

Environmental regulations in ASEAN related to cogeneration projects



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Prepared by EC-ASEAN COGEN Programme (COGEN 3)

COGEN 3 Programme Management Unit
Asian Institute of Technology, Energy Building
Km. 42 Paholyotin Highway
Klong Luang, Phatumthani 12120, THAILAND
Tel. +66 2 524 5399. Fax +66 2 524 5396, Email: cogen3@cogen3.net, Web: www.cogen3.net

COGEN 3 European Focal Point
Carl Bro International AB
Carl Gustafs Väg 4
SE-205 09 Malmö, SWEDEN
Tel. +46 40 25 61 12, Fax +46 40 30 59 44, Email: efp@carlbro.se

The objective of COGEN 3 is to promote the use of proven, clean and efficient cogeneration using biomass, coal or gas as fuel. This is achieved through partnership between ASEAN industries and European equipment suppliers. The programme is co-ordinated in ASEAN by the Asian Institute of Technology (AIT), Bangkok, Thailand and in Europe by Carl Bro International, Sweden. COGEN 3 started its operation in January 2002 and will continue until December 2004.

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Introduction

The environmental regulations for the implementation and operation of cogeneration projects vary from country to country in ASEAN. The main objective of this report is to compile the major environmental regulations relevant for cogeneration projects and provide requirements and standards for Environmental Impact Assessment (EIA) stack emission, ambient air quality, industrial liquid effluent (wastewater discharge) and acceptable noise levels in 7 of the 10 ASEAN countries: Cambodia, Indonesia, Malaysia, Philippines, Singapore, Thailand and Vietnam.

Please note that the purpose of this report is to provide an overview of environmental regulations. Before using the data provided in this report for decision making the original source should be thoroughly checked.

The information on environmental regulations was gathered by the COGEN 3 Country Coordinators:

Cambodia: The Cambodian Research Centre for Development

Indonesia: Research and Development Center for Energy & Electricity Tech (EERDC)

Malaysia: SIRIM Berhad

Philippines: Energy Development & Utilization Foundation, Inc.

Singapore: Energy Ventures Pte. Ltd.

Thailand: The Energy Conservation Center of Thailand (ECCT)

Vietnam: The Research Center for Energy and Environment

1. Environmental Regulations in Cambodia

a) Environmental Impact Assessment Cambodia

If the power generation capacity is more than 5 MW, an Environmental Impact Assessment is required to comply with the Cambodian Sub-decree on Environmental Impact Assessment No 72 date 11 August 1999.

b) Stack emission standards in Cambodia

Pollutant	Standard
Particulate matter	Max 400 mg/ m ³
Sulphur Dioxide (SO ₂)	Max 500 mg / m ³
Nitrogen Oxides (NO _x)	Max 1,000 mg / m ³

Source: Sub-decree on Air Pollution Control and Noise Disturbance adopted by the Council of Ministers on 10 July 2000

c) Ambient air quality standards in Cambodia

Pollutant	Standard
Total Suspended Particles (TSP) 8-Hour average	0.33 mg / m ³
Sulphur Dioxide (SO ₂) 1-Hour average 8-Hour average Annual mean	0.5 mg / m ³ 0.3 mg / m ³ 0.1 mg / m ³
Nitrogen Oxides (NO ₂) 1-Hour average 8-Hour average Annual	0.3 mg / m ³ 0.1 mg / m ³ -
Carbon Monoxide (CO) 1-Hour average 8-Hour average	40 mg / m ³ 20 mg / m ³
Ozone (O ₃) 1-Hour average Annual	0.2 mg / m ³ -
Lead (Pb) 8-Hour average	0.005 mg / m ³

Source: Sub-decree on Air Pollution Control and Noise Disturbance adopted by the Council of Ministers on 10 July 2000

d) Industrial liquid effluent (wastewater discharge) standards in Cambodia

N ^o	Parameters	Unit	Allowable limits for pollutant substance discharging to:	
			Protected public water area	Public water area and sewer
1	Temperature	°C	< 45	< 45
2	pH		6 – 9	5 - 9
3	BOD ₅ (5 days at 200 C)	mg / l	< 30	< 80
4	COD	mg / l	< 50	< 100
5	Total Suspended Solids	mg / l	< 50	< 80
6	Total Dissolved Solids	mg / l	< 1000	< 2000
7	Grease and Oil	mg / l	< 5.0	< 15
8	Detergents	mg / l	< 5.0	< 15
9	Phenols	mg / l	< 0.1	< 1.2
10	Nitrate (NO ₃)	mg / l	< 10	< 20
11	Chlorine (free)	mg / l	< 1.0	< 2.0
12	Chloride (ion)	mg / l	< 500	< 700
13	Sulphate (as SO ₄)	mg / l	< 300	< 500
14	Sulphide (as Sulphur)	mg / l	< 0.2	< 1.0
15	Phosphate (PO ₄)	mg / l	< 3.0	< 6.0
16	Cyanide (CN)	mg / l	< 0.2	< 1.5
17	Barium (Ba)	mg / l	< 4.0	< 7.0
18	Arsenic (As)	mg / l	< 0.10	< 1.0
19	Tin (Sn)	mg / l	< 2.0	< 8.0
20	Iron (Fe)	mg / l	< 1.0	< 20
21	Boron (B)	mg / l	< 1.0	< 5.0
22	Manganese (Mn)	mg / l	< 1.0	< 5.0
23	Cadmium (Cd)	mg / l	< 0.1	< 0.5
24	Chromium (Cr) ⁺³	mg / l	< 0.2	< 1.0
25	Chromium (Cr) ⁺⁶	mg / l	< 0.05	< 0.5
26	Copper (Cu)	mg / l	< 0.2	< 1.0
27	Lead (Pb)	mg / l	< 0.1	< 1.0
28	Mercury (Hg)	mg / l	< 0.002	< 0.05
29	Nickel (Ni)	mg / l	< 0.2	< 1.0
30	Selenium (Se)	mg / l	< 0.05	< 0.5
31	Silver (Ag)	mg / l	< 0.1	< 0.5
32	Zinc (Zn)	mg / l	< 1.0	< 3.0
33	Molybdenum (Mo)	mg / l	< 0.1	< 1.0
34	Ammonia (NH ₃)	mg / l	< 5.0	< 7.0
35	DO	mg / l	>2.0	>1.0
36	Polychlorinated Biphenyl	mg / l	<0.003	<0.003
37	Calcium	mg / l	<150	<200
38	Magnesium	mg / l	<150	<200
39	Carbon tetrachloride	mg / l	<3	<3
40	Hexachloro benzene	mg / l	<2	<2
41	DDT	mg / l	<1.3	<1.3
42	Endrin	mg / l	<0.01	<0.01
43	Dieldrin	mg / l	<0.01	<0.01
44	Aldrin	mg / l	<0.01	<0.01

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N°	Parameters	Unit	Allowable limits for pollutant substance discharging to:	
			Protected public water area	Public water area and sewer
45	Isodrin	mg / l	<0.01	<0.01
46	Perchloro ethylene	mg / l	<2.5	<2.5
47	Hexachloro butadiene	mg / l	<3	<3
48	Chloroform	mg / l	<1	<1
49	1,2 Dichloro ethylene	mg / l	<2.5	<2.5
50	Trichloro ethylene	mg / l	<1	<1
51	Trichloro benzene	mg / l	<2	<2
52	Hexaxhloro cyclohexene	mg / l	<2	<2

Source: Sub-decree on Water Pollution Control No 27 adopted by the Council of Ministers on 6 April 1999

e) Acceptable noise levels in Cambodia

N°	Area	Standard in period of time:		
		From 6:00 to 18:00	From 18:00 to 22:00	From 22:00 to 6:00
1	Public areas: Hospitals Libraries School Kindergarten	45 dBa	40 dBa	35 dBa
2	Residential area: Hotels Administration offices Houses	60 dBa	50 dBa	45 dBa
3	Commercial and service areas and mix	70 dBa	65 dBa	50 dBa
4	Small industrial factories intermingling in residential areas	75 dBa	70 dBa	50 dBa

Source: Sub-decree on Air Pollution Control and Noise Disturbance adopted by the Council of Ministers on 10 July 2000

2. Environmental Regulations in Indonesia

a) Environmental Impact Assessment Indonesia

If the power generation capacity is more than 10 MW, an Environmental Impact Assessment is required.

b) Stack emission standards in Indonesia

Pollutant	Standard
Particulate matter	Max 150 mg/ m ³ (coal)
Sulphur Dioxide (SO ₂)	Max 750 mg / m ³ (coal)
Nitrogen Oxides (NO ₂)	Max 850 mg / m ³ (coal)

Notes: These standards shown for new power plants. Reference condition is 25°C at 1 atm. Particulate corrected at 3% O₂

Source: Ministry of Environment Decree No 13 / 1995.

c) Ambient air quality standards in Indonesia

Pollutant	Standard
Total Suspended Particles (TSP)	
24 Hours	230 µg / Nm ³
1 Hour	90 µg / Nm ³
Sulphur Dioxide (SO ₂)	
1 Hour	900 µg / Nm ³
4 Hour	365 µg / Nm ³
Annual mean	60 µg / Nm ³
Nitrogen Oxides (NO ₂)	
1-Hour average	400 µg/ Nm ³
24 Hour	150 µg/ Nm ³
Annual	100 µg/ Nm ³
Carbon Monoxide (CO)	
1-Hour average	30.000 µg / Nm ³
24-Hour average	10.000 µg / Nm ³
Oxidant (O ₃)	
1-Hour average	235 µg / Nm ³
Annual	50 µg / Nm ³
Lead (Pb)	
24 Hours	2 µg / Nm ³
1 Hour	1 µg / Nm ³

Source: Government Regulation of Indonesia No 41/ 1999

d) Industrial liquid effluent (wastewater discharge) standards in Indonesia

Pollutant	Standard
Ph	5 - 9
BOD ₅	N/A
Heavy Metals (total)	
Arsenic (As)	1.0 mg / l
Cadmium (Cd)	0.01 mg / l
Chromium (Cr)	1.0 mg / l
Chromium (6 valent)	1.0 mg / l
Copper (Cu)	0.2 mg / l
Iron (Fe)	N/A
Lead (Pb)	1.0 mg / l
Manganese (Mn)	2.0 mg / l
Mercury (Hg)	0.005 mg / l
Nickel (Ni)	0.5 mg / l
Selenium (Se)	0.05 mg / l
Zinc (Zn)	2.0 mg / l
Oil & grease	N/A
Total suspended solids (TSS)	N/A
Total Dissolved solids (TDS)	1,000 mg / l
Residual chlorine	N/A
Temperature increase	N/A
Color & odor	Not objectionable
Permanganate Value	N/A
Sulphide as H ₂ S	N/A
Cyanide as HCN	N/A
Formaldehyde	N/A
Phenol & Cresols	N/A
Insecticides	N/A
Tar	N/A
Radioactivity	
Alpha Activity	Bq / l
Beta activity	1.0 Bq / l

Source: Government Regulation of Indonesia No 20/1990

e) Acceptable noise levels in Indonesia

Noise	Standard
Workplace	
Settlement	55 dBa
Business area	70 dBa
Office area	65 dBa
Green Open Air	50 dBa
Industry	70 dBa
Recreation area	70 dBa
Airport	60 dBa
Harbour	70 dBa
Hospital	55 dBa
School	55 dBa
Mosque/ Church	55 dBa

Source: Ministry of Environment Decree No 48, 25 November 1996

3. Environmental Regulations in Malaysia

a) Environmental Impact Assessment Malaysia

If the power generation capacity is more than 10 MW, an Environmental Impact Assessment is required.

b) Stack emission standards in Malaysia

Pollutant	Standard
Particulate matter / Dust	300 mg / Nm ³
Sulphur Dioxide (SO ₂)	200 mg / Nm ³
Nitrogen Oxides (NO ₂)	2.0 gm of SO ₃ / Nm ³

Notes:

These standards shown for new power plants. Reference condition is 25°C at 1 atm. Particulate corrected at 3% O₂

Source: *Malaysia Environmental Requirements: Guide to Investors / 1992*

c) Ambient air quality standards in Malaysia

Pollutant	Standard
Total Suspended Particles (TSP)	
24 Hours	260 µg / Nm ³
1 Hour	90 µg / Nm ³
Sulphur Dioxide	
1 Hour	350 µg / Nm ³
24 Hour	105 µg / Nm ³
Nitrogen Dioxides (NO ₂)	
1-Hour average	320 µg / Nm ³
Carbon Monoxide (CO)	
1-Hour average	35 µg / Nm ³
8-Hour average	10 µg / Nm ³
Ozone (O ₃)	
1-Hour average	200 µg / Nm ³
8-Hour average	120 µg / Nm ³
Lead (Pb)	
3 months average	1.5 µg / Nm ³

Source: *Environment Quality Act 1974 (Act 127) & Subsidiary Regulations, 1998*

d) Industrial liquid effluent (wastewater discharge) standards in Malaysia

Pollutant	Standard
Ph	6 – 9
BOD ₅	20
Heavy Metals (total)	
Arsenic (As)	0.05 mg / l
Cadmium (Cd)	0.01 mg / l
Chromium (Cr)	0.20 mg / l
Chromium (6 valent)	0.05 mg / l
Copper (Cu)	0.2 mg / l
Iron (Fe)	1.0 mg / l
Lead (Pb)	0.10 mg / l
Manganese (Mn)	0.20 mg / l
Mercury (Hg)	0.005 mg / l
Nickel (Ni)	0.20 mg / l
Zinc (Zn)	1.0 mg / l
Oil & grease	Not Detectable
Total suspended solids (TSS)	50 mg / l
Free chlorine	1.0 mg / l
Temperature	40 °C
Sulphide	0.50 mg / l
Cyanide as HCN	0.05 mg / l
Phenol	0.001 mg / l

Source: Environment Quality Act 1974 (Act 127) & Subsidiary Regulations, 1998

4. Environmental Regulations in Philippines

a) Environmental Impact Assessment Philippines

All power generation and cogeneration projects with capacities above 5 MW are required to submit an Environmental Impact Assessment.

b) Stack emission standards in Philippines

Pollutant	Standard
Particulate matter	150 mg / Nm ³ (urban or industrial area) 200 mg / Nm ³ (other area)
Sulphur Dioxide (SO ₂) Existing New	1,500 mg / Nm ³ 700 mg / Nm ³
Nitrogen Oxides (NO ₂) Existing New	1,500 mg / Nm ³ (existing) 1,000 mg / Nm ³ (new coal fired) 500 mg / Nm ³ (new oil fired)

Source: Republic Act No. 8749, 1998

c) Ambient air quality standard in Philippines

Pollutants	Short Term			Long Term		
	µ/m3	ppm	Averaging Time	µ/m3	ppm	Averaging Time
Total Suspended Particles TSP (c)	230 (d)		24 hours	90		1 year (e)
PM-10	150 (f)		24 hours	60		1 year (e)
Sulphur Dioxide (c) (SO ₂)	180	0.07	24 hours	80	0.03	1 year
Nitrogen Dioxide (NO ₂)	150					
Photochemical Oxidants as Ozone (O ₃)	140	0.07	1 hour			
	60	0.03	8 hours			
Carbon Monoxide (CO)	35	30	1 hour			
	10 mg/Nm ³	9	8 hours			
Lead (g)	1.5		3 months (g)	1.0		1 year

Notes:

(a) Maximum limits represented by ninety-eight percentile (98%) values not to exceed more than once a year.

(b) Arithmetic mean

(c) SO₂ and Suspended Particulate matter are samples once every six days when using the manual methods. A minimum of twelve sampling days per quarter or forty-eight sampling days each year is required for these methods. Daily sampling may be done in the future once continuous analyzer are procured and becomes available.

(d) Limits for Total Suspended Particulate Matter with mass median diameter less than 25-50 µm.

(e) Annual Geometric Mean.

- (f) Provisional limits for Suspended Particulate Matter with mass median diameter less than 10 microns and below until sufficient monitoring data are gathered to base a proper guideline.
- (g) Evaluation of this guideline is carried out for 24-hour averaging time and averaged over three moving calendar months. The monitored average value for any three months shall not exceed the guideline value.

d) Industrial liquid effluent (wastewater discharge) standards in Philippines

Please note that the standards are different between new and existing industrial installations.

Parameter	Unit	Inland Waters Class D		Coastal Waters Class SC		Class SD and other Coastal Waters	
		Existing	New	Existing	New	Existing	New
Color	PCU	–	–	Discharge shall not cause abnormal discoloration in the receiving waters outside of mixing zone			
Temperature	°C rise	3	3	3	3	3	3
pH range		5 – 9	6 – 9	6 – 9	6 – 9	5 – 9	5 – 9
COD	mg / L	250	200	250	200	300	200
5-day 20°C BOD	mg / L	150	120	120	100	150	120
Total suspended solids	mg / L	200	150	200	150	< 60 mg/L increase in dry season	< 30 mg/L increase in dry season
Total dissolved solids	mg / L	2,000	4,500	–	–	–	–
Surfactants (MBAS)	mg / L	–	–	15	10	–	–
Oil/grease (petroleum ether extract)	mg / L	–	–	15	10	–	–
Phenolic substances	mg / L	–	–	1.0	0.5	5.0	1.0
Total coliforms	MPN/100mL	500	500	–	–	–	–

Source: The wastewater discharge standards are contained in DENR Administrative Order No. 35 Series of 1990

e) Acceptable noise levels in Philippines

There are new national laws that set new standards in defining residential area noise levels. The implementing rules and regulations that will set the statutory requirements still have to be finalized. Local government units have also taken various initiatives that affect residential and commercial/industrial noise levels.

The Bureau of Labour Standards specifies that use of ear-protective devices for industrial workers that are subject to high noise level.

5. Environmental Regulations in Singapore

a) Environmental Impact Assessment Singapore

If the power generation capacity is more than 5 MW, an Environmental Impact Assessment is required.

b) Stack emission standards in Singapore

Pollutant	Standard
Smoke	Ringelmann No. 2 or equivalent opacity (Not to exceed more than 5 minutes in any period of one hour)
Solid particles	0.20 g / Nm ³ (Corrected to 12% CO ₂)
Sulphuric acid mist or sulphur trioxide	0.10 g / Nm ³ as sulphur trioxide
Nitric acid or oxides of nitrogen	1.0 g / Nm ³ as nitrogen dioxide

Source: Pollution Control Department (PCD), Ministry of the Environment (ENV)

c) Ambient air quality standards in Singapore

Nº	Parameter	1 hr-Averaging Time	8 hr-Averaging Time	24 hr-Averaging Time
1	Carbon Monoxide (CO)	40 mg / m ³	10 mg / m ³	5 mg / m ³
2	Nitrogen Dioxide (NO ₂)	0.4 mg / m ³	-	0.1 mg / m ³
3	Sulphur Dioxide (SO ₂)	0.5 mg / m ³	-	0.3 mg / m ³
4	Lead (particulate)	-	-	0.005 mg / m ³
5	Ozone (O ₃)	0.2 mg / m ³	-	0.06 mg / m ³
6	Suspended particulate matter	0.3 mg / m ³	-	0.2 mg / m ³

Note: Standard methods of analysis of ambient air quality parameters are specified in available current TCvNs.

Acknowledgement: Text courtesy of NEA Policy Division, MOSTE

d) Industrial liquid effluent standards in Singapore

Pollutant	Standard (discharge to watercourse)	Standard (discharge to public sewer)
Temperature	45 °C	45 °C
Ph	6 – 9	6 – 9
BOD ₅	N/A	N/A
Heavy Metals (total)		
Arsenic (As)	1.0 mg / l	5.0 mg / l
Barium (Ba)	5.0 mg / l	10 mg / l
Cadmium (Cd)	0.01 mg / l	1.0 mg / l
Chromium (Cr)	1 mg / l	5.0 mg / l
Chromium (6 valent)	1 mg / l	5.0 mg / l
Copper (Cu)	0.1 mg / l	5.0 mg / l
Iron (Fe)	20 mg / l	50 mg / l
Lead (Pb)	0.1 mg / l	5.0 mg / l
Manganese (Mn)	5.0 mg / l	10 mg / l
Mercury (Hg)	0.05 mg / l	0.5 mg / l
Nickel (Ni)	0.1 mg / l	10 mg / l
Selenium (Se)	0.5 mg / l	10 mg / l
Zinc (Zn)	1.0 mg / l	10 mg / l
Oil & grease	N/A	N/A
Total suspended solids (TSS)	N/A	N/A
Total Dissolved solids (TDS)	2,000 mg / l	3,000 mg / l
Residual chlorine	N/A	N/A
Temperature increase	N/A	N/A
Color & odor	7 lovibond units	-
Permanganate Value	N/A	N/A
Sulphide as H ₂ S	N/A	N/A
Cyanide as HCN	N/A	N/A
Formaldehyde	N/A	N/A
Phenol & Cresols	N/A	N/A
Insecticides	N/A	N/A
Tar	N/A	N/A
Radioactivity		
Alpha Activity	0 Bq / l	0 Bq/l
Beta activity	0 Bq / l	0 Bq/l

Note: The concentration of toxic metal shall not exceed the limit as shown individually or in total.
 Source: NEA, Ministry of Environment Singapore. EDP Annual Report 2003

e) Acceptable noise levels in Singapore

Types of affected Premises	Maximum permitted noise levels		
	Day 7am -7pm	Evening 7pm-11pm	Night 11pm-7am
Noise Sensitive premises	60 dBa	55 dBa	50 dBa
Residential premises	65 dBa	50 dBa	55 dBa
Commercial premises	70 dBa	65 dBa	50 dBa

Source: NEA, Ministry of Environment Singapore. EDP Annual Report 2003

6. Environmental Regulations in Thailand

a) Environmental Impact Assessment Thailand

If the power generation capacity is more than 10 MW, an Environmental Impact Assessment is required to comply with the Thai Government regulations.

b) Stack emission standards in Thailand

Pollutant	Standard
Particulate matter	120 mg / m ³ (coal & oil) 60 mg / m ³ (gas)
Sulphur Dioxide (SO ₂)	640 ppm (coal & oil) 20 ppm (gas)
Nitrogen Oxides (NO ₂)	
Gas fired	120 ppm
Oil fired	180 ppm
Coal fired	350 ppm

Notes: SO₂ standards shown for new power plants < 300 MW. Reference condition is 25°C at 1 atm or 760 mm Hg Excess Air at 50% or Excess O₂ at 7%, dry condition.

Source: Department of Pollution Control May 1995 Directive.

c) Ambient air quality standards in Thailand

Pollutant	Standard
Total Suspended Particles (TSP)	
Annual mean	0.10 mg / m ³ (Geometric mean value)
24-Hour average	0.33 mg / m ³ (Suspended particulate matter)
Sulphur Dioxide	
Annual mean	0.10 mg / m ³ (Geometric mean value)
24-Hour average	0.30 mg / m ³
Nitrogen Oxides (NO ₂)	
1-Hour average	0.32 mg / m ³
Carbon Monoxide (CO)	
1-Hour average	35 mg / m ³
24-Hour average	20 mg / m ³
Photochemical Oxidant (O ₃)	
1-Hour average	0.20 mg / m ³
Lead (Pb)	
Annual average	0.0015 mg / m ³

Source: Notification of Office of the National Environment Board, No.2, dated November 6, B.E.2524, published in the Royal Government Gazette, Vol. 98, Part 197, dated December 1, 1981

d) Industrial liquid effluent (wastewater discharge) standards in Thailand

Pollutant	Standard
pH	5.5 – 9
BOD ₅	60 mg / l (5 day at 20°C)
Heavy Metals (total)	
Arsenic (As)	0.25 mg / l
Barium (Ba)	1 mg / l
Cadmium (Cd)	0.03 mg / l
Chromium (Cr) (Tri valent)	0.75 mg / l
Chromium (hexavalent)	0.25 mg / l
Copper (Cu)	2 mg / l
Iron (Fe)	N/A
Lead (Pb)	0.2 mg / l
Manganese (Mn)	5 mg / l
Mercury (Hg)	0.005 mg / l
Nickel (Ni)	1 mg / l
Selenium (Se)	0.02 mg / l
Zinc (Zn)	5.0 mg / l
Oil & grease	5.0 mg / l
Total suspended solids (TSS)	Depends on dilution ratios of effluent and receiving water 1/8 to 1/150: 30 mg / l 1/151 to 1/300: 60 mg / l 1/301 to 1/500: 150 mg / l
Dissolved solids (DS)	If salinity of receiving water is >2,000 mg / l, DS in effluent is allowed to be up to 5,000 mg / l higher than DS of receiving water
Residual chlorine	N/A
Temperature increase	40°C
Color & odor	Not objectionable
Permanganate Value	60 mg / l
Sulphide as H ₂ S	1.0 mg / l
Cyanide as HCN	0.2 mg / l
Formaldehyde	1.0 mg / l
Phenol & Cresols	1.0 mg / l
Insecticides	None
Tar	None
Radioactivity	None

Source: Notification of Ministry of Industry No. 12 (B.E. 2525) (1982) issued under the Factory Act, published in the Royal Government Gazette. Vol 99, Part 33, dated March 5, 1982

e) Acceptable noise levels in Thailand

Noise	Standard
Workplace	<p><u>1976 Interior Ministry</u> Ear plugs or ear muffs should be used if exposure levels are as follows: 91 dBa for < 7 hrs/day 90 dBa for 7-8 hrs/day 80 dBa for > 8 hrs/day 104 dBa not allowed</p> <p><u>1975 Industry Ministry</u> Ear plugs or ear muffs shall be provided to a worker who works in the factory with noise levels exceeding 80 dBa</p>

Note: No ambient noise standards for non-mobile sources.

Sources:

Notification of the Ministry of Interior, issued under the Announcement of the Revolutionary Party No.103, dated November 12, 1976 (B.E.2519) published in the Royal Government Gazette, Vol. 89, Part 148, dated November 3, 1976

Notification of the Ministry of Industry No. 4 B.E. 2514 issued under the Factory Act B.E. 2512 (1969), dated August 11, 1971 (B.E.2514) published in the Royal Government Gazette Vol.88 (special issue) dated August 14, 1971

7. Environmental Regulations in Vietnam

a) Environmental Impact Assessment Vietnam

If the power generation capacity is more than 10 MW, an Environmental Impact Assessment is required.

b) Stack Emission Standard in Vietnam

Parameters	Maximum Allowable Concentration (MAC)	
	A	B
Particulate in smoke of:		
heating of metals	400 mg / m ³	200 mg / m ³
asphalt concrete plant	500 mg / m ³	200 mg / m ³
cement plant	400 mg / m ³	100 mg / m ³
other sources	600 mg / m ³	400 mg / m ³
Carbon Monoxide (CO)	1,500 mg / m ³	500 mg / m ³
Sulphur Dioxide (SO ₂)	1,500 mg / m ³	500 mg / m ³
Nitrogen Oxides (NO _x) (any source)	2,500 mg / m ³	1,000 mg / m ³

Notes: Column A are applied to the emission gases of existing sources. Column B are applied to all sources imposed from the date which stated by environmental authority

Source: Vietnam standard TCVN 5939 – 1995

c) Ambient air quality standards in Vietnam

Pollutant	Standard
1. Carbon Monoxide (CO)	
1 hour	5 mg / m ³
8 hours	10 mg / m ³
24 hours	40 mg / m ³
2. Sulphur Dioxide (SO ₂)	
1 hour	0.5 mg / m ³
24 hour	0.3 mg / m ³
3. Nitrogen Oxides (NO ₂)	
1 hour	0.4 mg / m ³
24 hours	0.1 mg / m ³
4. Lead (Pb)	
24 hours	0.005 mg / m ³
5. Oxidant (O ₃)	
1 hour	0.2 mg / m ³
24 hours	0.06 mg / m ³
6. Flue dust	
1 hour	0.3 mg / m ³
24 hours	0.2 mg / m ³

Source: Vietnam standard TCVN 5937 – 1995

d) Industrial liquid effluent (wastewater discharge) standards in Vietnam

N°	Parameters and substances	Unit	Limitation values		
			A	B	C
1	Temperature	°C	40	40	45
2	pH value		6-9	5.5-9	5-9
3	BOD ₅ (20°C)	mg / l	20	50	100
4	COD	mg / l	50	100	400
5	Suspended solids	mg / l	50	100	200
6	Arsenic	mg / l	0.05	0.1	0.5
7	Cadmium	mg / l	0.01	0.02	0.5
8	Lead	mg / l	0.1	0.5	1
9	Residual Chlorine	mg / l	1	2	2
10	Chromium (VI)	mg / l	0.05	0.1	0.5
11	Chromium (III)	mg / l	0.2	1	2
12	Mineral oil and fat	mg / l	Not detectable	1	5
13	Animal-vegetable fat and oil	mg / l	5	10	30
14	Copper	mg / l	0.2	1	5
15	Zinc	mg / l	1	2	5
16	Manganese	mg / l	0.2	1	5
17	Nickel	mg / l	0.2	1	2
18	Organic phosphorous	mg / l	0.2	0.5	1
19	Total phosphorous	mg / l	4	6	8
20	Iron	mg / l	1	5	10
21	Tetrachlorethylene	mg / l	0.02	0.1	0.1
22	Tin	mg / l	0.2	1	5
23	Mercury	mg / l	0.005	0.005	0.01
24	Total nitrogen	mg / l	30	60	60
25	Trichlorethylene	mg / l	0.05	0.3	0.3
26	Ammonia (as N)	mg / l	0.1	1	10
27	Fluoride	mg / l	1	2	5
28	Phenol	mg / l	0.001	0.05	1
29	Sulphide	mg / l	0.2	0.5	1
30	Cyanide	mg / l	0.05	0.1	0.2
31	Coliform	MPN/100ml	5,000	10,000	-
32	Gross α activity	Bq/l	0.1	0.1	-
33	Gross β activity	Bq / l	1.0	1.0	-

Notes:

Industrial waste waters containing the values of parameters and concentrations of substances which are equal to or lower than the values specified in the column A (table 1) may be discharged into the water bodies using for sources of domestic water supply.

Industrial waste waters containing the values of parameters and concentration of substances which are lower than or equal to those specified in the column B (table 1) are discharged only into the water bodies using for navigation, irrigation purposes or for bathing, aquatic breeding and cultivation, etc.

Industrial waste waters containing the values of parameters and concentrations of substances which are greater than those specified in the column B but not exceeding those specified in the column C (table 1) are discharged only into specific water bodies permitted by authority agencies.

Source: Vietnam standard TCVN 5945 - 1995

e) Acceptable noise levels in Vietnam

Area	Standard		
	from 6 h to 18 h	from 18 h to 22 h	from 22 h to 6 h
Hospital, library, sanatorium, kindergarten, school, church, pagoda	50 dBa	45 dBa	40 dBa
Residential area, hotel, pleasure-house, Office area	60 dBa	55 dBa	50 dBa
Residential area insert in commerce area, service, manufacture	75 dBa	70 dBa	50 dBa

Source: Vietnam standard TCVN 5949 - 1995