Application of BAT in China

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中创碳投
SINOCARBON INNOVATION & INVESTMENT

Main Contents

1、Pollutant control policies -pollutant permit

2、BAT for pollutant control in power sector

Part I：Pollutant control policies -pollutant permit

The background of pollutant permit system

Local pilots for the pollutant permit

A total of 240,000 pollutant permits have been issued in 28 provinces

"Implementation Plan for the Permission System for Controlling the Discharge of Pollutants" (No. 81 [2016], General Office of the State Council) was issued.

Late 1980s

September 2016

November , 2016

System positioning is not clear

The responsibility is not fully implemented

Supervision is insufficient

To further improve the management efficiency and promote environment protection

Part I：Pollutant control policies -pollutant permit

The development of pollutant permit system

Policies and regulations

- In Nov. of 2016, Implementation Plan for the Permission System for Controlling the Discharge of Pollutants
- In July of 2017, Directory of Classified Management on Pollutant Permits of Stationary Sources （ MEP 45 ）
- In Jan. of 2018, Measures for Pollutant Discharge Permitting Administration(For Trial Implementation) (MEP 48)

Technical standards

- From 2016, Technical specification for application and issuance of pollutant permit for different sectors
- From 2008 to 2014, incorporated Discharge standard of water pollutants for pulp and paper industry, Emission standard of air pollutants for thermal power plants and boilers, etc.
- From 2010 onwards, Guideline on BAT of pollution prevention and control for the power, iron & steel and paper making sector

Part I：Pollutant control policies -pollutant permit

Main subjects of Directory of Classified Management

Scope：

Covers three major industries, including 32 sectors, 78 small and medium subsectors, and 4 general processes

Types of pollutants:

Sulfur dioxide, nitrogen oxide, soot(dust), COD, ammonia-nitrogen

Management methods：

Key management + simplified management

Implementation time:

From 2017 onwards, different time limits for different sectors, By 2020, covers all stationary sources.

Part I：Pollutant control policies -pollutant permit

Main subjects of Measures for Pollutant Discharge Permitting Administration

General requirements：

For the application, issuance, implementation, supervision and penalty.

Competent authorities:

MEP and local department of EP

Main contents of the pollutant permits：

1. Basic information
2. Production information
3. Pollutant sources and prevention
4. Pollutant information

Online application and management:

Management information platform of pollutant permits

Part II: BAT for pollutant control in power sector

Emission standards and technical guidelines for pollutants in the power sector

- Emission standard of air pollutants for thermal power plants （GB13223-2011）
- Comprehensive discharge standard of sewage（GB8978-2017）
- Technical specification for application and issuance of pollutant permit for thermal power industry (2017)
- Guideline on available technologies of pollution prevention and control for thermal power plant（HJ2301-2017）
- Self-monitoring guidelines for pollution sources—Thermal power generation and boiler (HJ 820-2017)

Part II: BAT for pollutant control in power sector

Emission standard of air pollutants for thermal power plants（GB13223-2011）

Table1 Emission Concentration Limits of Atmospheric Pollutants from Boilers and Gas Turbines (mg/m^3)

Fuel and facility type	type of pollutants	Scope of application	Limits	Pollutant emission monitoring location
coal-fired boiler	soot	all	30	A chimney or duct
	Sulfur dioxide	New boiler	100,200(1)	
		Existing Boiler	200,400(1)	
	Nitrogen oxides (in NO_2 terms)	all	100,200(2)	
	Mercury and its compounds	all	0.03	
Boilers or steam turbines fueled by gases	soot	Natural Gas Boiler and Turbines	5	A chimney or duct
		Other Gas Fuel Boilers and Turbines	10	
	Sulfur dioxide	Natural Gas Boiler and Turbines	35	
		Other Gas Fuel Boilers and Turbines	100	
	Nitrogen oxides (in NO_2 terms)	Natural gas Boilers	100	
		Other Gas Fuel Boilers	200	
		Natural Gas Turbines	50	
		Other Fuel Gas Turbines	120	

Note: (1) Thermal power boilers located in Guangxi, Chongqing, Sichuan Province and Guizhou Province implement this limit.

(2) This limit applies to thermal power boilers with W type flame , existing CFB thermal power boilers and thermal power boilers which have been put into operation or approved by environmental impact report before December 31, 2003 .

Part II: BAT for pollutant control in power sector

Key factors for the determination of emission standard

Research and forecast

1. Current situation and development trends for the power sector
2. Pollutant emission status and development as well as requirements for pollutant control

Compare with international standards

1. Standards in EU, US, Japan, etc.
2. EU: Directive on the limitation of emissions of certain pollutants into the air from large combustion plants (2001/80/EC)

Technology development in the pollutant prevention and control

1. flue gas desulfurization and denitrification
2. **flue gas dust removal**

Part II: BAT for pollutant control in power sector

- **Comprehensive implementation of ultra-low emission and energy-saving mechanism of coal-fired power plants**

  MEP (2015, No.164)

Soot (mg/m^3)	sulfur dioxide(mg/m^3)	nitrogen oxide(mg/m^3)
10	35	50

1. Applied to newly built coal-fired power plants
2. For the existing coal-fired power plants, below the limits before 2020

Part II: BAT for pollutant control in power sector

Available technology of prevention and control for gas pollutants

Types of pollutant r emoval	Feasible technology	Features and applicability	Removal efficiency
flue gas dust removal	electrostatic precipitation	1. Wide range application with low cost 2. Dust removal efficiency is greatly influenced by the coal type and ash content and takes up large area	The dust removal efficiency is 99.2% ~99.85%, a nd the outlet soot concentration can reach below 20mg/m^3.
	Electrostatic-fabric integrated precipitation	1. Stable low emission, low maintenance cost and takes up small area 2. Wide range application, especially for the coal with high silicon, aluminum, ash, high specific resistance, low sulfur, low sodium and low moisture content.	The dust removal efficiency is 99.50% and 99.99%, and the outlet dust concentration can reach below 20mg/m^3.
	Fabric filter dedusting system	1. Stable low emission and takes up small area 2. Wide range application	The dust removal efficiency is 99.50% and 99.99%, and the outlet dust concentration can be controlled below 30mg/m3 or 20mg/m^3

Part II: BAT for pollutant control in power sector

Available technology of prevention and control for gas pollutants

Types of pollutant removal	Feasible technology	Features and applicability	Removal efficiency
flue gas desulfurization	limestone-gypsum wet flue gas desulphurization (FGD)	1. Wide range application, technology is mature with stable operation 2. Strong adaptability to the coal types and load capacity, and can meet the emission standard of SO_2 when the inlet concentration of SO_2 is lower than that of 12000mg/m^3.	The desulfurization efficiency is 95.0%~99.97%. SO_3, particulate matter and heavy metals in flue gas can also be partially removed.
	circulating fluidized bed flue gas desulfurization	1. Simple process flow, takes up small area, save energy and water, no waste water generation 2. Suitable for CFD units, especially for water shortage areas.	The desulfurization efficiency is 93.0% to 98%. The emission limit can be reached when the inlet SO_2 concentration of flue gas in absorption tower is lower than 3000mg/m^3 and the ultra-low emission limit can be reached with 1500mg/m^3
	ammonia-based flue gas desulfurization	1. It is energy saving and the dust concentration for inlet flue gas should be below 35mg/m^3. 2. It has wide adaptability to sulfur content in coal. It is suitable for coal-fired units with stable nitrogen sources within 200 km , and without environmental sensitive targets such as schools, hospitals and residential areas.	The desulfurization efficiency is 95.0% to 99.7%. The emission limit can be reached when the inlet flue gas concentration is lower than 15000mg/m^3 and the ultra-low emission limit can be reached with 10000mg/m^3
	Seawater desulfurization	1. Using seawater as absorbent with easy maintenance 2. Applicable for sulfur content in coal below 1% and the costal plant	The desulfurization efficiency is 95.0% to 99%. The ultra-low emission limit can be reached when the inlet SO_2 concentration is below 2000mg/m^3

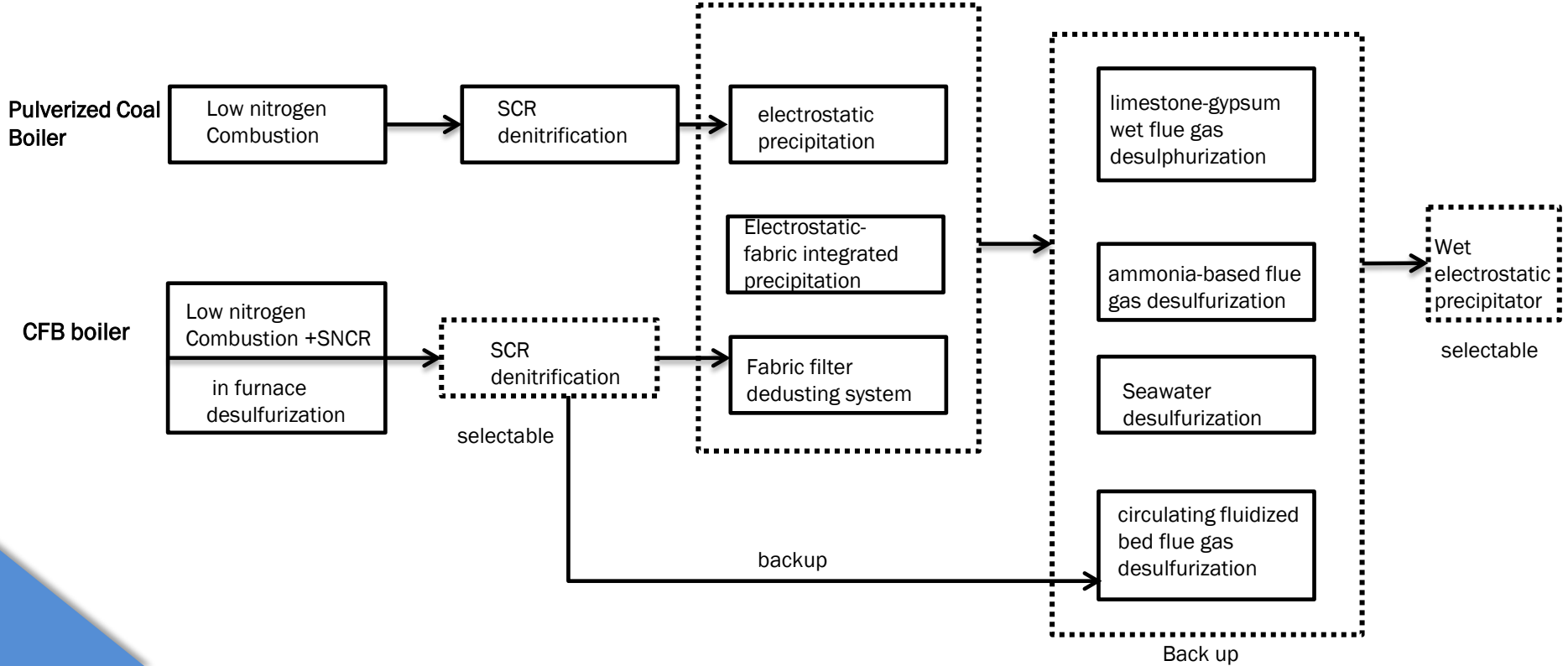
Part II: BAT for pollutant control in power sector

Available technology of prevention and control for gas pollutants

Types of pollutant removal	Feasible technology	Features and applicability	Removal efficiency
Flue Gas denitrification	Low nitrogen Combustion	1. Easily modified, with low cost and easy maintenance. 2. Wide range application and is the first choice to control NOx.	The emission reduction rate of NOx can be up to 20% to 50%.
	SCR denitrification	1. Located between economizer and air heater, with space requirement and higher initial and maintenance cost 2. It has strong adaptability to the change of coal quality and the fluctuation of load capacity.	The emission reduction rate of NOx is 50% to 90%.
	SNCR denitrification	1. No need for catalytic reactor, takes up small area, with lower initial cost and easy maintenance. 2. Strict requirement for temperature and poor adaptability to load capacity changes, suitable for small pulverized and circulating fluidized bed (CFD) boilers.	The denitrification efficiency is 30% to 40% for pulverized coal boilers, and 60% to 80% for CFD boilers

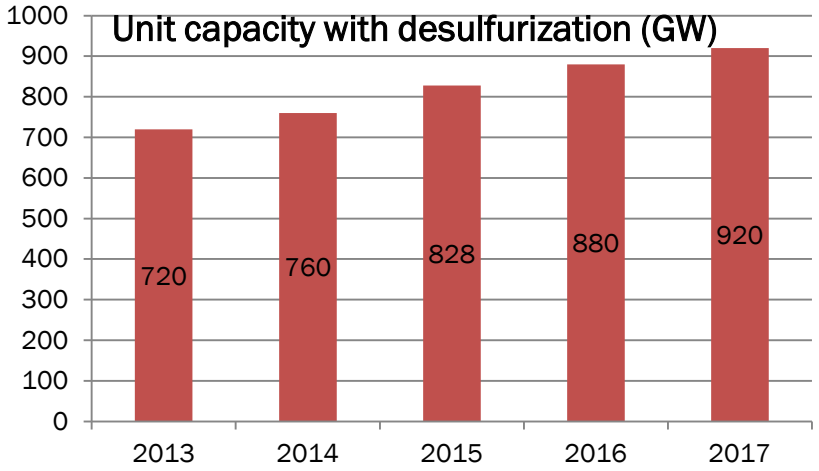
Part II: BAT for pollutant control in power sector

BAT to reach ultra-low emissions for the coal-fired power plants

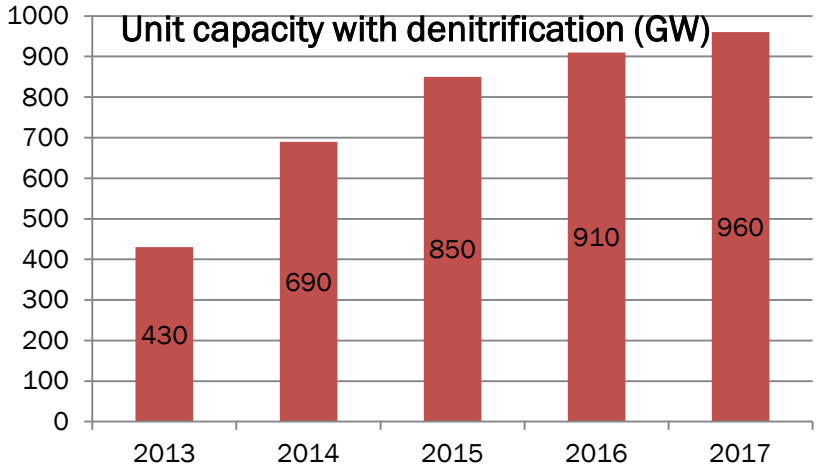


Part II: BAT for pollutant control in power sector

Development for the desulfurization and denitrification



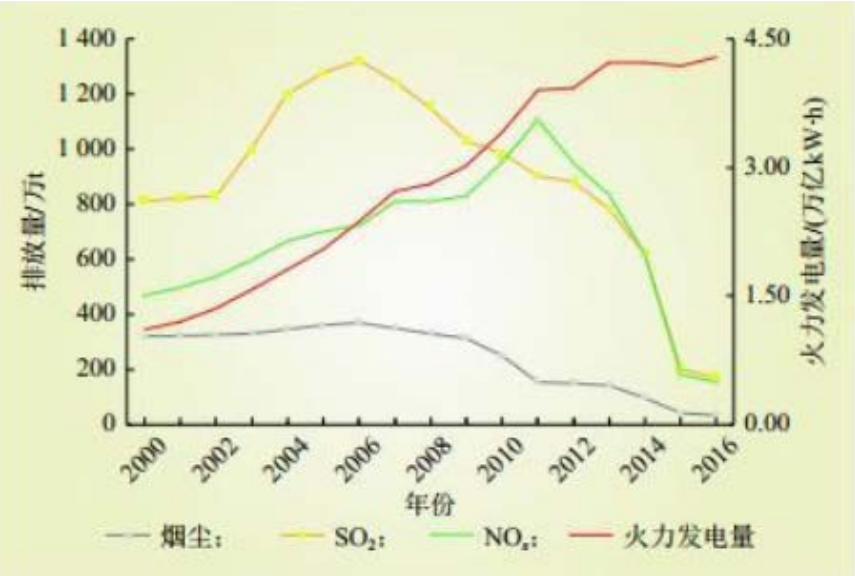
At the end of 2017, the unit capacity with desulfurization takes up about 93.9% to the total coal-fired power plants



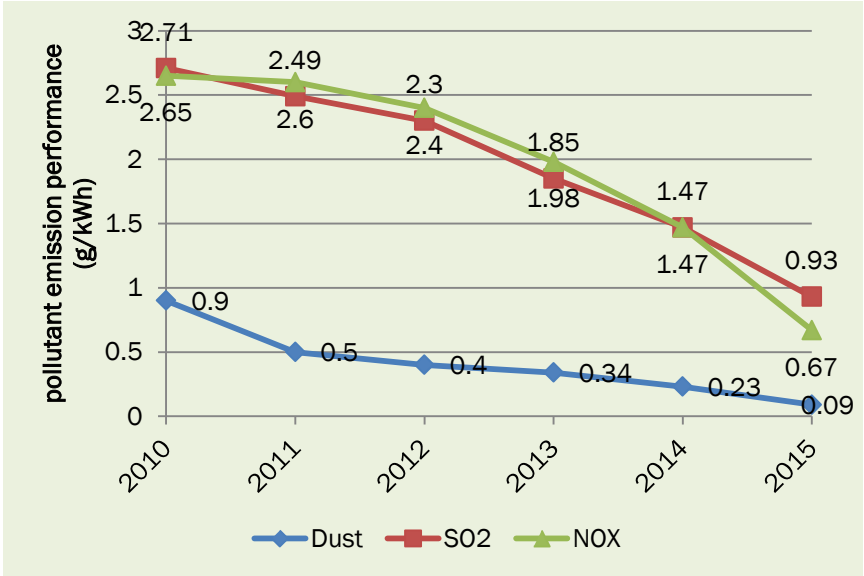
At the end of 2017, the unit capacity with denitrification takes up about 98% to the total coal-fired power plants

Part II: BAT for pollutant control in power sector

Effects for the application of pollutant control technology



1. The dust emission in 2016 is 0.35 million tons, less than 10% of 2006 summit
2. The SO_2 emission in 2016 is 1.7 million tons, 13% of 2006 summit
3. The NO_x emission in 2016 is 1.5 million tons, 14% of 2011summit.



1. The dust emission intensity declines by 90% in 2016 compared with 2010
2. The SO_2 emission intensity declines by 66% in 2016 compared with 2010
3. The NO_x emission intensity declines by 75% in 2016 compared with 2010

THANKS

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