II

*(Preparatory Acts)*

# COMMISSION

## Proposal for a Council Directive on the incineration of hazardous waste

(92/C 130/01)

*COM(92) 9 final — SYN 406*

*(Submitted by the Commission on 23 March 1992)*

THE COUNCIL OF THE EUROPEAN COMMUNITIES,

Having regard to the Treaty establishing the European Economic Community, and in particular Article 100a thereof,

Having regard to the proposal of the Commission,

In cooperation with the European Parliament,

Having regard to the opinion of the Economic and Social Committee,

Whereas the 1973 (1), 1977 (2), 1983 (3) and 1987 (4) European Community Action Programmes on the Environment stress the importance of the prevention and reduction of air pollution;

Whereas in their resolution concerning the action programme on the environment 1987 to 1992, the Council and the Representatives of the Governments of the Member States meeting within the Council, emphasize the importance for Community action to concentrate, *inter alia*, on implementation of appropriate standards in order to ensure a high level of public health and environmental protection;

Whereas the Council resolution of 7 May 1990 on waste policy (5) invites the Commission to complete its proposals on incinerators for industrial waste, as a matter of urgency;

Whereas the incineration of hazardous waste, due to its characteristics and constituents, gives rise to emissions particularly dangerous for the environmental media of air, soil, surface and groundwater, thereby endangering public health; whereas in some cases this pollution may have transboundary features;

Whereas therefore preventive action is required to protect the environment against particularly dangerous emissions from the incineration of hazardous waste and to guarantee citizens the right to a clean and healthy environment;

Whereas the differences between technical standards and control and operating procedures relating to installations for the incineration of hazardous waste have an influence on incineration activity, in particular as a result of the costs arising from the nature of the technical standards imposed and the level of environmental protection thus ensured;

Whereas the current differences in national provisions applicable to the incineration of hazardous waste, and in some cases the absence of such provisions, may distort competition, affect the free movement of goods in the single market, and give rise to differences in the protection of health and the environment;

Whereas it is necessary, for the smooth functioning of the internal market, to harmonize the national provisions relating to the incineration of hazardous waste in such a way as to ensure a high level of protection of health and the environment in all Members States;

Whereas Article 4 of Council Directive 84/360/EEC of 28 June 1984 on the combating of air pollution from

(1) OJ No C 112, 20. 12. 1973, p. 1.
(2) OJ No C 139, 13. 6. 1977, p. 1.
(3) OJ No C 46, 17. 2. 1983, p. 1.
(4) OJ No C 328, 7. 2. 1987, p. 1.
(5) OJ No C 122, 18. 5. 1990, p. 2.

industrial plants (1) provides that prior authorization shall be required for the operation of industrial plants, particularly those belonging to listed categories among which are waste incineration plants; whereas this authorization may be issued only when all appropriate preventive measures against air pollution have been taken, including the application of the best available technology not entailing excessive costs;

Whereas Council Directive 75/442/EEC of 15 July 1975 on waste (2), as amended by Directive 91/156/EEC (3), provides that waste must be disposed of without endangering human health and without harming the environment; whereas, to this end, the same Directive stipulates that any installation or undertaking treating waste must obtain a permit from the competent authority relating, *inter alia*, to the precautions to be taken;

Whereas a high level of environmental protection requires the setting and maintaining of appropriate operating conditions and emission limit values for hazardous waste incineration plants within the Community; whereas hereby and in the first place the competent authorities have to take into account the latest development of effective emission control techniques when issuing or reviewing the permit;

Whereas high standard measurement techniques are required to monitor the mass concentrations of the pollutants permitted to be released into the environment and to compare the results of the measurements within the Community taking into account maximum confidence intervals;

Whereas the normal operation as well as technically unavoidable stoppages, disturbances or failures of the purification devices have to be regulated; whereas, the provisions to prevent and minimize the risks and consequences of major accidents as set by Council Directive 82/501/EEC of 24 June 1982 on the major-accident hazards of certain industrial activities (4), as last amended by Directive 90/656/EEC (5), apply to incineration plants for hazardous waste;

Whereas, for the emissions of dioxins and furans, a guide value only should be set due to the lack of existing appropriate measurement methods; whereas, nonetheless, it is decisive to minimize such emissions by using progressive techniques and to make all efforts to meet the fixed guide values;

Whereas the environment requires an integrated protection against emissions resulting from the incineration of hazardous wastes; whereas, therefore, waste water resulting from the cleaning of exhaust gases of new plants shall not be discharged, in order to prevent a pollution shift from one environmental medium to another;

Whereas the incineration of hazardous waste as additional fuel in plants not solely destined for this purpose may not cause higher mass concentrations of polluting substances in that part of the exhaust gas volume resulting from such incineration and should therefore be subject to appropriate limitations;

Whereas the Commission and each Member State shall collaborate in order to ensure that information on the progress on emission control techniques and the results of the measurements of the pollutants released into the environment will be made available;

Whereas a committee should be set up to assist the Commission in implementing this Directive and adapting it to scientific and technical progress,

HAS ADOPTED THIS DIRECTIVE:

*Article 1*

1. The aim of this Directive is to provide for measures and procedures to prevent or at least to minimize the effects on the environment, in particular the pollution of air, soil, surface and groundwater, and the resulting risks to human health, from the incineration of hazardous waste and, to this end, to set up and maintain appropriate operating conditions and emission limit values for hazardous waste incineration plants within the Community.

2. This Directive applies without prejudice to other Community legislation relating to hazardous waste and the protection of the health and safety of the workers at the incineration plant, in particular Council Directives 80/1107/EEC (6) and 89/391/EEC (7).

*Article 2*

For the purpose of this Directive:

1. 'hazardous waste' shall mean any solid or liquid waste as laid down by Article 1 of Council Directive 91/689/EEC (8).

(1) OJ No L 188, 16. 7. 1984, p. 20.
(2) OJ No L 194, 25. 7. 1975, p. 47.
(3) OJ No L 78, 26. 3. 1991, p. 32.
(4) OJ No L 230, 5. 8. 1982, p. 1.
(5) OJ No L 353, 17. 12. 1990, p. 59.
(6) OJ No L 327, 3. 12. 1980, p. 8.
(7) OJ No L 183, 29. 6. 1989, p. 1.
(8) OJ No L 377, 31. 12. 1991, p. 20.

The following wastes shall be excluded from the scope of this Directive:

— municipal wastes as defined in Article 1 (3) of Council Directive 89/369/EEC (1) and Article 1 (3) of Council Directive 89/429/EEC (2),

— combustible liquid wastes including waste oils as defined in Council Directive 75/439/EEC (3) if

  — the mass content of polychlorinated aromatic hydrocarbons, e.g. polychlorinated biphenyls (PCB) or pentachlorinated phenol (PCP), amounts to not more than 10 ppm,

  — the net calorific value amounts to at least 30 MJ per kilogram, and

  — these wastes are not rendered hazardous due to other constituents.

— any combustible liquid wastes which cannot cause, in the flue gas directly resulting from their combustion, other emissions than those from gas oil as defined in Article 1 (1) of Council Directive 75/716/EEC (4) or a higher concentration of emissions than those resulting from the combustion of gas oil as so defined;

2. 'incineration plant' shall mean any technical equipment used for the incineration by oxidation of hazardous wastes including pretreatment as well as pyrolysis or other thermal treatment processes, e.g. plasma process, insofar as their products are subsequently incinerated with or without recovery of the combustion heat generated. This includes plants burning such wastes as a regular or additional fuel for any industrial process;

   This definition covers the site and the entire installation comprising the waste reception, storage, pretreatment facilities, the incinerator, its wastes, fuel and air-supply systems, exhaust gas and waste water treatment facilities, and devices and systems for controlling incineration operations and continuously recording and monitoring incineration conditions;

3. 'new incineration plant' shall mean a plant for which the permit to operate is granted as from the date specified in Article 19 (1);

4. 'existing incineration plant' shall mean a plant for which the first permit to operate is granted before the date specified in Article 19 (1);

5. 'emission limit value' shall mean the concentration and/or mass of polluting substances which is not to be exceeded in emissions from plants during a specified period;

6. 'operator' shall mean any natural or legal person who operates the incineration plant, or who has or has been delegated decisive economic power over it.

*Article 3*

Member States shall ensure that:

1. permits for installations, establishments or undertakings which operate incineration plants must be obtained from the competent authorities, pursuant to Articles 9, 10 and 11 of Directive 75/442/EEC and Article 3 of Council Directive 84/360/EEC;

2. the permit shall be given only if the application shows that the incineration plant is designed, equipped and will be operated in such a manner that all appropriate preventive measures against environmental pollution, in particular measures to prevent or minimize emissions, have been taken. As a minimum, those measures provided for by Articles 5 to 13 must be met;

3. the permit given by the competent authorities must explicitly list the categories and/or the generic types of those hazardous wastes which may be treated in the incineration plant as well as the total capacity of the incinerator;

4. in the case of a plant not intended primarily to incinerate hazardous wastes, and where such a plant is being fed with hazardous wastes the resulting heat release from which is between 10 and 40 % inclusive of the total heat released in the plant at each moment of the operation, the following Articles only of the Directive shall apply:

   — Articles 1 to 6,

   — Article 7 points 2 and 6,

   — Article 8 including its measuring provisions,

   — Article 10,

   — Articles 13, 14 and 15;

5. the permit for additional incineration as described in paragraph 4 shall be issued only if it is demonstrated in the application:

(1) OJ No L 163, 14. 6. 1989, p. 32.
(2) OJ No L 203, 15. 7. 1989, p. 50.
(3) OJ No L 194, 25. 7. 1975, p. 31.
(4) OJ No L 307, 27. 11. 1975, p. 22.

— that the hazardous waste burners shall be positioned and the waste added in such a way as to achieve complete incineration, and

— with calculations as laid down in Annex II that the provisions of Article 8 shall be met.

The permit for additional incineration shall explicitly list the categories and/or the generic types of those hazardous wastes which may be incinerated additionally in the plant. It shall, moreover, specify the minimum and maximum mass flows of those hazardous wastes, their lowest and maximum calorific values and their maximum contents of pollutants, e.g. PCB, PCP, chlorine, fluorine, sulphur, heavy metals.

The permit shall expire six months after starting such incineration, if a comparison of the results of measurements carried out under the most unfavourable conditions show that the provisions of Article 8 are not met. For this period of six months the competent authority may grant exemptions from the percentage requirement stipulated in point 4.

*Article 4*

Member States shall take measures in order that:

1. the applications for a permit and the decisions of the competent authorities are made available to the public in accordance with procedures provided for in Community and national law;

2. the results of the monitoring provided for in Article 12 are made available to the public in a form decided upon by the competent authorities and in accordance with procedures provided for in Community and national law.

*Article 5*

Member States shall ensure that:

1. the operator of the incineration plant takes all necessary measures concerning the delivery and reception in order to prevent or minimize as far as possible the effects to the environment, in particular the pollution of air, soil, surface and groundwater, and the risks to human health. These measures have to cover at least the requirements set out in points 2 and 3;

2. prior to accepting the waste at the incineration plant, the operator shall receive a description of the waste covering:

— the physical and chemical composition of the waste and all information necessary to evaluate its suitability for the intended incineration process,

— the hazard characteristics of the waste, the substances with which it cannot be mixed, precautions to be taken in handling the waste;

3. prior to accepting the waste at the incineration plant, at least the following reception procedures have to be respected:

— the mass of the waste has to be determined,

— the checking of those documents required by Directive 91/689/EEC and, where they apply, those required by Council Directive 84/631/EEC [1] and dangerous goods transport regulations,

— representative samples have to be taken where appropriate and as far as possible before unloading, to verify the conformity with the description provided under point 2 by carrying out controls like those indicated in Annex TN I and to enable the competent authorities to identify the nature of the wastes treated. These samples have to be kept for at least 10 days after the incineration.

*Article 6*

Member States shall take measures in order that the equipment used for the intermediate storage and the pretreatment of hazardous wastes necessary prior to the incineration shall be designed and operated so as to avoid or minimize emissions of dust, volatile substances and odours [2].

*Article 7*

Member States shall ensure that:

1. incineration plants for hazardous wastes shall be designed, equipped and operated to prevent or at least minimize the effects to the environment in particular the pollution of air, soil and water, and the risks to human health. To this end, the most

[1] OJ No L 326, 13. 12. 1984, p. 31.
[2] Information on equipment and operational practice is provided by TN II.

appropriate technological means (1) and requirements shall be applied to fulfil the prescriptions laid down in the subsequent points;

2. plants for the incineration of hazardous wastes shall be operated in order to achieve a complete incineration. This may require the use of appropriate techniques of waste pretreatment;

3. all waste incineration plants shall be equipped with auxiliary burners. These burners must be switched on automatically when the temperature of the combustion gases, after the last injection of combustion air, falls below the relevant temperature stated in points 4 and 5. They shall also be used during plant start-up and shut-down operations in order to ensure that the abovementioned minimum temperature is maintained at all times during these operations and as long as the waste is in the combustion chamber. During start-up and shut-down or when the temperature of the combustion gas falls below the temperatures stated in points 4 and 5, the auxiliary burners must not be fed with fuels which can cause higher emmissions than those resulting from the burning of gasoil as defined in Article 1 (1) of Directive 75/716/EEC, liquefied gas or natural gas.

   It is mandatory to have an automatic system to prevent hazardous waste feed:

   — at start-up, until the required minimum incineration temperature has been reached,

   — whenever the required minimum incineration temperature is not maintained,

   — whenever the continuous measurements required by Article 12 (1) (a) show that any emission limit value is exceeded due to disturbances or failures of the purification devices;

4. all incineration plants shall be designed, equipped and operated in such a way that the gas resulting from the combustion of the hazardous waste, is raised, after the last injection of combustion air, in a controlled and homogeneous fashion and even under the most unfavourable conditions, to a temperature of at least 850° C, as measured at the inner wall of the combustion chamber, for at least two seconds in the presence of at least 6 % oxygen; if halogenated organic substances are incinerated, the temperature has to be raised to at least 1200° C.

   When the furnace is fueled with liquid hazardous waste only or with a mixture of gaseous substances and powdered solids from a thermal pretreatment of hazardous waste under oxygen deficiency, and when the gaseous part provides for more than 50 % of the entire heat released, the oxygen content after the last injection of combustion air shall amount to at least 3 %;

5. requirements different from those laid down in point 4 and specified in the permit for certain hazardous wastes may be authorized by the competent authorities if appropriate techniques are used in the incineration furnaces or exhaust gas treatment equipment. This authorization shall be conditional upon at least the emission limit values given in point 1 of Article 8 being met and the levels of dioxins and furans emitted being lower or equivalent to those obtained with the requirements laid down in point 4 of this Article.

   All operating conditions determined under the provisions of this paragraph and the results of verifications made shall be communicated to the Commission;

6. during the operation of the incineration plant the following limit values of carbon monoxide (CO) concentrations shall not be exceeded in the combustion gases:

   (a) 50 milligrams/$m^3$ of combustion gas determined as daily average value;

   (b) 150 milligrams/$m^3$ of combustion gas of at least 95 % of all measurements determined as 10-minute average values taken in any 24-hour period;

7. the deposit of fly ash shall be minimized before the dust arrestment plant, e.g. by appropriate ducting for exhaust gas as well as by frequent cleaning of boilers, heating surfaces, economizers and exhaust gas ducts;

8. all incineration plants shall be designed, equipped and operated in such a way as to prevent emissions into the air giving rise to significant ground-level air pollution; in particular, exhaust gases shall be discharged in a controlled fashion by means of a stack.

   The stack height is calculated in such a way as to safeguard human health and the environment.

*Article 8*

Member States shall ensure that:

1. incineration plants have to be designed, equipped and operated in such a way that at least the follow-

(1) Currently available technology is indicated briefly in Annex TN III.

ing emission limit values are not exceeded in the exhaust gas:

(a) *daily average values*

| | | |
|---|---|---|
| 1. | total dust | 5 mg/m³ |
| 2. | gaseous and vapourous organic substances, expressed as total organic carbon | 5 mg/m³ |
| 3. | hydrogen chloride (HCl) | 5 mg/m³ |
| 4. | hydrogen fluoride (HF) | 1 mg/m³ |
| 5. | sulphur dioxide ($SO_2$) | 25 mg/m³; |

(b) *half-hourly average values*

| | | |
|---|---|---|
| 1. | total dust | 10 mg/m³ |
| 2. | gaseous and vapourous organic substances, expressed as total organic carbon | 10 mg/m³ |
| 3. | hydrogen chloride (HCl) | 10 mg/m³ |
| 4. | hydrogen fluoride (HF) | 2 mg/m³ |
| 5. | sulphur dioxide ($SO_2$) | 50 mg/m³; |

(c) *all average values over the sample period of a minimum of half and a maximum of four hours*

| | | |
|---|---|---|
| 1. | Cadmium and its compounds, expressed as cadmium (Cd) | total 0,05 mg/m³ |
| 2. | Thallium and its compounds, expressed as thallium (Tl) | |
| 3. | Mercury and its compounds, expressed as mercury (Hg) | 0,05 mg/m³ |
| 4. | Antimony and its compounds, expressed as antimony (Sb) | |
| 5. | Arsenic and its compounds, expressed as arsenic (As) | |
| 6. | Lead and its compounds, expressed as lead (Pb) | |
| 7. | Chromium and its compounds, expressed as chromium (Cr) | |
| 8. | Cobalt and its compounds, expressed as cobalt (Co) | |
| 9. | Copper and its compounds, expressed as copper (Cu) | total 0,5 mg/m³. |
| 10. | Manganese and its compounds, expressed as manganese (Mn) | |
| 11. | Nickel and its compounds, expressed as nickel (Ni), | |
| 12. | Vanadium and its compounds, expressed as vanadium (V) | |
| 13. | Tin and its compounds, expressed as tin (Sn). | |

These average values cover also gaseous and the vapour forms of the relevant heavy metal emissions as well as their compounds;

2. the emission of dioxins and furans shall be minimized by the most progressive techniques. To this end every effort must be made to ensure that all average values measured over the sample period of a minimum of six hours and a maximum of 16 hours do not exceed a guide value of 0,1 ng/m³.

   This guide value is defined as the sum of the concentrations of the individual dioxins and furans evaluated in accordance with Annex I;

3. the results of the measurements made to verify compliance with the limit and guide values set out in Articles 7 and 8 shall be standardized under the conditions laid down in point 2 of Article 12;

4. where hazardous wastes are additionally incinerated in plants which are not solely destined for the incineration of such wastes, the provisions of point 6 of Article 7 and points 1, 2 and 3 of this Article shall only apply to that part of the volume of exhaust gas resulting from the incineration of the wastes.

   Appropriate emission limit and guide values for the relevant pollutants emitted in the exhaust gas of such plants as set out in Annex II shall be laid down.

*Article 9*

Member States shall ensure that:

1. any waste water discharged from an incineration plant must be subject to a licence issued by the competent authority. This licence shall state that it is only valid under the condition that the waters are treated, as necessary, in order to minimize the effects on the environment and to prevent risks to human health and that the limit values imposed therein are respected;

2. in so far as the waste water contains dangerous substances covered by Council Directive 76/464/EEC [1] and its daughter Directives [2], any licence which is issued and the relevant limit values must be fixed according to these Directives;

3. discharge to the aquatic environment of waste waters resulting from the cleaning of exhaust gases shall be prohibited for new plants;

4. incineration plant sites including associated storage areas for hazardous wastes shall be designed and operated in such a way, as to prevent the release of any polluting substances into soil and groundwater following the provisions of Council Directive 80/68/EEC [3]. Moreover, storage capacity shall be provided for rainwater run-off from the incineration plant site or for contaminated water arising from spillages or fire-fighting operations. This storage capacity shall be adequate to ensure that such waters can be tested and treated before discharge where necessary.

*Article 10*

Member States shall ensure that:

1. wastes resulting from the operation of the incineration plant shall be recovered or disposed of in accordance with Directives 75/442/EEC and 91/689/EEC. This may require a pretreatment of such wastes according to the technical development.

   Such wastes should be kept separate from each other and, in order to further facilitate their recovery or disposal, the appropriate technologies should be applied;

2. transport and intermediate storage of dry residues e.g. filter and boiler dust and dry residues from the treatment of exhaust gases shall take place in closed containers;

3. the heat recovered from the incineration processes should be used as far as possible on-site, by third parties or for power generation.

*Article 11*

Member States shall ensure that:

1. measurement equipment shall be installed and techniques shall be used in order to monitor in accordance with Article 12 the parameters, conditions and mass concentrations of the pollutants relevant to the incineration process. They shall be subject to the permit issued by the competent authorities. (For monitoring information, see Annex TN IV);

2. the permit shall only be issued if the measurement techniques comply with Annex III. The values of the 95 % confidence interval at the emission limit values in point 6 (a) of Article 7 and Article 8, point 1 (b), Nos (1), (2), (3) and (5), shall not exceed the values given by point 4 of Annex III.

   The competent authorities shall give approval of the appropriate installation and the functioning of the automated monitoring equipment and shall require an annual surveillance test with respect to this equipment;

3. the sampling and measurement procedures used to satisfy the obligations imposed for periodical measurements of each air pollutant and the location of the sampling or measurement points shall be subject to the permit issued by the competent authority.

   The requirements for periodical measurements shall be fixed by the competent authority according to Annex III.

*Article 12*

1. Member States shall ensure that the following measurements shall be carried out in compliance with Annex III at the incineration plant:

(a) continuous measurements of the substances mentioned in point 6 of Article 7 and Article 8, points 1 (a) and (b);

(b) continuous measurements of the following process operation parameters:

   — temperature as mentioned in Article 7, points 4 and 5,

   — concentration of oxygen, pressure, temperature and water vapour content of the exhaust gas;

(c) periodical, i.e. monthly measurements of the substances mentioned in Article 8, points 1 (c) and 2;

(d) the residence time, the minimum temperature and the oxygen content of the exhaust gases as specified in Article 7, points 4 and 5 shall be subject to appro-

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(1) OJ No L 129, 18. 5. 1976, p. 23.
(2) OJ No L 81, 27. 3. 1982, p. 29.
OJ No L 291, 24. 10. 1983, p. 1.
OJ No L 74, 17. 3. 1984, p. 49.
OJ No L 274, 17. 10. 1984, p. 11.
OJ No L 181, 4. 7. 1986, p. 16.
OJ No L 158, 25. 6. 1988, p. 35.
OJ No L 219, 14. 8. 1990, p. 49.
(3) OJ No L 20, 26. 1. 1980, p. 43.

priate verification, at least once when the incineration plant is first brought into service and under the most unfavourable operating conditions envisageable.

The continuous measurement of HF may be omitted if treatment stages for HCl are used which make'sure that the emission limit value under Article 8, points 1 (a) (3) and 1 (b) (3) is not being exceeded. In this case the emissions of HF are subject to periodical measurements as laid down in point (c) above.

The continuous measurement of the water vapour content shall not be necessary provided that the exhaust gas is dried before the emissions are analysed.

Measurements of the pollutants listed in point 1 of Article 8 may not be necessary, provided that the permit allows the incineration of only those hazardous wastes which cannot cause average values of those pollutants higher than 10 % of the emission limit values set out in point 1.

The competent authorities shall require continuous measurements of the substances mentioned in Article 8, points 1 (c) and 2, being carried out in compliance with Annex III as soon as appropriate measurement techniques are available within the Community.

2. The results of the measurements made to verify compliance with the limit and guide values set out in Articles 7 and 8 shall be standardized under the following conditions:

— temperature 273 K, pressure 101,3 kPa, 11 % oxygen, dry gas,

— temperature 273 K, pressure 101,3 kPa, 3 % oxygen, dry gas, in case of incineration of waste oil only as defined in Directive 75/439/EEC.

When the hazardous wastes are burnt in a pure oxygen atmosphere, the results of the measurements can be standardized at an oxygen content laid down by the competent authority reflecting the special circumstances of the individual case. In a case covered by point 4 of Article 3, the results of the measurements shall be standardized at a total oxygen content as calculated in Annex II.

When the emissions of pollutants are reduced by exhaust gas treatment, the standardization with respect to the oxygen contents foreseen above shall be done only if the measured oxygen content over the same period exceeds the relevant standard oxygen content.

3. Member States shall ensure that all measurement results shall be recorded, processed and presented in an appropriate fashion in order to enable the competent authorities to verify compliance with the permitted operating conditions and emission limit and guide values laid down in this Directive in accordance with procedures to be decided upon by those authorities.

4. The emission limit values are complied with if 97 % of the half-hourly average values over the year and all of the daily average values of Article 7, point 6 (a) and Article 8, point 1 (a) and (b) and all average values over the sample period of Article 8, point 1 (c) do not exceed the emission limit values and if the provision of Article 7, point 6 (b) (10 minutes average) is met.

The half-hourly average values and the 10-minute averages shall be determined within the effective operating time (including the start-up and shut-off periods when hazardous waste is being incinerated) from the measured values after having subtracted the value of the confidence interval given by point 4 of Annex III. The daily average values are determined from those validated average values.

The average values over the sample period and, in the case of periodical measurements of HF, the average values for HF are determined as given by the requirements imposed under point 3 of Article 11.

5. For the periodic measurements, the competent authorities shall lay down appropriate measurement programmes to ensure that the results are representative for the level of emissions of the substances concerned resulting from the incineration of the categories and/or the generic types of wastes permitted to the plant.

The results obtained must be suitable for verifying that the limit values have been observed.

*Article 13*

Member States shall take measures in order to ensure that:

1. Should the valid measurements taken show that the limit values laid down in this Directive have been exceeded, the competent authorities shall be informed as soon as possible. The plant concerned shall not continue to operate while failing to comply with emission standards.

   In the case of point 4 of Article 3, additional feeding of hazardous wastes shall be stopped when the limit values are exceeded due to disturbances or failures of the purification devices.

2. The competent authorities shall lay down the maximum permissible period of any technically unavoidable stoppages or disturbances, or failures of the purification devices, during which the concen-

trations in the discharges into the air of the regulated substances may exceed the limit values laid down. Under no circumstances shall the plant continue to incinerate hazardous waste for a time period of more than two hours uninterrupted; moreover, the cumulative duration of operation in such conditions over one year shall be less than 24 hours.

In case of a breakdown, the operator shall reduce or close down operations as soon as practicable until normal operations can be restored. In plants falling within Article 3, point 4, additional feeding of hazardous wastes shall be stopped.

The total dust content of the discharges shall under no circumstances exceed 150 mg/m$^3$ expressed as half-hourly average; moreover, the emission limit value laid down in Article 8, points 1 (a) (2) and 1 (b) (2) must not be exceeded. All other conditions, in particular the combustion conditions mentioned in this Directive, shall be complied with.

*Article 14*

1. The provisions of this Directive shall apply to existing incineration plants within three years after the date specified by Article 19 (1).

2. However, the plant operator may notify the competent authority within six months after the date specified by Article 19 (1) that the existing plant will not be operated for more than 20 000 hours within a period of five years at maximum starting with the operators' notification before being definitely shut down. In this case the provisions of paragraph 1 do not apply.

*Article 15*

1. Member States shall require their competent authorities to review the permit for each incineration plant for hazardous wastes at least every five years and to ensure that the plants are updated, where necessary, consistent with the progress in emission control techniques.

For new plants, the date for the first review shall be within five years of the first operation of the plant at the latest. For existing plants the date of the first review shall be within five years of the date specified in Article 14 (1).

2. Member States shall provide annually the following information to the Commission.

For each new incineration plant or substantial modification, which is newly authorized:

— the date of authorization,

— the most important measures and/or techniques incorporated for the minimization of emissions,

— the imposed operating conditions,

— the maximum emission limits imposed.

The information shall also include for each new or substantially modified incineration plant:

— the date at which it was put into operation,

— the result of the continuously measured emissions, in accordance with Article 12, for an unbroken period of 12 months within the first two years after the notified date of the first operation,

— the results of the periodically measured emissions, in accordance with Article 12, carried out in the first two years after the notified date of the first operation.

3. The Commission, assisted by the committee as described in Article 17, shall annually submit to the Member States a summary report, based on the information described in paragraph 2, in order to inform on the progress in emission control techniques already implemented and any further major technical developments in this field.

Member States shall ensure that the summary reports are disseminated to their competent authorities.

*Article 16*

The modifications required to adapt the Directive to technical progress will be adopted in accordance with the procedure laid down in Article 17.

*Article 17*

The Commission shall be assisted by a committee composed of the representatives of the Member States and chaired by the representative of the Commission.

The representative of the Commission shall submit to the committee a draft of the measures to be taken. The committee shall deliver its opinion on the draft within a time limit which the chairman may lay down according to the urgency of the matter. The opinion shall be delivered by the majority laid down in Article 148 (2) of the Treaty in the case of decisions which the Council is

required to adopt on a proposal from the Commission. The votes of the representatives of the Member States within the committee shall be weighted in the manner set out in that Article. The chairman shall not vote.

The Commission shall adopt the measures envisaged if they are in accordance with the opinion of the committee.

If the measures envisaged are not in accordance with the opinion of the committee, or if no opinion is delivered, the Commission shall, without delay, submit to the Council a proposal relating to the measures to be taken. The Council shall act by a qualified majority.

If, on the expiry of a period of three months, the Council has not acted, the proposed measures shall be adopted by the Commission.

*Article 18*

1. The reports on the implementation of this Directive shall be established according to the procedure laid down in Article 5 of Directive 91/692/EEC [1]. The first report covers the period 1995 to 1997.

*Article 19*

1. Member States shall bring into force the laws, regulations and administrative provisions necessary to comply with this Directive not later that 30 June 1994. They shall forthwith inform the Commission thereof.

When Member States adopt these provisions, these shall contain a reference to this Directive or shall be accompanied by such reference at the time of their official publication. The procedure for such reference shall be adopted by Member States.

2. Member States shall communicate to the Commission the texts of the provisions of national law which they adopt in the field covered by this Directive.

*Article 20*

This Directive is addressed to the Member States.

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[1] OJ No L 377, 31. 12. 1991, p. 48.

*ANNEX I*

## EQUIVALENCE FACTORS FOR DIOXINS AND DIBENZOFURANS

For the determination of the summed value as stated in Article 8 point 2 the mass concentrations of the following dioxins and dibenzofurans have to be multiplied with the following equivalence factors before summing up (using the concept of toxic equivalents).

| | | *Toxic equivalence factor* |
|---|---|---|
| 2, 3, 7, 8 | -Tetrachlordibenzodioxin (TCDD) | 1 |
| 1, 2, 3, 7, 8 | -Pentachlordibenzodioxin (PeCDD) | 0,5 |
| 1, 2, 3, 4, 7, 8 | -Hexachlordibenzodioxin (HxCDD) | 0,1 |
| 1, 2, 3, 7, 8, 9 | -Hexachlordibenzodioxin (HxCdd) | 0,1 |
| 1, 2, 3, 6, 7, 8 | -Hexachlordibenzodioxin (HxCDD) | 0,1 |
| 1, 2, 3, 4, 6, 7, 8 | -Heptachlordibenzodioxin (HpCDD) | 0,01 |
| | -Octachlordibenzodioxin (OCDD) | 0,001 |
| 2, 3, 7, 8 | -Tetrachlordibenzofuran (TCDF) | 0,1 |
| 2, 3, 4, 7, 8 | -Pentachlordibenzofuran (PeCDF) | 0,5 |
| 1, 2, 3, 7, 8 | -Pentachlordibenzofuran (PeCDF) | 0,05 |
| 1, 2, 3, 4, 7, 8 | -Hexachlordibenzofuran (HxCDF) | 0,1 |
| 1, 2, 3, 7, 8, 9 | -Hexachlordibenzofuran (HxCDF) | 0,1 |
| 2, 3, 4, 6, 7, 8 | -Hexachlordibenzofuran (HxCDF) | 0,1 |
| 1, 2, 3, 4, 6, 7, 8 | -Heptachlordibenzofuran (HpCDF) | 0,01 |
| 1, 2, 3, 4, 7, 8, 9 | -Heptachlordibenzofuran (HpCDF) | 0,01 |
| | -Octachlordibenzofuran (OCDF) | 0,001 |

*ANNEX II*

## DETERMINATION OF EMISSION LIMIT AND GUIDE VALUES FOR THE ADDITIONAL INCINERATION OF HAZARDOUS WASTE

The limit or guide value for each relevant pollutant and carbon monoxide in the exhaust gas resulting from the additional incineration of hazardous waste must be calculated as follows:

$$\frac{V_{waste} \times C_{waste} + V_{fuel} \times C_{fuel}}{V_{waste} + V_{fuel}} = C$$

$V_{waste}$ = exhaust gas volume resulting from the incineration of hazardous waste only determined from the waste with the lowest calorific value specified in the permit and standardized at the conditions given by Article 12, point 2.

$C_{waste}$ = emission limit values set for plants destined to incinerate hazardous wastes only (at least the emission limit values and guide value for the pollutants and carbon monoxide as laid down in Article 8, points 1 and 2, and Article 7, point 6).

$V_{fuel}$ = exhaust gas volume resulting from the combustion of the authorized fuels normally used in the plant (hazardous wastes excluded) determined on the basis of oxygen contents at which the emissions must be standardized as laid down in Community or national regulations. In the absence of regulations for this kind of plants, the real oxygen content in the exhaust gas without being thinned by addition of air unnecessary for the combustion process must be used. The standardization at the other conditions is given by Article 12, point 2.

$C_{fuel}$ = real mass concentrations of the relvant pollutants and carbon monoxide in the flue gas of plants which comply with the national laws, regulations and administrative provisions for such plants while burning the normally authorized fuels (hazardous wastes excluded).

C = total emission limit value or guide value for CO and the relevant pollutants replacing the emission limit values and the guide value as laid down in Article 7, point 6 and in Article 8, points 1 and 2. The total oxygen content to replace the oxygen content for the standardization in Articles 7 and 8 is calculated on the basis of the content above respecting the volume ratio.

Pollutants and CO not resulting directly from the incineration of hazardous wastes or from the combustion of fuels (e.g. from materials necessary for the production or from products) as well as CO resulting from such incineration directly if:

— the higher CO concentrations in the combustion gas are required by the production process, and

— $C_{waste}$ (as defined above) for total organic carbon, dioxins and furans is met

should not be taken into account.

In any case, given the authorized hazardous wastes which can be additionally incinerated, the total emission limit value (C) must be calculated under conditions which would minimize the emissions into the environment. Such conditions may be materialized for each relevant pollutant in the case of additional incineration of hazardous wastes in plants not solely destined for the incineration of the wastes:

$C_{waste} < C_{fuel}$: the pollution of the surroundings will be less as a result of the additional incineration of hazardous wastes

$C_{waste} = C_{fuel}$: indifferent

$C_{waste} > C_{fuel}$: the surroundings would suffer from the additional incineration of hazardous wastes

*ANNEX III*

## MEASUREMENT TECHNIQUES

1. Measurements for the determination of concentrations of air pollutants in gas-carrying ducts have to be carried out representatively.

2. Sampling and analysis of all pollutants including dioxins and furans as well as reference measurement methods to calibrate automated measurement systems shall be carried out as given by CEN standards. While awaiting the elaboration of the CEN standards, national standards shall apply.

3. The procedure to monitor dioxins and furans can only be authorized if the detection limit for the sampling and analysis of the individual dioxins and furans is sufficiently low to allow the determination of a meaningful result in terms of toxicity equivalents.

4. The values of the 95 % confidence intervals determined at the emission limit values shall not exceed the following percentages of the emission limit values:

| | |
|---|---|
| Carbon monoxide (Article 7, point 6a): | 10 % |
| Sulphur dioxide (Article 8, point 1b (5)): | 10 % |
| Total dust (Article 8, point 1b (1)): | 20 % |
| Total organic carbon (Article 8, point 1b (2)): | 30 % |
| Hydrogen chloride (Article 8, point 1b (3)): | 30 %. |

*ANNEX TN I*

for information

**Waste Delivery and Reception**

Before the waste material can be allowed into the plant, it has to pass the entrance and control area. Here it has to undergo the following control and supervising activities: besides weighing and administrative control also a laboratory control.

The laboratory control consists of inspecting the waste material to get a visual impression, the sampling of the material, characterization of the material by general qualitative or semi-quantitative screening tests. Due to the lack of time, a comprehensive analysis is often not possible. The following parameters need to be tested:

— nonflammability,

— chlorine and sulphur content,

— pH-value,

— content of heavy metals (e.g. by test strips, atomic absorption spectrometry or atomic emission spectrometry with inductively coupled plasma).

An alternative control system consists of a comprehensive analysis of the waste material before actual delivery at the plant. When the waste is delivered, it is only checked for conformity with the original sample and on specific relevant parameters. In general, it depends on the nature and the chemical and physical characteristics of the waste, e.g. if it is liquid or solid as to which parameters have to be tested and by which analytical methods. Therefore it is impossible to define a list of tests that can be applied to each type of waste.

Normally further checks are carried out on the sample later on, e.g. calorific value, water content, concentration of PCB or other toxic and/or thermoresistant contaminants.

At the end of the laboratory tests, the identity of the waste is known and the material can be directed to the proper discharge station within the plant.

*ANNEX TN II*

for information

Before finally discharging the waste either into a bunker or into one of the tanks, it has to be confirmed that no reactions between bunker or tank contents and the newly delivered material may occur. Such reactions, e.g. polymerization, may lead to uncontrolled temperature increases, ultimately causing a fire or even an explosion. Therefore, the behaviour of the waste has to be checked before unloading by some kind of small scale test.

The discharge areas are an integral part of the storage facilities. This plant section is normally designed in such a manner that emissions caused by the handling of hazardous waste materials, especially contamination of soils and groundwater by spills and leakages and diffuse emissions into the air are avoided. Therefore, where necessary, the areas where the waste is handled need to be isolated by materials that are among other things resistant to chlorinated hydrocarbons; all stations where volatile substances are unloaded, discharged or taken in have to be equipped with suction units.

Apart from the abovementioned general criteria for the technical equipment, the following types of storages facilities for combustible, toxic waste can be distinguished:

— storage of solid waste (bunker),

— storage of slurry material (tanks or specially equipped bunker compartments),

— storage of liquid waste oil, solvents, toxic waste water (tanks),

— storage of waste drums and other containers (drum storage area).

Where solid waste is stored other than in closed containers, it may be kept under less than atmospheric pressure by exhausting air out of the bunker or the sluice area. The exhaust gas may be used either as combustion air to the incinerator or, if the incinerator is out of order, it must be treated under the provisions of the authorization or discharged by the stack.

By discharging liquid or wet material into a tank, a gas volume (volume saturated with volatile organic matter) equivalent to the discharged waste is displaced. This gas stream has to be handled in such a manner that it causes neither odour nor pollution. State of the art is to discharge the displaced gas volume within a closed system, e.g. tubes with the necessary safety equipment either into the combustion chamber or in the case of plant shut down to an activated carbon filter or nitrogen cooled condensing plant.

Due to the highly variable characteristics of wastes as far as their level of contamination with pollutants is concerned, water content, calorific value etc., great attention is necessary to equalize and homogenize the waste fractions before feeding them to the kiln. To this end, the solid waste may be mixed and the different liquid materials should be mixed to a fuel that finally differs little in its physical and chemical characteristics.

*ANNEX TN III*

for information

1. **Combustion**

General considerations

There is no single 'best' technology for achieving combustion. Whilst certain basic requirements will always apply, selection of the most suitable type of combustion chamber and of the operating conditions required in any particular case will depend upon the chemical and physical nature of the waste.

1.1 *Combustion conditions*

Effective combustion will always depend upon at least four key parameters:

— temperature,

— residence time,

— oxygen availability,

— turbulence.

2. **Combustion gas treatment**

2.1 *Gas conditioning — some aspects*

Care should be taken when gas cooling is used that recombination of dioxins and furans which may occur under some circumstances after the combustion process is not enhanced.

Reformation of PCDDs and PCDFs is now often considered as occurring mainly in the range of temperature between 400 and 200° C.

When heat recovery is used, gas can still be quenched to achieve a temperature lower than 200° C very rapidly.

In addition, quenching has an important removal efficiency for HCl and outlet gas, when it is water saturated, and in proper conditioning for wet scrubbing.

2.2 *Dust separation*

Proven separation processes such as those using electrostatic precipitators, filter separators and wet collectors of various types are available for separating dust from flue gases in special waste incinerators. Inertial separators, e.g. cyclones, are incapable of meeting current requirements, at least when installed as final collectors in a series.

The requirements with regard to the dust content of the scrubbed gas obtained by means of dust collectors fitted downstream of special waste incineration plants will depend largely on where the collectors are placed within the flue gas treatment units. In the case of primary separators, the requirements will mainly depend on what demands are placed on the downstream flue gas treatment installations. On the other hand, in the case of final separators, existing laws must be complied with.

In addition to the widely used dry electrostatic filters, wet filters of both the horizontal plate type and the vertical tube type are particularly recommended for humid flue gases as, in addition to the dust, aerosols and droplets can effectively be separated out at a low pressure loss.

Wet electrostatic filters are suitable for the removal of residual dust and the separation of aerosols downstream of the noxious gas treatment stage.

The main type of filter collector is the bag filter which can be subdivided into the reverse air flow bag filter and the pulse jet bag filter, depending on the filter cleaning method used.

In reverse air flow filters the dust is deposited on the inside of the bag which is made of light textiles or felts. The flow of contaminated gas keeps the bags inflated.

In a wet collector dust particles are deposited on droplets of liquid which is finely dispersed in the contaminated gas. A special feature of wet collectors is that the degree of separation depends very largely on particle size. Large particles are much more efficiently eliminated than fine ones.

2.3 *Acid gas removal and demister*

Depending on the waste burned, the contaminated flue gases arising in special waste incineration plants may contain noxious gases such as HCl, HF and SOx in the following concentrations (actual conditions):

| | |
|---|---|
| HCl: | 1 000-15 000 mg/m³ |
| HF: | 10- 500 mg/m³ |
| SOx (in the form of $SO_2$: | 100- 1 000 mg/m³. |

the flue gases may also contain considerable amounts of vaporized mercury. The following processes are available for eliminating these noxious substances adequately:

— wet scrubbing,

— spray absorption.

Wet gas-cleaning

As the residues are re-used separately, there is an increasing tendency not to separate the dust and gaseous pollutants simultaneously, although this possibility does exist. The dust tends to be removed, e.g. by means of a dry electrofilter, before the pollutant treatment stage.

For pure separation of gaseous pollutants, the scrubbers can then be operated with a much lower energy input.

In view of the different physico-chemical properties of HCl and HF on the one hand and $SO_2$ on the other, it has proved advantageous to wash the waste gas in two stages. The first stage in the washing process is to separate out HCl, HF and heavy metal vapours (e.g. mercury) with a very low pH value (0-3). In the second stage, $SO_2$ is separated out using dilute caustic soda (pH = 6-8).

Spray absorption methods

With these methods the absorbent is injected as a solution (e.g. NaOH) or as a suspension (e.g. lime milk) into a reactor where it reacts with the acidic HCl, HF and $SO_2$ gases. As a result of heat exchange with the waste gas, the absorbent droplets are dried as they pass through the reactor, with the result that the acidic pollutant components are transported in a dry particulate state.

Apart from jets, rotating disk sprays are the preferred spraying devices used. A filtering separator is generally installed after the reactor in order to collect the particulate reaction products leaving the reactor.

3. **Available technologies**

For the time being, especially the following measures are known for an incineration as complete as possible and minimization of emissions of air pollutants:

— adequate pre-treatment (e.g. mechanical, thermal),

— incineration including after-burning with additional use of oxygen to lower the emissions of carbonmonoxide and organic substances and to improve the burnout especially in connection with the input of drums,

— quench or spray absorber,

— dry electrostatic precipitator or baghouse filter for dust removal,

— wet scrubber,

— flue-gas cooling,

— wet electrostatic precipitator,

— activated carbon filter/activated carbon in drifting stream processes,

— SCR-reactor.

*ANNEX TN IV*

for information

**Monitoring of emissions**

## 1. Introduction

To ensure proper plant operation, it is essential that key combustion and gas cleaning parameters are monitored and recorded.

Emissions from hazardous waste incineration plants can be monitored and analysed continuously by the plant's own instruments, supplemented by regular check measurements. Other emissions like solid residuals require supplementary laboratory tests.

## 2. Plant instruments

### 2.1 *Parameters*

The plant instruments are used for ongoing plant control and the automatic control of the incineration process, including flue gas cleaning. The following are typical control parameters:

- flue gas temperatures:
  - in the kiln room,
  - in the secondary combustion chamber,
  - in the boiler, and
  - before/after the filter.
- the concentration of:
  - oxygen ($O_2$),
  - carbon monoxide (CO),
  - hydrogen chloride (HCl),
  - suspended matter/dust in the flue gas.

Other instrumentation is used for monitoring the plant's combustion efficiency and emissions. The following are typical monitoring parameters:

- nitric oxides ($NO_X$),
- sulphur dioxide ($SO_2$),
- suspended particles/dust,
- total organic carbon (TOC).

### 2.2 *Monitoring of emissions*

In the literature there are many accounts of monitors for emission measurements, but the lists are incomplete because of the rapid developments in the area.

The bibliography refers to the German Umweltbundesamt: Bericht 1/1986 (Umweltbundesamt 1986). The basic principles are *in situ* and extractive measurements.

## 3. Check measurement

Check measurements can be subdivided into three types:

- random sample measurements,
- calibration measurements,
- performance measurements.

3.1 *Periodic sample measurements*

To check the plant's particulate matter emissions and emissions of heavy metals and acid gases in particular, it is recommended to regularly measure emissions of the following:

— particulate matter,

— mercury and cadmium,

— arsenic, nickel and lead,

— chromium, copper and vanadium,

— hydrogen chloride, hydrogen fluoride and hydrogen bromide,

— sulphur dioxide and sulphur trioxide,

— total organic carbon,

— polychlorinated biphenyls and polychlorinated triphenyls,

— halogens and hydrogen sulphide,

— dioxins and dibenzofurans,

— phosphorus compounds,

— odourous substances.

Sampling of dust particles and metals contained therein should be carried out isokinetically as described in ISO/DIS 9096.

Isokinetic sampling means that the velocity of suction in the sampling equipment's nozzle is equal to the flue gas velocity in the duct or stack from which the partial gas stream is sucked out.

3.2 *Calibration measurements*

Validation of plant performance including calibration of the plant's instruments can be carried out in conjunction with the random sample measurements. There has proved to be a need for this since emission monitors are complicated systems which become unreliable after lengthy periods without expert inspection.

3.3 *Plant performance measurements*

After entry into service of a new furnace line and/or new flue gas cleaning equipment, there is a need for performance testing, so that plant-specific characteristics are demonstrated. The test programme is a matter for agreement both in terms of content and frequency. Among the typical parameters are:

— Emission of TOC,

— Hydrogen chloride (HCl),

— Hydrogen fluoride (HF),

— Oxides of sulphur ($SO_2$, $SO_3$),

— Emission of PCDDs and PCDFs,

— Oxides of nitrogen ($NO_X$),

— Mercury (Hg).