

The Ultra-Low Emission Transformation of China's Steel Industry and Its Key Techniques

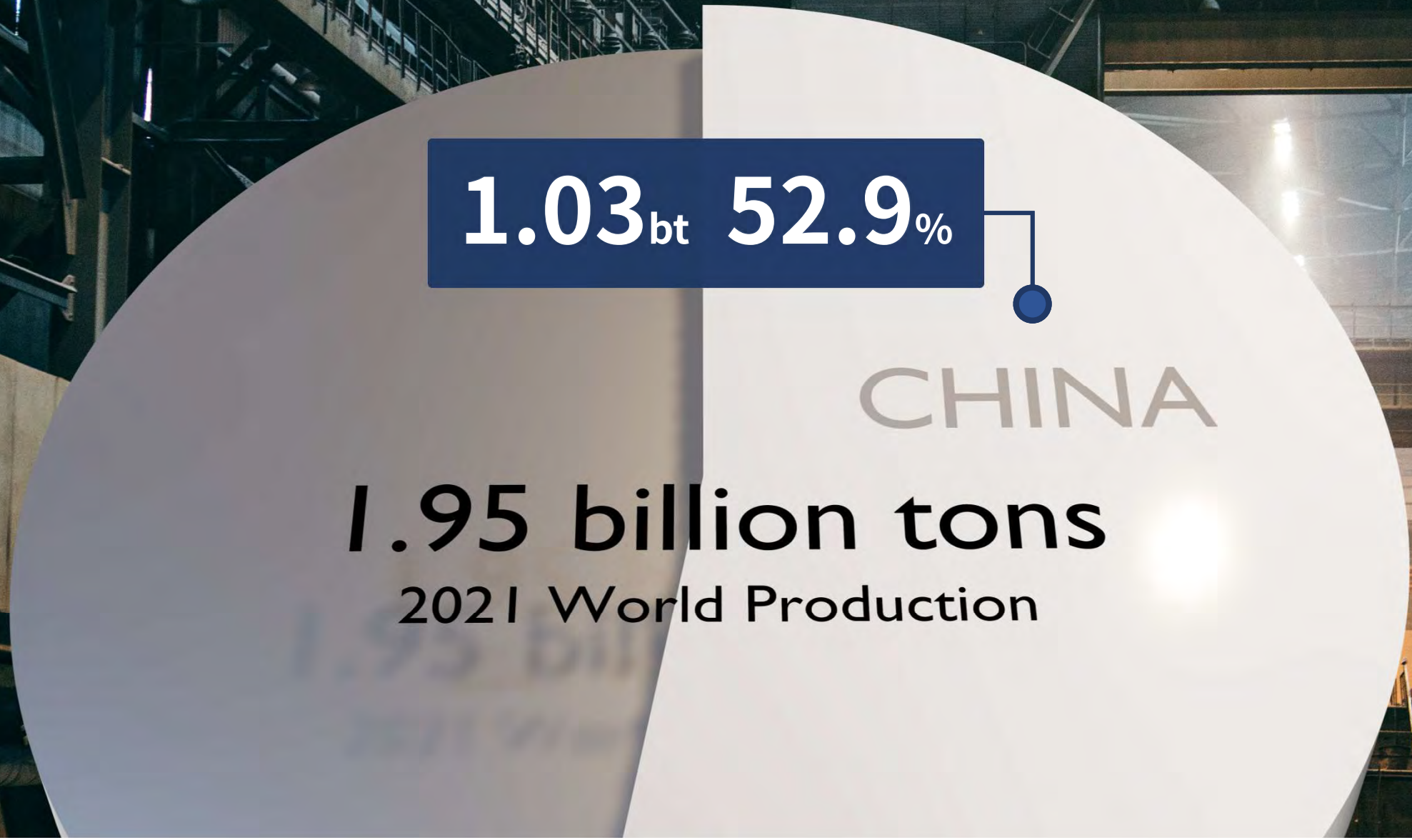


WISDRI Engineering & Research Incorporation Limited



A photograph of a large industrial facility, likely a steel mill, with multiple levels, walkways, and bright lighting. The scene is filled with complex machinery and structural elements, creating a sense of scale and industrial activity.

Since 1996, China has become the country with the largest steel production capacity in the world



1.03_{bt} 52.9%

CHINA

1.95 billion tons

2021 World Production

Largest industrial emission source in China

2017 data

1.06_{mt} 7%

SO₂ Emission

1.7_{mt} 10%

NO_x Emission

2.8_{mt} 20%

PM Emission

Top 20 cities with highest steel production

2017 data

42% Over

PM_{2.5} air quality limit

28% Higher

National average

Major emission standards of iron and steel industry in China





Comparison of national emission limits (mg/Nm³) - Sintering and Pelletizing

	Austria	French	German	US	Vietnam existing	Vietnam new-built	China existing	China new-built	China special
PM	10	100	10	60	100	50	80	50	40
SO ₂	350	300	500	90	500	500	600	200	180
NO _x	350	500	100	-	750	500	500	300	300
Dioxin (ng-TEQ)	0.1	-	0.4	-	0.5	0.1	1	0.5	0.5
Fluoride	3	-	-	-	10	10	6	4	4

Comparison of national emission limits (mg/Nm³) - Blast furnace ironmaking

	German	Japan	US existing	US new-built	UK	Vietnam existing	Vietnam new-built	China existing	China new-built	China special
PM (Cast house)	20	30	22.9	6.9	20	100	50	50	25	15
PM (Stove)	10	100	-	-	10	100	50	50	20	15
PM (Raw material)	20	20	18.32	11.45	20	100	50	50	25	10
SO ₂ (Stove)	-	-	-	-	250	500	500	100	100	100
NO _x (Stove)	-	-	-	-	350	750	500	300	300	300

ICS
Z

中华人民共和国

炼钢工业大气
Emission standard of air po
(发

本电子稿为发布稿。请以中国环境

2012-06-27 发布

环境保
国家质量监督

ICS
Z 63

中华人民共和国国家标准
GB 28665—2012

轧钢工业大气污染物排放标准

Emission standard of air pollutants for steel rolling industry
(发布稿)

本电子稿为发布稿。请以中国环境科学出版社出版的正式标准
文本为准。

2012-06-27 发布

环境保
国家质量监督检验检疫总局 发布

2012-10-01 实施

Comparison of national emission limits (mg/Nm³) - Steelmaking

	German existing	German new- built	Japan	US	Vietnam existing	Vietnam new-built	China existing	China new- built	China special
PM (Primary fuel gas)	50	20	-	22.9	100	50	100	50	50
PM (Secondary fuel gas)	20	20	-	11.9	100	50	50	20	15
PM-EAF	-	5	20	11.45	-	-	50	20	15
Dioxin (ng-TEQ)	0.5	0.5	0.5	0.5	0.5	0.1	1	0.5	0.5

Comparison of national emission limits (mg/Nm³) - Rolling

	German	Japan	Vietnam existing	Vietnam new-built	China existing	China new-built	China special
PM (rolling dedust)	20	20	100	50	30	20	15
PM (furnace for heat treatment)	-	-	100	50	30	20	15
SO ₂ (furnace for heat treatment)	350	-	500	500	250	150	150
NO _x (furnace for heat treatment)	350	-	750	500	350	300	300



On Promoting The Implementation Of Ultra-low Emission In The Steel Industry

2019 MEE, NDRC, MIIT, MOF, MOT

On Promoting The Implementation Of Ultra-low Emission In The Steel Industry

All new-built

shall approach ULE level in principle

>60%

shall approach ULE level by the end of 2020

>80%

shall approach ULE level by the end of 2025

100% in key regions

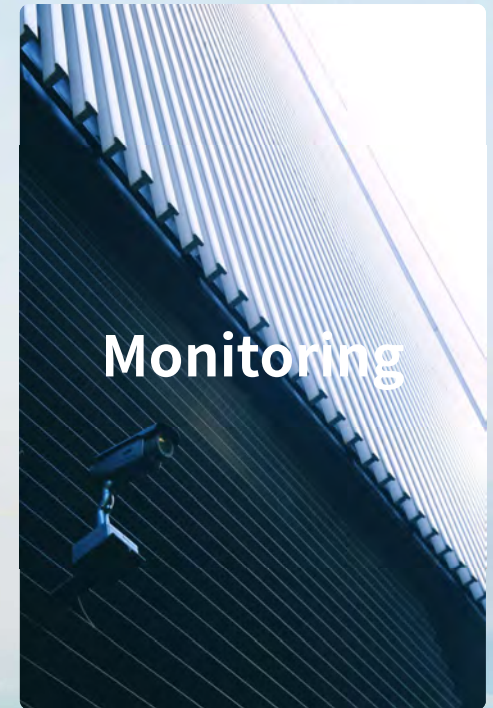
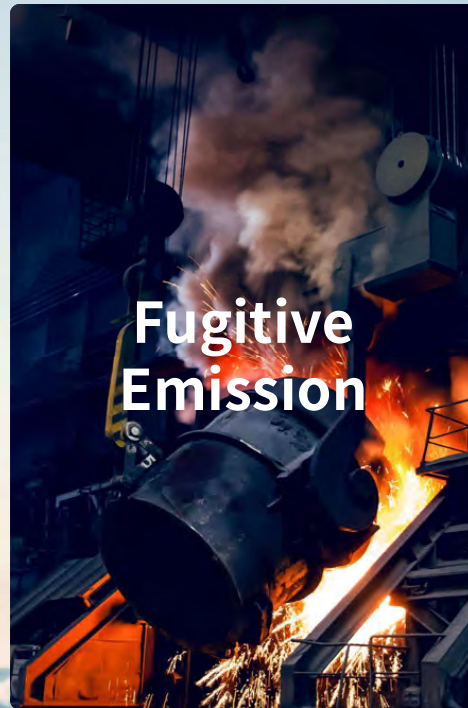
On Promoting The Implementation Of Ultra-low Emission In The Steel Industry

462
enterprises

681 mt/a
production capacity



On Promoting The Implementation Of Ultra-low Emission In The Steel Industry





Organized
Emission

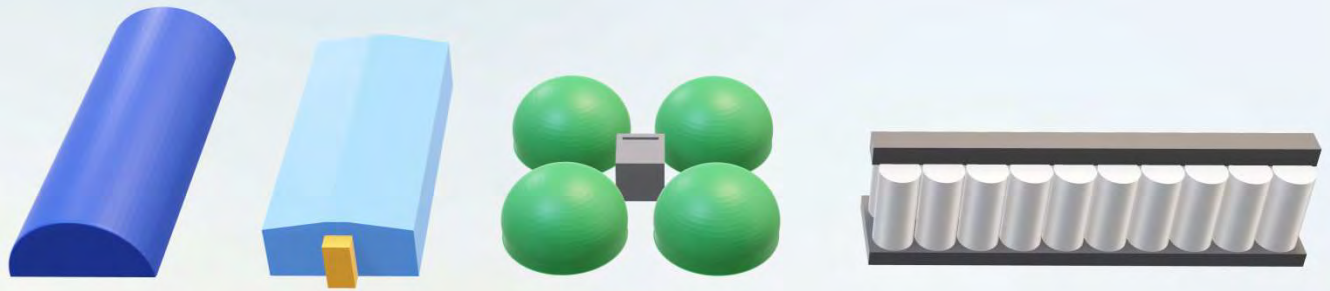
The most stringent emission limits of long-process steel production

Procedure	Facility	Reference oxygen content (%)	PM Limit	SO ₂ Limit	NO _x Limit
Sintering & Pelletizing	Sintering machine head	16	10	35	50
	Shaft furnace pelletizing				
Pelletizing	Grate kiln, Belt type pelletizing	18	10	35	50
	Sintering machine tail, others	-	10	-	-
Coking	Coke oven chimney	8	10	30	150
	coal loading and coke pushing	-	10	-	-
	Dry quenching	-	10	50	-
Ironmaking	Stove	-	10	50	200
	Cast house, Ore bin	-	10	-	-
Steelmaking	Pre-treatment, Secondary fuel gas of converter, EAF, Lime kiln, Dolomite kiln	-	10	-	-
Rolling	Furnace for heat treatment	8	10	50	200
Power plant	Gas boiler	3	5	35	50
	Coal boiler	6	10	35	50
	CCPP	15	5	35	50
	Oil boiler	3	10	35	50



Fugitive Emission

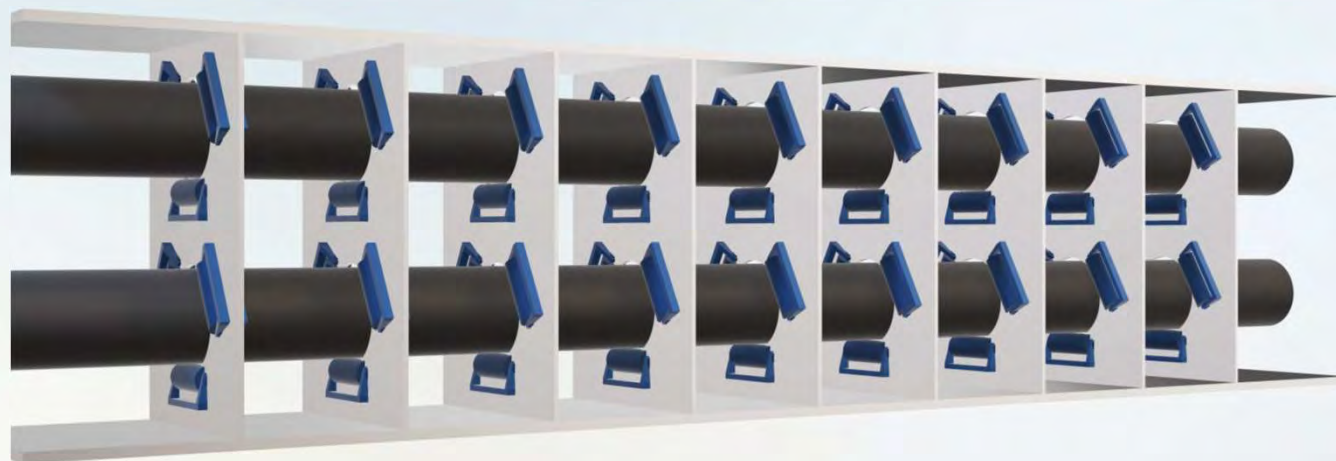
Full enhancement of fugitive emission controlling in material storage processes



Powdery materials should be stored in silos or storage tanks; Massive or sticky materials should be stored in sealed off silos or sheds; Dry slag storage procedure should adopt dust suppression measures such as water spraying



Full enhancement of fugitive emission controlling in material handling processes

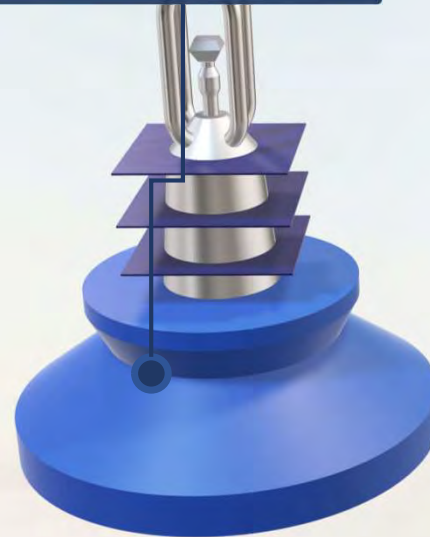


Powdery materials should be transported in an enclosed manner by means of tubular belt conveyors, pneumatic conveying equipment and tank trucks; Lumpy or viscous materials should be transported in tubular belt conveyors or other airtight manners.



Full enhancement of fugitive emission controlling in production processes

Enclosed cast house platform



Tertiary de-dust of steelmaking workshop





Clean Shipping

>80%

clean transportation (railway, water transport, pipeline or tubular belt conveyors)

China VI

Vehicles that meet China VI emission standard should be adopted



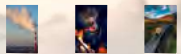


Monitoring

**Automatic monitoring
DCS system**

**Self-monitoring
Public disclosure**

**High definition
video surveillance facilities**

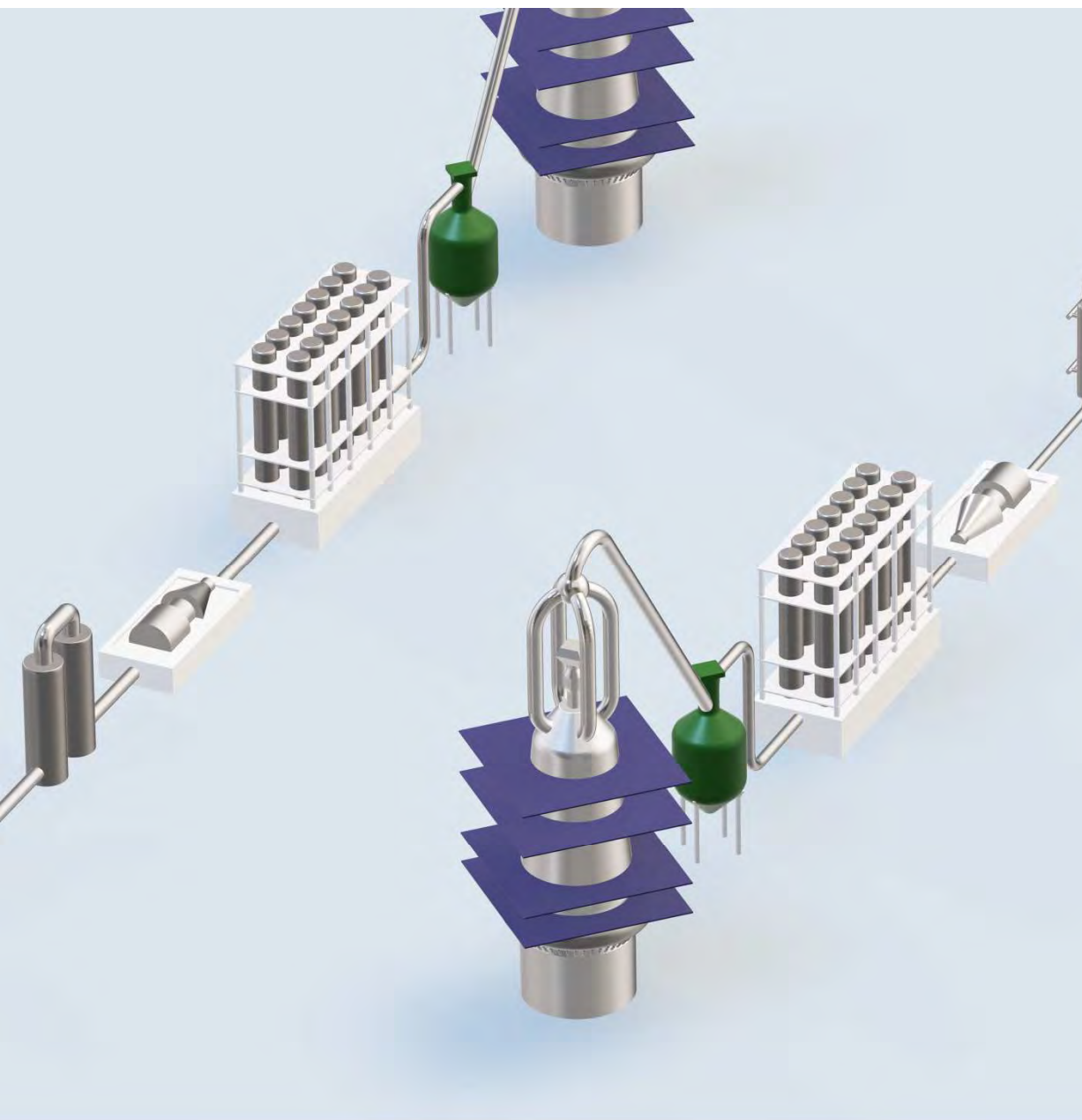




**Source
Reduction**

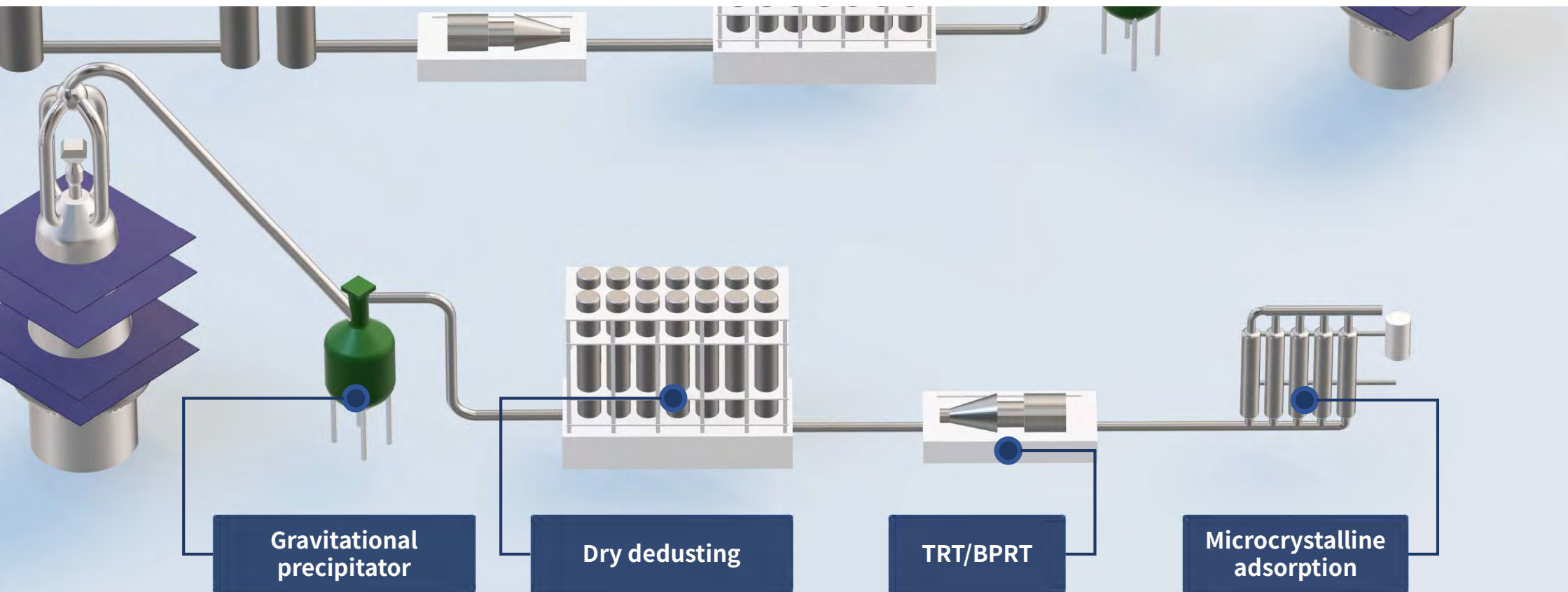


**Terminal
Control**



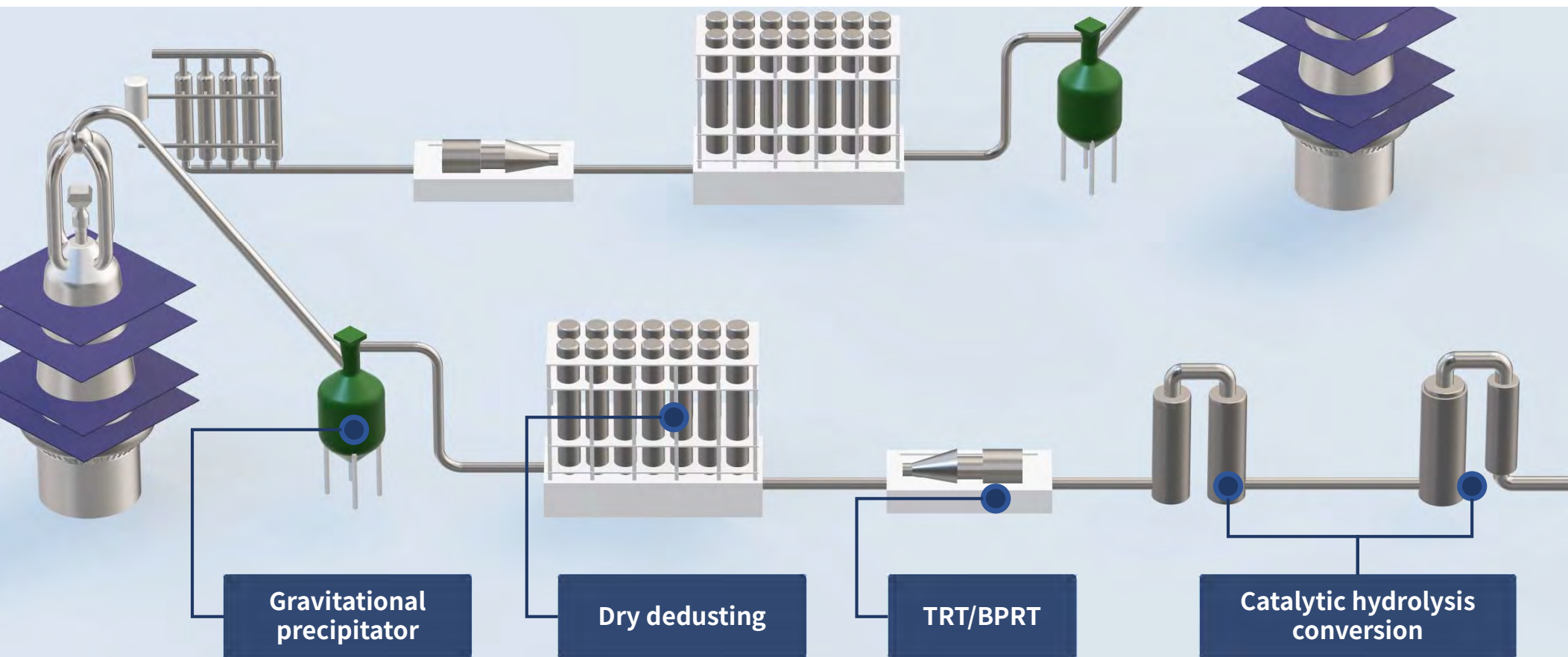
Key Source Reduction Techniques

Fine desulfurization for BFG



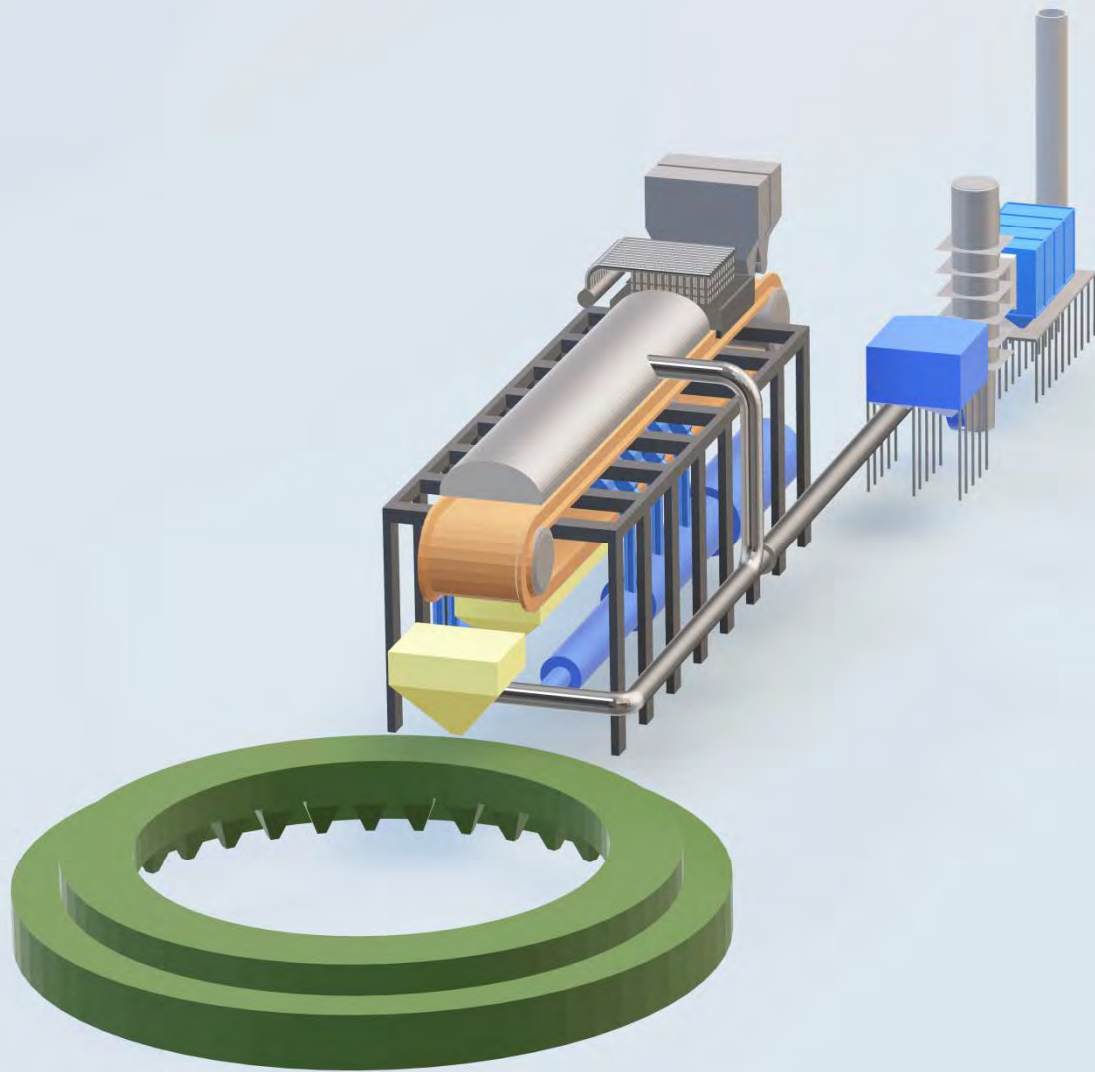
Microcrystalline adsorption

Full-solid-phase reaction; No sewage



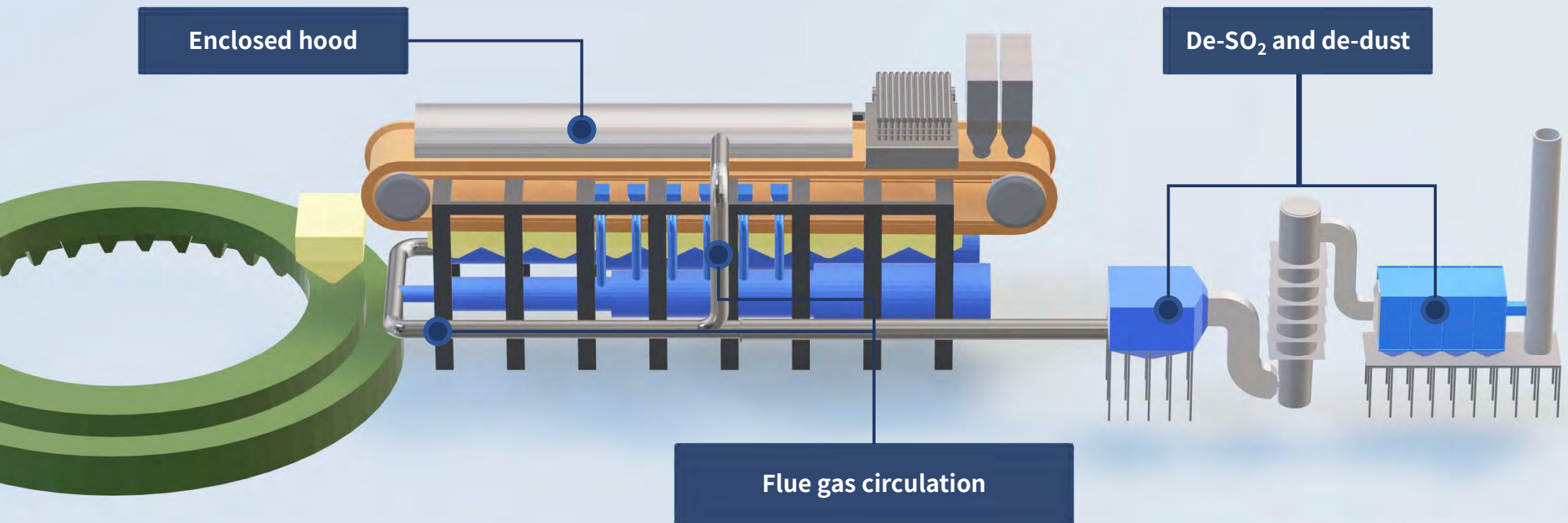
Catalytic hydrolysis conversion(CHC)

Converts COS to inorganic sulfur (H_2S)



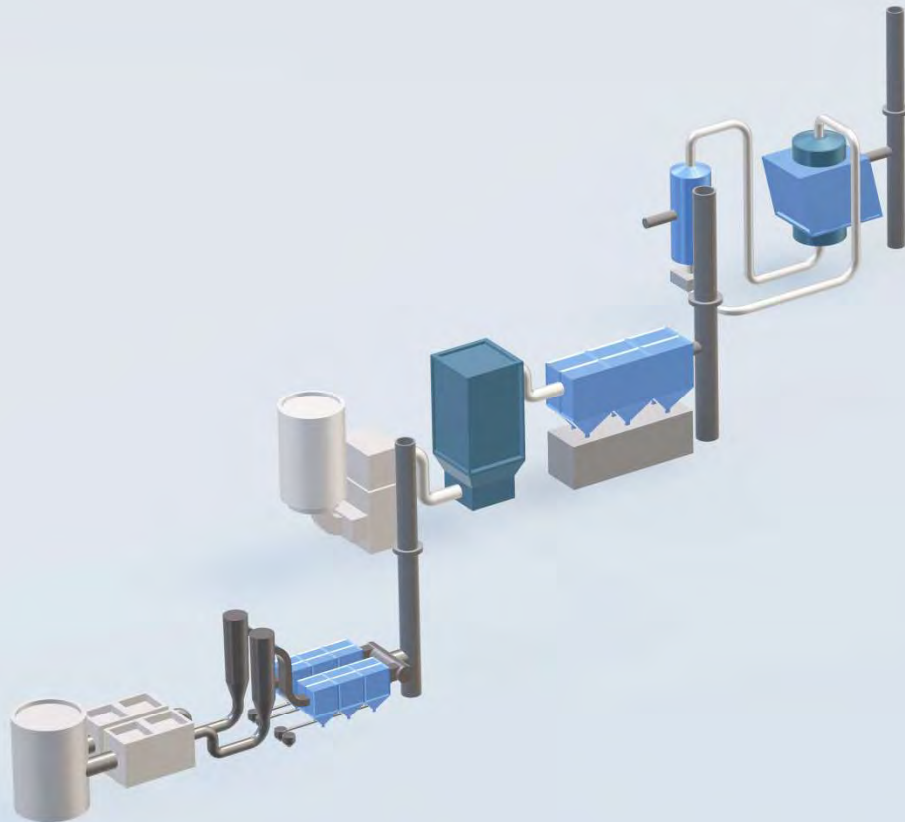
Key Source Reduction Techniques

Flue gas circulation technology of sintering machine



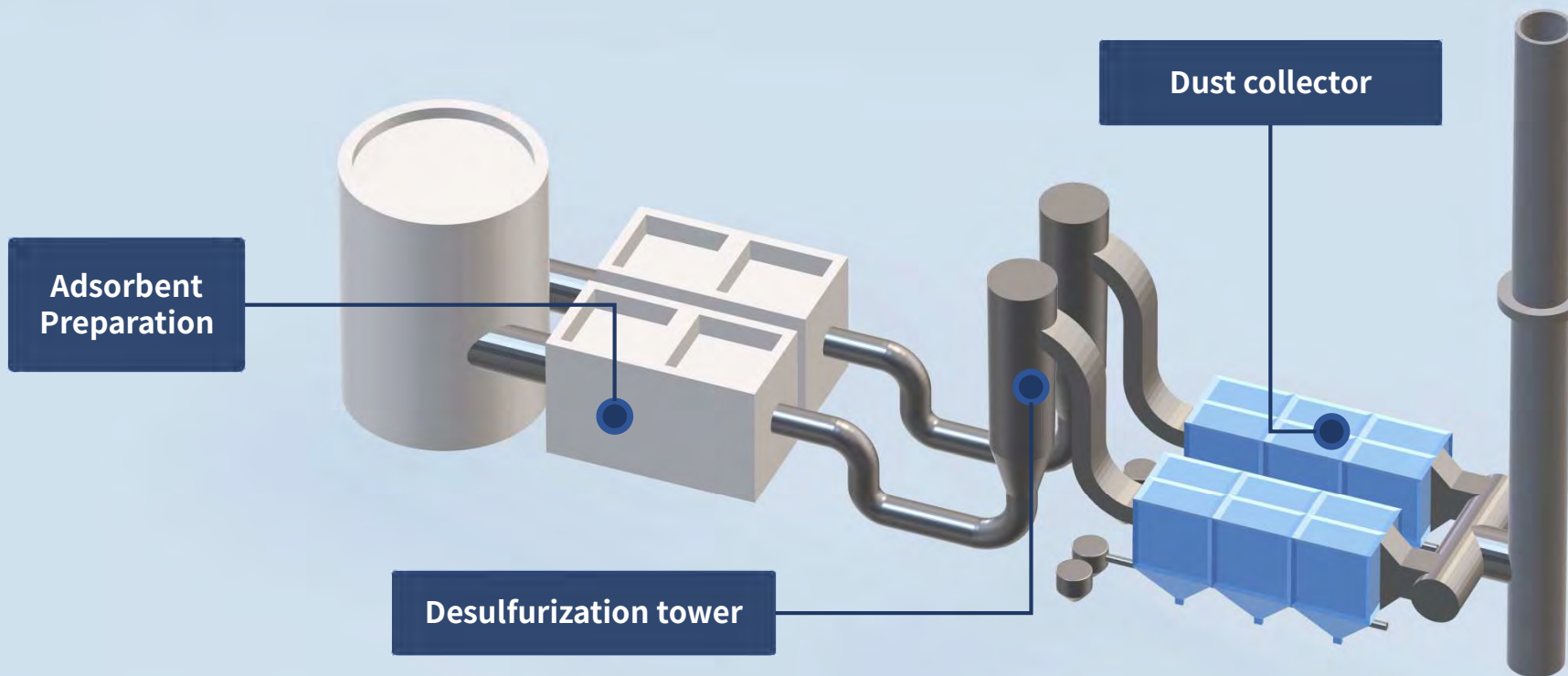
Flue gas circulation technology

Enriched SO₂, reduce toxic components, save energy



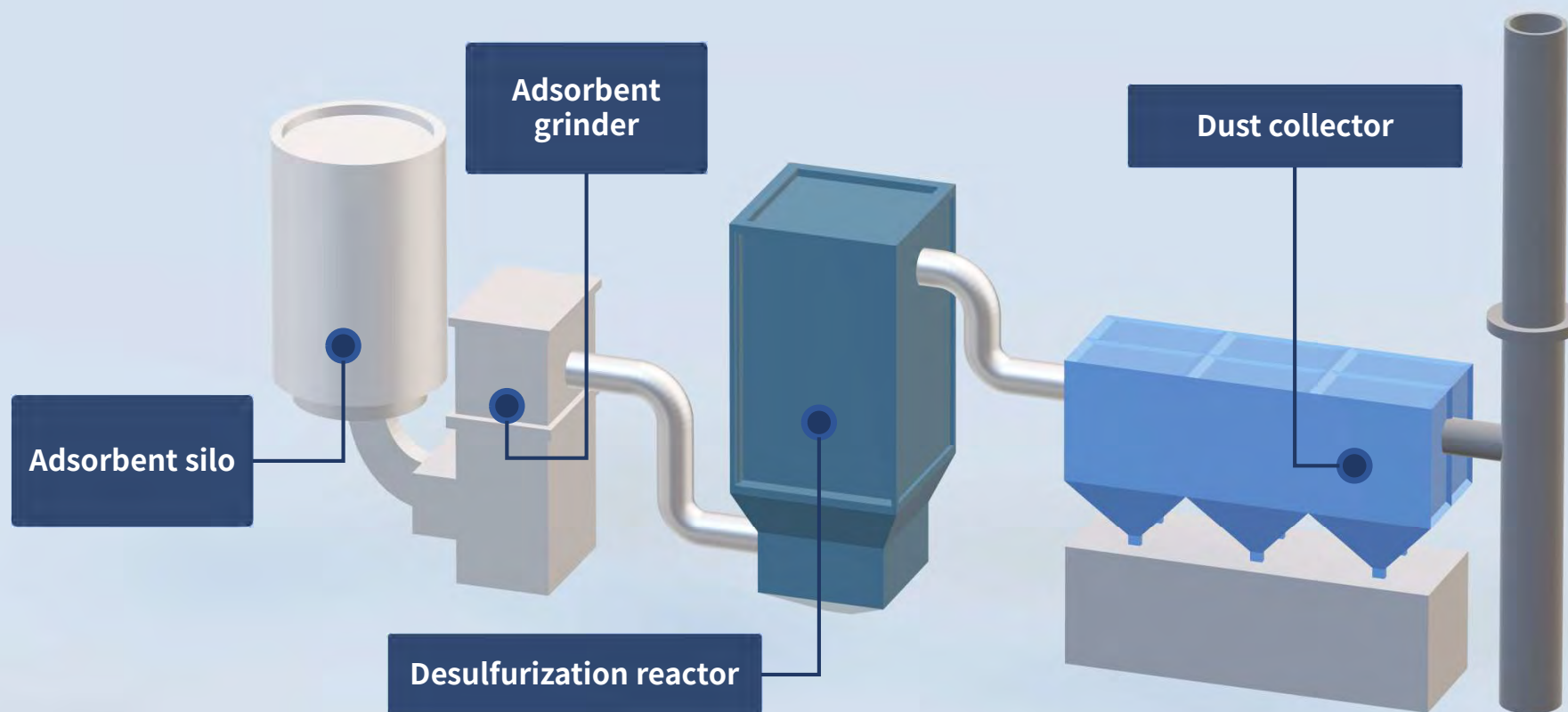
Key Terminal Control Techniques

Semidry and dry desulfurization



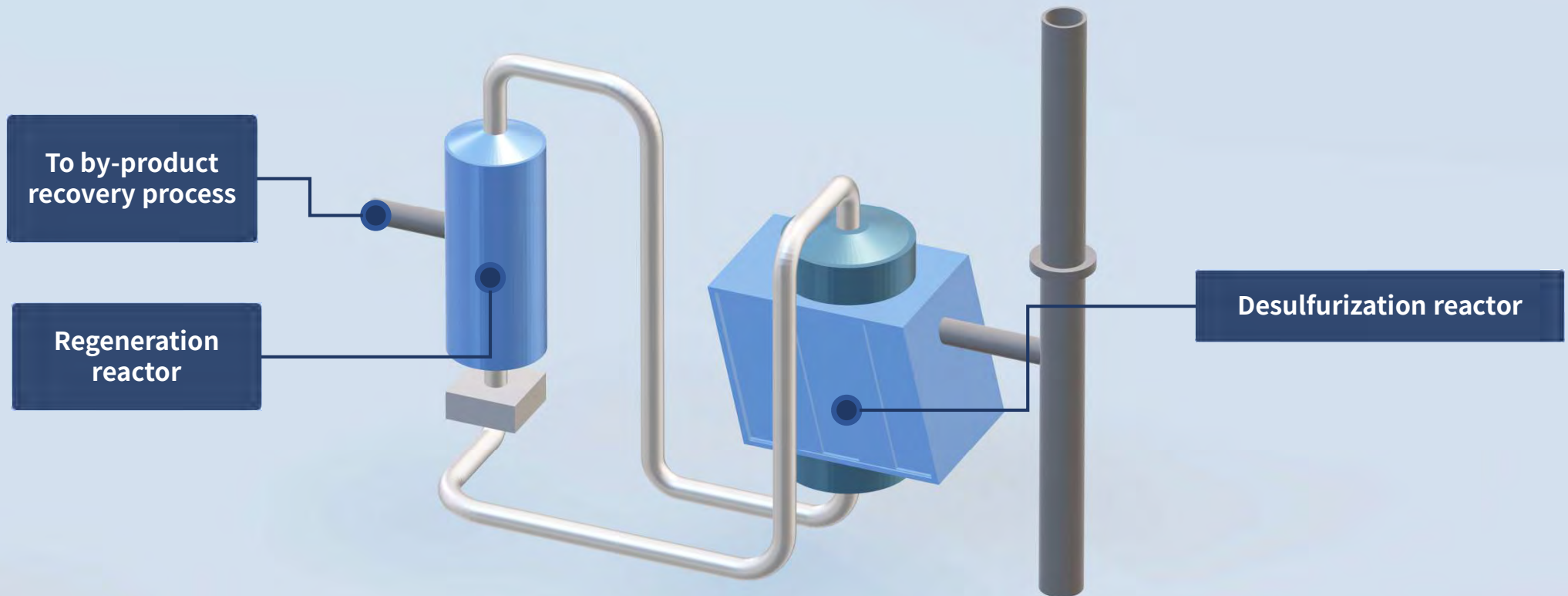
Circulating Fluidized Bed (CFB)

Semidry process
Less prone to fouling and blocking
No desulfurization sewage
High desulfurization efficiency with a lower Ca/S ratio



Sodium bicarbonate Dry powder Spray (SDS)

Na-based dry desulfurization process
Less prone to fouling and blocking
No desulfurization sewage

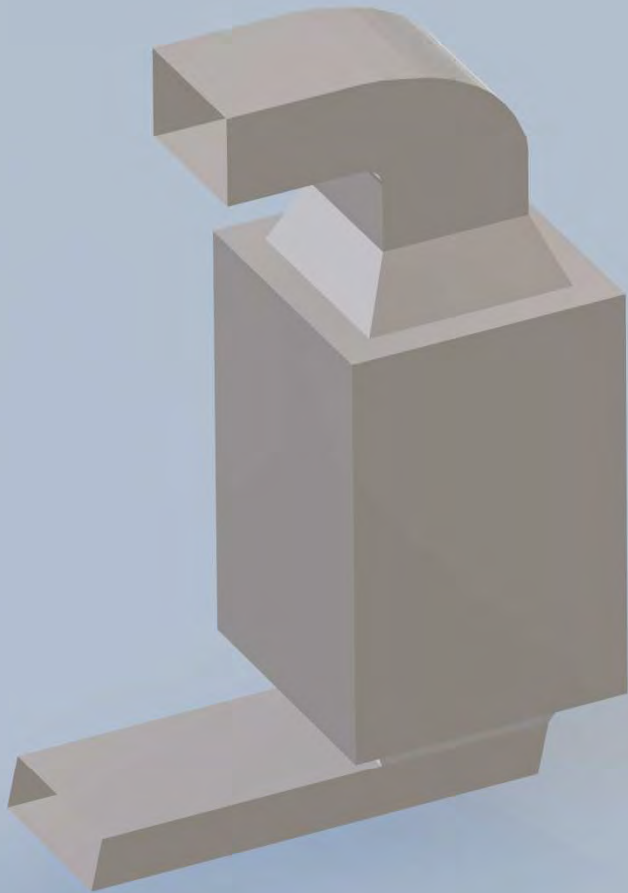


Activated Coke Desulfurization (ACD)

Dry desulfurization process

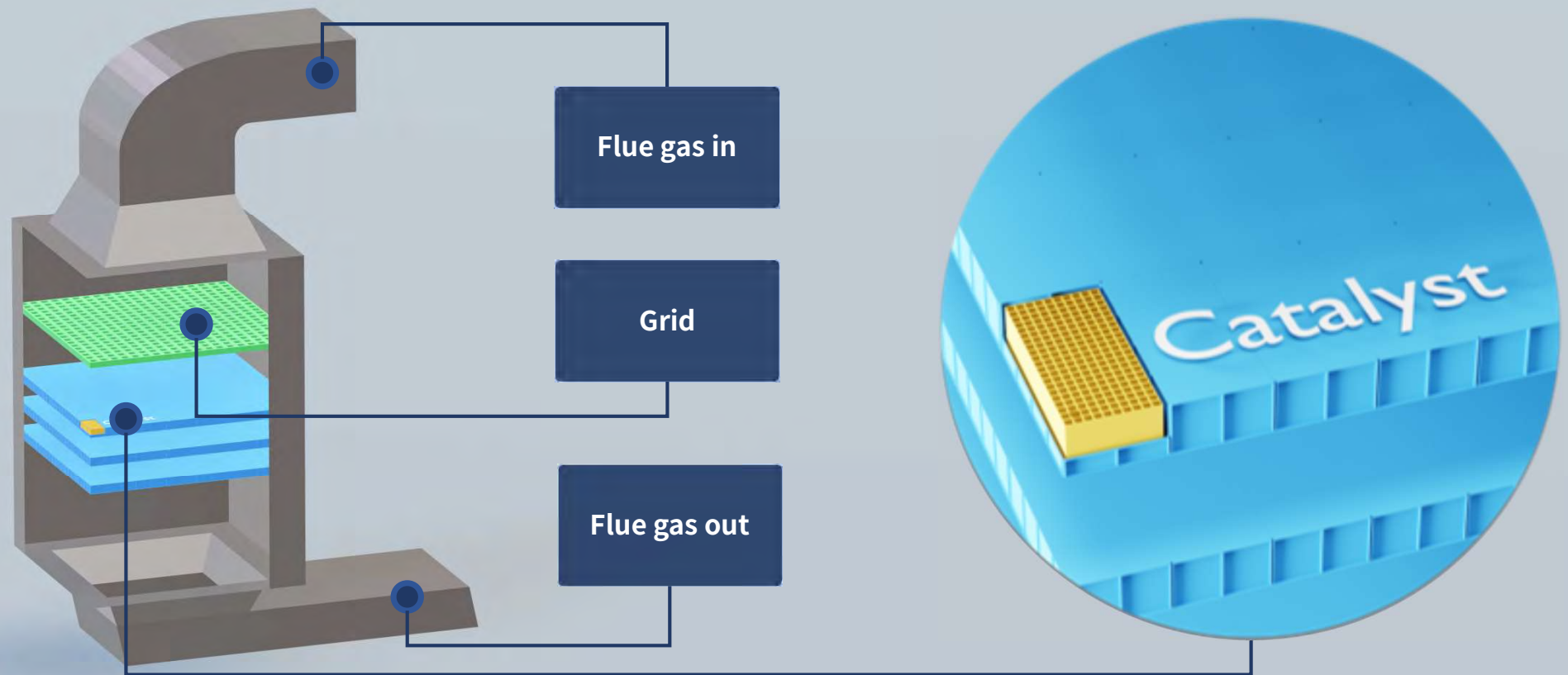
Adsorbent regeneration

Require by-product recovery process for the sulfide-rich



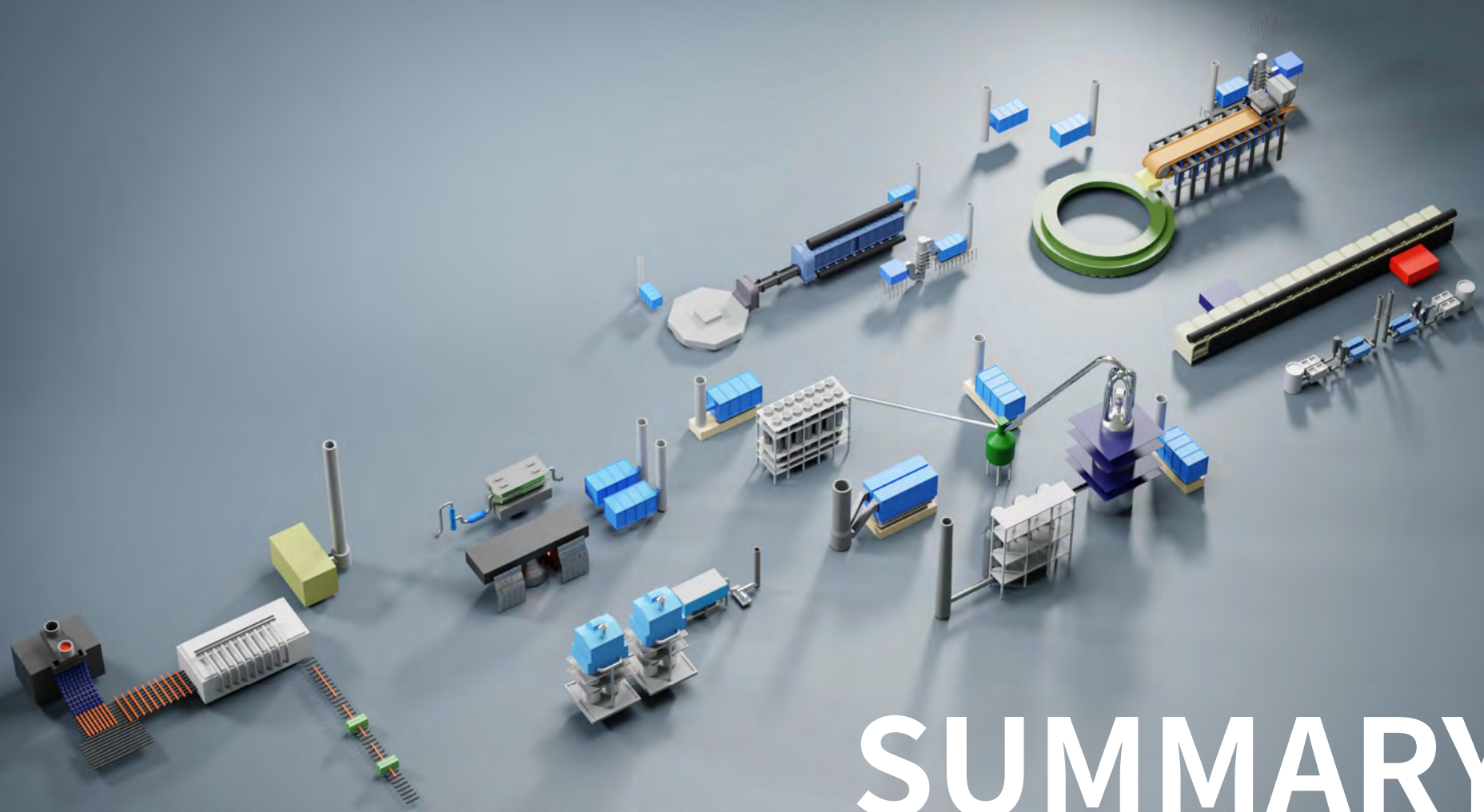
Key Terminal Control Techniques

SCR denitrification



Selective Catalytic Reduction (SCR)

Achieving 90% or higher de-NO_x efficiency at a lower temperature



SUMMARY

Thank you for your attention

The Ultra-Low Emission Transformation of China's Steel Industry and Its Key Techniques



Du Lei, WISDRI Engineering & Research Incorporation Limited

