nm^3	15
	> 5	20 mg compound/Nm^3	10
New and existing installations: other surface cleaning	2 - 10	75 mg C/Nm^3[a/]	20[a/]
	> 10	75 mg C/Nm^3[a/]	15[a/]

[a/] Installations which demonstrate to the competent authority that the average organic solvent content of all cleaning material used does not exceed 30 wt.-% are exempt from applying of these values.

N. Vegetable oil extraction and fat and vegetable oil refining processes

45. Limit values for NMVOCs released from extraction of vegetable and animal fat and refining of vegetable oil (as defined in table 1, category 14) are:

Table 16: NMVOC limit values for extraction of vegetable and animal fat and refining of vegetable oil

Capacity, technique, further specification	Threshold value for solvent consumption (Mg/a)	Limit value (mg C/Nm^3)	Total limit value (kg/Mg)	
New and existing installations	> 10		Animal fat:	1.5
			Castor:	3.0
			Rape seed:	1.0
			Sunflower seed:	1.0
			Soya beans (normal crush):	0.8
			Soya beans (white flakes):	1.2
			Other seeds and vegetable material:	3.0[a/]
			All fractionation processes, excl. degumming[b/]:	1.5
			Degumming:	4.0

[a/] Limit values for total emissions of installations treating single batches of seeds or other vegetable material, shall be set on a case-by-case basis by competent authorities according to the best available technologies.

[b/] The removal of gum from the oil.

O. Vehicle refinishing

46. Limit values for NMVOCs released from vehicle refinishing (as defined in table 1, category 15) are:

Table 17: NMVOC limit values for vehicle refinishing

Capacity, technique, further specification	Threshold value for solvent consumption (Mg/a)	Limit value (mg C/Nm³)	Limit value for fugitive emissions (% of solvent input)
New and existing installations	> 0.5	50[a/]	25

[a/] Compliance with limit values to be proven by 15 min. average measurements.

P. Impregnation of wooden surfaces

47. Limit values for NMVOC released from the impregnation of wooden surfaces (as defined in table 1, category 16) are:

Table 18: NMVOC limit values for impregnation of wooden surfaces

Capacity, technique, further specification	Threshold value for solvent consumption (Mg/a)	Limit value (mg C/Nm³)	Limit value for fugitive emissions (% of solvent input)
New and existing installations	> 25	100 [a/] [b/]	45 [b/]

[a/] Does not apply to impregnation with creosote.
[b/] A total limit value of 11 kg solvent/m³ of wood treated may be applied instead of using the waste gas concentration limit and the limit value of fugitive emissions.

Q. Man-made mineral fibers

48. Limit values for NMVOCs released from man-made mineral fibers (as defined in table 1, category 17) are:

Table 19: NMVOC limit values for man-made mineral fibers

Capacity, technique, further specification	**Threshold value**	**Limit value**	**Limit value for fugitive emissions (% of solvent input)**
New and existing installations, target value	> 0.1 kg/h emission	[20][30] mg NMVOC/Nm^3	
The limit value is given as a target value and requires specific approval by the competent authorities for each single installation.			

Endnotes

1/ Monitoring is to be understood as an overall entity, comprising measuring of emissions, mass balancing, etc. It can be carried out continuously or discontinuously.

[2/ A substantial change to an installation means a change in the nominal capacity leading to an increase in emissions of more than 10 % for major source categories. In the case this can be considered as a new installation.]

3/ A substantial change to an installation means a change in the nominal capacity leading to an increase in emissions of more than 10 % for major source categories. In the case this can be considered as a new installation.

Appendix 1

SOLVENT MANAGEMENT PLAN

1. Introduction

This appendix to the annex on limit values (LVs) for emissions of VOCs from stationary sources provides guidance on carrying out a solvent management plan. It identifies the principles to be applied (item 2), provides a framework for the mass balance (item 3) and provides an indication of the requirements for verification of compliance (item 4).

2. Principles

The solvent management plan serves the following purposes;

(a) Verification of compliance as specified in the annex;

(b) Identification of future reduction options.

3. Definitions

The following definitions provide a framework for the mass balance exercise.

Inputs of organic solvents:

I1. The quantity of organic solvents or their quantity in preparations purchased which are used as input into the process in the time frame over which the mass balance is being calculated.

I2. The quantity of organic solvents or their quantity in preparations recovered and re-used as solvent input into the process. (The recycled solvent is counted every time it is used to carry out the activity.)

Outputs of organic solvents:

O1. Emissions in waste gases.

O2. Organic solvents lost in water, if appropriate taking into account waste water treatment when calculating O5.

O3. The quantity of organic solvents which remains as contamination or residue in products output from the process.

O4. Uncaptured emissions of organic solvents to air. This includes the general ventilation of rooms, where air is released to the outside environment via windows, doors, vents and similar openings.

O5. Organic solvents and/or organic compounds lost due to chemical or physical reactions (including, for example, those which are destroyed, e.g. by incineration or other waste gas or waste water treatments, or captured, e.g. by adsorption as long as they are not counted under O6, O7, or O8).

O6. Organic solvents contained in collected waste.

O7. Organic solvents, or organic solvents contained in preparations, which are sold or are intended to be sold as a commercially valuable product.

O8. Organic solvents contained in preparations recovered for reuse but not as input into the process, as long as not counted under O7.

O9. Organic solvents released in other ways.

4. Guidance on use of solvent management plan for verification of compliance

The use of the solvent management plan will be determined by the particular requirement which is to be verified, as follows:

(i) Verification of compliance with the reduction option mentioned in paragraph 5 (a) of the annex, with a total limit value expressed in solvent emissions per unit product, or as otherwise stated in the annex.

(a) For all activities using the reduction option mentioned in paragraph 5 (a) of the annex, the solvent management plan should be done annually to determine consumption. Consumption can be calculated according to the following equation:

$$C = I1 - O8$$

A parallel exercise should also be undertaken to determine solids used in coating in order to derive the annual reference emission and the target emission each year.

(b) For assessing compliance with a total limit value expressed in solvent emissions per unit product or as otherwise stated in the annex, the solvent management plan should be done annually to determine emissions. Emissions can be calculated according to the following equation:

$$E = F + O1$$

Where F is the fugitive emission as defined in section (ii) (a) below. The emission figure should then be divided by the relevant product parameter.

(ii) Determination of fugitive emissions for comparison with fugitive emission values in the annex:

(a) Methodology

The fugitive emission can be calculated according to the following equation:

$$F = I1 - O1 - O5 - O6 - O7 - O8$$

or

$$F = O2 + O3 + O4 + O9$$

This quantity can be determined by direct measurement of the quantities. Alternatively, an equivalent calculation can be made by other means, for instance by using the capture efficiency of the process.

The fugitive emission value is expressed as a proportion of the input, which can be calculated according to the following equation:

$$I = I1 + I2$$

(b) Frequency

Determination of fugitive emissions can be done by a short but comprehensive set of measurements. It need not to be done again until the equipment is modified.

Appendix 2

Reduction Scheme

1. Principles

The purpose of the reduction scheme is to allow the operator the possibility to achieve by other means emission reductions, equivalent to those achieved if the limit values were to be applied. To that end the operator may use any reduction scheme, specially designed for his installation, provided that in the end an equivalent emission reduction is achieved. Parties shall report about the progress in achieving the same emission reduction, including experience from the application of the reduction scheme.

2. Practice

In the case of applying coatings, varnishes, adhesives or inks, the following scheme can be used. Where the following method is inappropriate the competent authority may allow an operator to apply any alternative exemption scheme which it is satisfied fulfils the principles outlined here. The design of the scheme takes into account the following facts:

(i) where substitutes containing little or no solvent are still under development, a time extension must be given to the operator to implement his emission reduction plans;

(ii) the reference point for emission reductions should correspond as closely as possible to the emissions which would have resulted had no reduction action been taken.

The following scheme shall operate for installations for which a constant solid content of product can be assumed and used too define the reference point for emission reductions:

(i) the operator shall forward an emission reduction plan which includes in particular decreases in the average solvent content of the total input and/or increased efficiency in the use of solids to achieve a reduction of the total emissions from the installation to a given percentage of annual reference emissions, termed the target emission. This must be done on the following time frame:

Time period		Maximum allowed total annual emissions
New installations	Existing installations	
By 31.10.2001	By 31.10.2005	Target emission x 1.5
By 31.10.2004	By 31.10.2007	Target emission

(ii) The annual reference emission is calculated as follows:

(a) The total mass of solids in the quantity of coating and/or ink, varnish or adhesive consumed in a year is determined. Solids are all materials in coatings, inks, varnishes and adhesives that become solid once the water or the volatile organic compounds are evaporated.

(b) The annual reference emissions are calculated by multiplying the mass

determined in (a) by the appropriate factor listed in the table below. Competent authorities may adjust these factors for individual installations to reflect documented increased efficiency in the use of solids.

Activity	Multiplication factor for use in Item (ii) (b)
Rotogravure printing; flexography printing; laminating a part of a printing activity; printing; varnishing a part of a printing activity; wood coating; coating of textiles, fabric film or paper; adhesive coating	4
Coil coating; vehicle refinishing	3
Food contact coating; aerospace coating	2.33
Other coatings and rotary screen printing	1.5

(c) The target emission is equal to the annual reference emission multiplied by a percentage equal to:

- (the fugitive emission value + 15), for installations in the sectors:
P vehicle coating (solvent consumption < 15 Mg/a) and vehicle refinishing;
P metal, plastic, textile, fabric, film and paper coating (solvent consumption between 5 and 15 Mg/a);
P coating of wooden surfaces (solvent consumption between 15 and 25 Mg/a).
- (the fugitive emission value + 5) for all other installations.

(d) Compliance is achieved if the actual solvent emission determined from the solvent management plan is less than or equal to the target emission.