

7.2 Combustion Installation from 1 to 50MW

7.2.1 Coverage

This section covers emissions from boiler installations and gas turbines with a net thermal input between 1 and 50MW_{th}. In the following, the term “boilers” is meant in contrast to combustion engines or turbines and includes all kinds of boilers and process heaters.

The following installations are not covered by this section:

- Plant in which the products of combustion are used for direct heating, drying, or any other treatment of objects or materials, e.g. reheating furnaces, furnaces for heat treatment;
- Post-combustion plant, i.e. any technical apparatus designed to purify the waste gases by combustion that is not operated as an independent combustion plant;
- Facilities for the regeneration of catalytic cracking catalysts;
- Facilities for the conversion of hydrogen sulphide into sulphur;
- Reactors used in the chemical industry;
- Coke battery furnaces;
- Cowpers;
- Waste incinerators; and
- Plant powered by diesel, petrol or gas engines, irrespective of the fuel used (For information about stationary engines see document "Stationary Engines" 7-42)

7.2.2 Combustion technologies

Within the sector, the technologies used for the combustion of liquid and gaseous fuels are similar to those for production of thermal energy in industrial combustion activities.

For the combustion of solid fuels and biomass mainly fixed bed combustion technology, i.e. grate-firing, is applied.

Fluidized bed combustion technologies are also used in the sector. This technology is most appropriate for co-combustion of coal with biomass and/or with waste fuels, or combustion of biomass.[1]

Gas turbines are used for the transformation of thermal energy into mechanical energy. They use a steady flow of a gas (mostly air), compressed and fired with gaseous or liquid fuel.

7.2.3 Available Techniques, Associated Emission Levels (AEL)

Emissions within the sector strongly depend on the fuel, combustion technologies as well as on operational practices and maintenance. For solid fuels specific emissions are higher in smaller than in larger plants. For gaseous and liquid fuels, the emissions are not significantly higher in comparison to industrial scale boilers due to the quality of fuels and design of burners.[1]

7.2.3.1 SO₂

Table 1 Emission sources and selected SO₂ control measures with associated range of emission levels (solid and liquid fuels) resp. upper emission level (gaseous fuels) in combustion installations between 1 and 50MW_{th} [2]

Emission source	Control measures	SO ₂ emission level (mg/Nm ³)
Solid fuel		
Boilers other than FBC	Use of low-sulphur fuel, Sorbent injection, Flue gas desulphurization,	[50-1000]
Fluidized bed combustion (FBC)	Use of low-sulphur fuel, Sorbent injection, Flue gas desulphurization,	[50-400]
Liquid fuel		
Boilers	Use of low-sulphur fuel, Sorbent injection, Flue gas desulphurization	[50-850]
Gaseous fuel		
Boilers: Refinery gas	Use of low-sulphur fuel,	[100]
Boilers: Liquefied gas	Sorbent injection,	[5]
Boilers: Other gaseous fuel	Flue gas desulphurization	[35]
If not stated otherwise, values are daily averages assuming an oxygen content by volume in the waste gas of 3 % in the case of liquid and gaseous fuels, 6 % in the case of solid fuels.		

[Comment: The values in the previous table need to be reviewed, especially concerning a distinction between new and existing installations.]

If emission reduction measures are regarded, for low sulphur fuels a level of 700 mg/Nm³ can be reached, for sorbent injection a level of 200 - 400 mg/Nm³ and for desulphurisation a level; of 50 – 200 mg/Nm³.

7.2.3.2 NO_x

Table 2 Emission sources and selected NO_x control measures with associated upper emission levels in combustion installations between 1 and 50MW_{th} [1], [2]

Emission source	Control measures	NO _x emission level (mg/Nm ³)
Solid fuel		
Grate firing	Low-NO _x burner Air staging Flue gas recirculation Boiler design	[< 200-400]
Pulverized coal	Low-NO _x burner Air staging Flue gas recirculation Boiler design	[< 200-400]
Fluidized bed combustion	Air staging Flue gas recirculation Boiler design	[< 200-500]
	SNCR	[< 50-100]
Liquid fuel		
Boiler	Low-NO _x burner Air staging Flue gas recirculation Boiler design	[< 200-300]
Gaseous fuel		
Boiler	Low-NO _x burner Air staging Flue gas recirculation Boiler design	[< 200]
Existing Gas-Turbines		
Fuel: natural gas	Water and steam injection or SCR	[50-120]
Fuel: diesel oil or process gas	Water and steam injection or SCR	
New Gas-Turbines		
Fuel: natural gas	Dry low-NO _x premix burner or SCR	[20-50]
Fuel: diesel oil or process gas	Wet controls SCR	[...]
If not stated otherwise, values are daily averages assuming an oxygen content by volume in the waste gas of 3 % in the case of liquid and gaseous fuels, 6 % in the case of solid fuels and 15 % in the case of gas turbines.		

Comment: The values in the previous table need to be reviewed, especially concerning a distinction between new and existing installations.

7.2.3.3 Dust

Table 3 Emission sources and selected dust control measures with associated range of emission levels in boiler installations between 1 and 50MW_{th} [1]

Emission source	Control measures	Dust emission level (mg/m ³)	
		new	existing
Solid fuel, 1- < 5	Cyclone	< 50	< 100
	ESP	5 - 20	5 - 30
	FF	5 - 20	5 - 20
Solid fuel, 5 - < 50	ESP	5 - 20	5 - 30
	FF	< 5 - 20	< 5 - 20
Liquid fuels, 1- < 5	ESP	5 - 50	5 - 50
	FF	< 5 - 20	< 5 - 20
	Use of low ash fuel	< 5 - 50	< 5 - 50
Liquid fuels, 5 - < 50	ESP	5 - 20	5 - 50
	FF	< 5 - 20	< 5 - 20
Gaseous fuels		2 - 5	2 - 5
If not stated otherwise, values are daily averages assuming an oxygen content by volume in the waste gas of 3 % in the case of liquid and gaseous fuels, 6 % in the case of mineral solid fuels, 11 % in the case of wood			

7.2.4 References used in chapter 7.2

1 European Commission: Kubica. K; Paradiz. B; Dilara. P: Small combustion installations: Techniques, emissions and measures for emission reduction, 2007

2 German TA Luft - Technische Anleitung zur Reinhaltung der Luft, Erste Allgemeine Verwaltungsvorschrift zum Bundes-Immissionsschutzgesetz, Germany

The association for British Furniture Manufacturers: Benchmarking wood waste combustion in the UK furniture manufacturing sector, 2005