NATIONAL TECHNICAL REGULATIONS

QCVN 41:2011/BTNMT

ON CO-TREATMENT OF HAZARDOUS WASTE IN CEMENT KYLINGS

National Technical Regulation on Co-processing of

Hazardous Waste in Cement Kiln

Preface

QCVN 41: 2011/BTNMT was compiled by *the Drafting Team of National Technical Regulation on co-processing of hazardous waste in cement kilns ,* approved by the General Department of Environment, Department of Science and Technology, Department of Legal Affairs and issued under Circular No. 44/2011/TT-BTNMT dated December 26, 2011 of the Minister of Natural Resources and Environment.

1. GENERAL PROVISIONS

1.1. Scope of regulation

This regulation specifies technical requirements for the application of co-processing of hazardous waste (hereinafter referred to as HW) in cement kilns.

1.2. Subjects of application

This regulation only applies to facilities and cement production lines applying co-processing.
Hazardous waste in cement kilns (hereinafter referred to as cement facilities co-treating hazardous waste), state environmental management agencies and organizations and individuals related to co-treating hazardous waste in cement kilns.

1.3. Explanation of terms

In this Regulation, the following terms are construed as follows:

1.3.1. *Cement kiln* (hereinafter referred to as *kiln)* is a system for converting raw materials into clinker in a cement production facility, possibly accompanied by a pre-burning and pre-calcining unit.

1.3.2. *Pre-calcining* or *pre-calcining* are processes carried out separately or in combination in the same section attached to the kiln, with the purpose of drying or calcining part or all of the raw material before loading into the kiln.

1.3.3. *Co-processing of hazardous waste in cement kilns* (hereinafter referred to as *hazardous waste co-processing)* is the combination of the cement production process to treat hazardous waste, in which hazardous waste is used as fuel, alternative raw material in cement production or is incinerated by the temperature in the kiln.

1.3.4. *Pretreatment* is the process of preliminary processing or treatment of waste to create a relatively homogeneous waste stream according to certain technical requirements before loading into co-processing.

1.3.5. *Industrial emissions from cement production using CTNH co-treatment* (hereinafter referred to as *CTNH co-treatment emissions)* are a mixture of material components emitted into the air environment from the main chimney of the kiln and the pre-calciner and pre-calciner section using CTNH co-treatment (hereinafter referred to as the main chimney).

1.3.6. *Nm3* (standard cubic meter of exhaust gas) is the cubic meter of exhaust gas at a temperature of 25oC and a pressure of 760 mm Hg.

1.3.7. *Kp* is the power factor corresponding to the total designed capacity of the co-processing cement facility.
CTNH.

1.3.8. *Kv* is the regional coefficient corresponding to the location of the cement facility for co-processing hazardous waste.

1.3.9. *P* is the total designed capacity of the CTNH co-treatment cement facility.

2. TECHNICAL REGULATIONS

2.1. General requirements for cement facilities co-processing hazardous waste

2.1.1. Dry method rotary kiln technology must be used.

2.1.2. Has a location that is not in one of the following areas:

2.1.2.1. Inner city, inner city of special type, type I, II, III, IV (according to the provisions of Decree No. 42/2009/ND-CP dated May 7, 2009 of the Government on urban classification); suburban areas with a distance to the boundary of inner city of special type, type I urban area of less than 05 km (calculated from the base of the main chimney of the cement facility co-processing hazardous waste);

2.1.2.2. Special-use forest areas include: National parks; nature reserves; landscape protection areas; research and scientific experimental forests (according to the provisions of the Law on Forest Protection and Development 2004);

2.1.2.3. Natural heritage sites, historical and cultural relics that are ranked (recognized by UNESCO or established and ranked by decision of the Prime Minister or the competent ministry).

2.1.3. Measures must be taken to cool the exhaust gas from the main chimney to below 200oC (<200°C) before discharging it into the environment.

2.1.4. There must be a system for receiving, temporarily storing and loading waste safely and reasonably according to

regulations. 2.1.5. Meet the technical requirements specified in Appendix 7 of Circular No. 12/2011/TT-BTNMT dated April 14, 2011 of the Minister of Natural Resources and Environment regulating the management of hazardous waste (hereinafter referred to as Circular No. 12/2011/TT-BTNMT).

2.2. Maximum allowable concentrations of pollutant parameters in hazardous waste co-treatment emissions

2.2.1. For general characteristic pollution parameters in cement production industrial emissions applied to CTNH co-processing emissions: Under normal

operating conditions, the maximum allowable concentration of general characteristic pollution parameters in CTNH co-processing emissions is calculated as follows:

$$Cmax = C \times Kp \times Kv$$

In there:

- Cmax is the maximum allowable concentration of common characteristic pollution parameters in the co-processed waste gas, calculated in milligrams per cubic meter of standard waste gas (mg/Nm3);

- C is the concentration used as the basis for calculating the maximum allowable concentration (Cmax) of common typical pollution parameters in the co-processed waste gas, specified in Table 1 of this Regulation; - Kp is specified in Table 2 of

this Regulation; - Kv is specified in Table 3 of this Regulation.

Table 1: Concentration C as the basis for calculating the maximum allowable concentration of common characteristic pollution parameters

STT	**Parameter**	**Concentration C** (mg/Nm3)
1	Total dust	100
2	CO	500
3	NOx (as NO2)	1,000
4	SO2	500

Table 2: Power factor Kp

Total design capacity (million tons/year)	**Kp coefficient**
P ÿ 0.6	1.2
0.6 < P ÿ 1.5	1.0
P > 1.5	0.8

Table 3: Regional coefficient, area Kv

Partition, area		**Kv factor**
Type 1	Areas with a distance to the boundaries of special-use forests, natural heritage sites, historical and cultural relics classified (stated in point 2.1.2 of this Regulation) of less than 05 km.	0.6
Type 2	- Suburban areas have a distance of: 5 km or more to the boundary of the inner city of a special or type I urban area; or less than 5 km to the boundary of the inner city of a type II, III, or IV urban area; - Areas with a distance to the boundary of the suburban area of special or type I urban areas of less than 05 km.	0.8

Type 3	- Industrial parks, industrial clusters; type V urban areas; suburban areas with a distance to the boundary of inner city areas, inner city areas of type II, III, IV from 05 km or more; - Area with distance to the boundary of the regions, this area is below 05 km.	1.0
Type 4	Rural areas outside the above regions and areas.	1.2
Type 5	Rural mountainous areas outside the above regions and areas.	1.4
Note: - The distance specified in Table 3 is calculated from the base of the main chimney of the cement facility that co-processes hazardous waste; - In case the main chimney of the cement facility that co-treats hazardous waste is determined to belong to both types of zones or areas or more, the smallest Kv coefficient in these zones or areas shall be applied.		

2.2.2. For specific pollution parameters in the exhaust gas of the co-processed hazardous waste: Under normal operating conditions, the maximum allowable concentrations of specific pollution parameters in the exhaust gas of the co-processed hazardous waste are specified in Table 4 below.

Table 4: Maximum allowable concentrations of specific pollutant parameters in the co-processing gas of hazardous waste

TT	Parameter	Unit	Maximum allowable concentration
1	HF	mg/Nm3	5
2	HCl	mg/Nm3	50
3	Mercury and compounds, as Hg	mg/Nm3	0.55
4	Cadmium and compounds, as Cd	mg/Nm3	0.16
5	Total other heavy metals: As, Sb, Ni, Co, Cu, Cr, Pb, V, Sn, Mn, Tl, Zn	mg/Nm3	2
6	Total Dioxin/Furan (PCDD/PCDF)	ng-TEQ/Nm3	0.6

2.2.3. In addition to the parameters specified in Table 1 and Table 4, if necessary according to the requirements and purposes of pollution control, the concentrations of other pollution parameters are applied according to the provisions in Table 1 of QCVN 19: 2009/BTNMT - National technical regulation on industrial emissions for dust and inorganic substances.

3. REGULATIONS ON OPERATION, MONITORING AND SUPERVISION

3.1. Trial operation

3.1.1. The trial operation must be conducted in accordance with the provisions of Circular No. 12/2011/TT-BTNMT.

3.1.2. In case of trial operation of co-processing of hazardous waste containing organic halogen components exceeding the threshold specified in QCVN 07: 2009/BTNMT - National technical regulation on hazardous waste threshold (hereinafter referred to as QCVN 07: 2009/BTNMT), it is necessary to monitor the Dioxin/Furan parameters according to the provisions in Table 4 of this Regulation.

3.2. Requirements for preparing hazardous waste for co-processing

3.2.1. Before being loaded into the co-processor, hazardous waste must be stable in terms of quality, quantity and calorific value, as well as uniform in size, properties and chemical composition so as not to affect the normal operation of the furnace, product quality and emissions. Some requirements on CTNH before being loaded into co-processing is guided in Appendix 2 of this Regulation.

3.2.2. Where necessary, hazardous waste must be pre-treated to meet the requirements in point 3.2.1 of this Regulation, including purely mechanical and physical pre-treatment measures to change physical properties (such as reducing size, moisture) or chemical treatment to change composition. Pre-treatment is carried out inside or outside the cement facility that co-treats hazardous waste.

3.2.3. Different hazardous wastes (including those in different states of existence) are allowed to be mixed with each other or with other raw materials, additives, fuels or wastes to meet the requirements at point 3.2.1 of this Regulation, except in cases of incompatibility in chemical properties or that may cause harmful reactions such as fire, explosion or generation of dangerous gases.

3.2.4. Large-scale mixing of wastes may only be carried out after successful laboratory-scale testing.

3.3. Requirements for loading hazardous waste into co-processing

3.3.1. In addition to the general loading procedures of cement production, the loading of hazardous waste into the co-processor must comply with the following specific requirements:

3.3.1.1. Do not charge CTNH when the furnace is in drying mode during start-up or the charge level is below 75% of the optimal operating level;

3.3.1.2. Waste (hazardous and general) containing halogens shall not be fed into the pre-heating or pre-calcining unit;

3.3.1.3. Organic waste (hazardous and general) must not be loaded into the pre-incinerator;

3.3.1.4. Maintain stable CTNH charging level when the furnace runs stably at optimal operating level.

3.3.2. Hazardous waste must be loaded at appropriate locations depending on the nature of each waste stream according to the following options:

3.3.2.1. Hazardous waste is loaded through a separate loading line (for hazardous waste in liquid form such as wastewater, a mist nozzle must be used);

3.3.2.2. Non-volatile solid, liquid, sludge wastes are mixed with raw materials and additives to be supplied through a normal feed line;

3.3.2.3. Liquid HW as alternative fuel is loaded directly or mixed with fuel to be loaded through the burner;

3.3.2.4. In particular, hazardous waste containing organic halogen components exceeding the hazardous waste threshold as prescribed in QCVN 07: 2009/BTNMT or volatile organic compounds must be loaded into the main burner area at the end of the furnace.

3.4. Requirements for furnace shutdown procedures

3.4.1. In case of emergency furnace shutdown, the loading of hazardous waste must be stopped immediately before stopping the loading of traditional raw materials and fuels, and the prescribed furnace shutdown procedure must be strictly followed.

3.4.2. In case of scheduled kiln shutdown, waste loading must be stopped at least 02 hours before the kiln shutdown, switching to using traditional fuels and materials and carrying out the kiln shutdown steps according to regulations.

3.5. Requirements for environmental monitoring and supervision

3.5.1. There must be equipment for continuous automatic monitoring of the co-processing waste gas for at least two parameters: temperature and CO. Other continuous automatic monitoring parameters are managed by the licensing authority.
The licensing authority (hereinafter referred to as the licensing authority) requests depending on the actual situation.

3.5.2. Periodic environmental monitoring is carried out in accordance with the provisions of law and at the request of the environmental impact assessment report approval agency and the licensing authority.

3.5.3. The chimney body must have a gas sampling point with a safe and convenient working platform for sampling; sampling must not be done at the chimney mouth.

3.5.4. Monitoring of Dioxin/Furan parameters is not required except in cases of co-processing of hazardous waste with organic halogen components exceeding the hazardous waste threshold or other necessary cases as required by the environmental impact assessment report approval agency or licensing agency.

4. METHOD OF DETERMINATION

4.1. The method for determining the concentration of pollution parameters specified in this Regulation is carried out according to the following National Standards:

- TCVN 5977: 2009 - Emissions from stationary sources - Determination of dust mass concentration by manual method;

- TCVN 6750: 2000 - Stationary source emissions - Determination of sulfur dioxide mass concentration – Ion gas chromatography;

- TCVN 7172: 2002 - Stationary source emissions - Determination of nitrogen oxide mass concentration - Photometric method using naphthylethylenediamine;

- TCVN 7242: 2003 - Medical solid waste incinerators - Method for determining carbon monoxide (CO) concentration in exhaust gas;

- TCVN 7243: 2003 - Medical solid waste incinerators - Method for determining the concentration of hydrofluoric acid (HF) in exhaust gas;

- TCVN 7244: 2003 - Medical solid waste incinerators - Method for determining hydrochloric acid (HCl) concentration in exhaust gas;

- TCVN 7245: 2003 - Medical solid waste incinerators - Method for determining nitrogen oxide (NOx) concentration in exhaust gas;

- TCVN 7556-1: 2005 - Medical solid waste incinerators - Determination of mass concentration of PCDD/PCDF - Part 1: Sample;

- TCVN 7556-2: 2005 - Medical solid waste incinerators - Determination of mass concentration of PCDD/PCDF - Part 2: Extract and clean;

- TCVN 7556-3: 2005 - Medical solid waste incinerators - Determination of mass concentration of PCDD/PCDF - Part 3: Qualitative and quantitative;

- TCVN 7557-1: 2005 - Medical solid waste incinerators - Determination of heavy metals in exhaust gas - Part 1: General provisions;

- TCVN 7557-2: 2005 - Medical solid waste incinerators - Determination of heavy metals in exhaust gas - Part 2: Method for determining mercury concentration by cold vapor atomic absorption spectrometry;

- TCVN 7557-3: 2005 - Medical solid waste incinerators - Determination of heavy metals in exhaust gas - Part 3: Method for determining cadmium and lead concentrations by flame and flameless atomic absorption spectrometry fire.

4.2. When there are no national standards to determine the concentrations of pollution parameters specified in this Regulation, international standards with equivalent or higher accuracy shall be applied.

4.3. It is permitted to apply international standards with equivalent or higher accuracy to replace the National Standards stated in Section 4.1 of this Regulation.

5. IMPLEMENTATION ORGANIZATION

5.1. When registering and being licensed to practice hazardous waste management, cement facilities that co-treat hazardous waste (except for cement production lines that do not apply hazardous waste co-treatment in these facilities or other auxiliary units) must comply with the provisions of this Regulation; they do not have to comply with the provisions of QCVN 23: 2009/ BTNMT - National technical regulation on industrial emissions from cement production and Clause 2, Article 11 of Circular No. 12/2011/TT-BTNMT (regulations on the number of means of transport).

Cement facilities that co-process hazardous waste that have been operating under a Hazardous Waste Management License before the effective date of this Regulation shall temporarily comply with the provisions of the approved environmental impact assessment report, the issued License, and must upgrade and adjust technically to meet the provisions of this Regulation before January 1, 2014.

5.2. Organizations and individuals shall research and select appropriate types of hazardous waste according to the instructions in Appendix 1 of this Regulation to register for co-processing in cement kilns and prepare registration dossiers, submit them to the licensing authority for consideration and licensing of hazardous waste management practice according to regulations.

5.3. Cement production facilities and lines that meet the technical requirements of this Regulation are allowed to co-process ordinary waste.

5.4. In case the legal documents, National Technical Regulations, National Standards cited in this Regulation are amended, supplemented or replaced, the new documents shall apply.

5.5. The state environmental management agency is responsible for guiding, inspecting and supervising the implementation of this Regulation.

APPENDIX 1:

SELECTION OF HAZARDOUS WASTE FOR CO-PROCESSING IN CEMENT KYLIN

(Attached to QCVN 41: 2011/ BTNMT - National technical regulation on co-treatment of hazardous waste in cement kilns)

1.1. CTNH can be co-processed in cement kilns

1.1.1. Hazardous wastes used as alternative fuels include the following types of hazardous wastes with high calorific value:

- Hazardous waste in liquid form such as: waste oil; waste emulsion; waste organic solvent; waste paint, varnish...

- Solid hazardous wastes such as: wax, waste grease; solid waste containing oil; mixtures of bitumen, coal tar and waste tar; rags; waste materials (wood, sawdust, paper, cardboard, rubber, plastic, leather, fabric...) containing hazardous components; waste adhesives and sealants; waste activated carbon; distillation tower residue...

1.1.2. Hazardous wastes used as alternative raw materials include hazardous wastes containing components suitable for cement production such as: waste sludge; ash, slag, soot, coal dust; ore, clay, stone, sand, gypsum waste containing hazardous components; abrasive materials...

1.1.3. Hazardous wastes intended only for incineration by heat in a furnace without any value as fuel or alternative materials such as: liquid, suspension, wastewater; waste chemicals (including waste pesticides); soil contaminated with chemicals; waste catalysts; waste printing ink...

1.1.4. Hazardous wastes that are a combination of the types specified in points 1.1.1, 1.1.2 and 1.1.3 of this Appendix, including: Hazardous wastes that simultaneously have components suitable for use as raw materials and components suitable for use as fuel; or Hazardous wastes that simultaneously have components suitable for use as raw materials or fuel and components suitable for incineration only.

1.2. Hazardous waste is not co-processed in cement kilns.

Except for special cases specifically considered by the licensing authority, hazardous wastes that cannot be co-processed in cement kilns include: Infectious hazardous wastes or hazardous wastes containing mercury discharged from the medical and veterinary sectors; waste containing asbestos; electrical equipment (including batteries and accumulators), and unclassified and dismantled waste electronics; explosive waste; radioactive waste; and other wastes of unknown composition or not yet identified and classified (including general waste).

APPENDIX 2:

REQUIREMENTS FOR HAZARDOUS WASTE BEFORE CHARGING INTO THE CO-PROCESSOR IN THE FURNACE CEMENT

(Attached to QCVN 41: 2011/ BTNMT - National technical regulation on co-treatment of hazardous waste in cement kilns)

Unless separately tested and reviewed and specifically licensed by the licensing authority on a case-by-case basis, hazardous waste before being loaded into the cement kiln for co-processing must meet or be pre-treated to meet the following requirements on composition and properties:

Parameters	Unit	Limit
pH	-	4-12
CL	%	ÿ 3
S	%	ÿ 3
F	%	ÿ 1
PCB	ppm	ÿ 500
As	ppm	ÿ 100
Cr	ppm	ÿ 1,000
Cu	ppm	ÿ 1,000
Hg	ppm	ÿ 30
Pb	ppm	ÿ 1,000
Sb	ppm	ÿ 1,000
Tl	ppm	ÿ 50
Zn	ppm	ÿ 15,000

APPENDIX 3:

REFERENCES

(Attached to QCVN 41: 2011/ BTNMT - National technical regulation on co-processing of hazardous waste in cement kilns)

1. Law on Environmental Protection, 2005.

2. Law on Technical Standards and Regulations, 2006.

3. Circular No. 12/2011/TT-BTNMT dated April 14, 2011 of the Minister of Natural Resources and Environment regulating the management of hazardous waste.

4. QCVN 07: 2009/BTNMT - National technical regulation on hazardous waste threshold.

5. QCVN 19: 2009/BTNMT - National technical regulation on industrial emissions of dust and inorganic substances.

6. QCVN 23: 2009/BTNMT - National technical regulation on industrial emissions from cement production.

7. QCVN 30: 2010/BTNMT - National technical regulation on emissions from industrial waste incinerators.

8. TCVN 5977: 2009 - Emissions from stationary sources - Determination of dust mass concentration by manual method.

9. TCVN 6750: 2000 - Stationary source emissions - Determination of mass concentration of sulfur dioxide - Ion gas chromatography method.

10. TCVN 7172: 2002 - Stationary source emissions - Determination of nitrogen oxide mass concentration - Photometric method using naphthylethylenediamine.

11. TCVN 7242: 2003 - Medical solid waste incinerators - Method for determining carbon monoxide (CO) concentration in exhaust gas.

12. TCVN 7243: 2003 - Medical solid waste incinerators - Method for determining the concentration of hydrofluoric acid (HF) in exhaust gas.

13. TCVN 7244: 2003 - Medical solid waste incinerators - Method for determining hydrochloric acid (HCl) concentration in exhaust gas.

14. TCVN 7245: 2003 - Medical solid waste incinerators - Method for determining nitrogen oxide (NOx) concentration in exhaust gas.

15. TCVN 7556-1: 2005 - Medical solid waste incinerators - Determination of mass concentration of PCDD / PCDF - Part 1: Sampling.

16. TCVN 7556-2: 2005 - Medical solid waste incinerators - Determination of mass concentration of PCDD/PCDF - Part 2: Extraction and cleanup.

17. TCVN 7556-3: 2005 - Medical solid waste incinerators - Determination of mass concentration of PCDD/PCDF - Part 3: Qualitative and quantitative.

18. TCVN 7557-1: 2005 - Medical solid waste incinerators - Determination of heavy metals in exhaust gas - Part 1: General provisions.

19. TCVN 7557-2: 2005 - Medical solid waste incinerators - Determination of heavy metals in exhaust gas - Part 2: Method for determination of mercury concentration by cold vapor atomic absorption spectrometry.

20. TCVN 7557-3: 2005 - Medical solid waste incinerators - Determination of heavy metals in exhaust gas - Part 3: Method for determination of cadmium and lead concentrations by flame and flameless atomic absorption spectrometry fire.

21. Department of Environmental Protection, 2007. Technical guidance for co-processing hazardous waste in cement kilns.

22. Holcim - GTZ, 2006. Guidelines on Co-processing Waste Materials in Cement Production.

23. Basel Convention, 2011. (Draft) Technical Guidelines on Environmentally Sound Co-processing of Hazardous Waste in Cement Kilns.