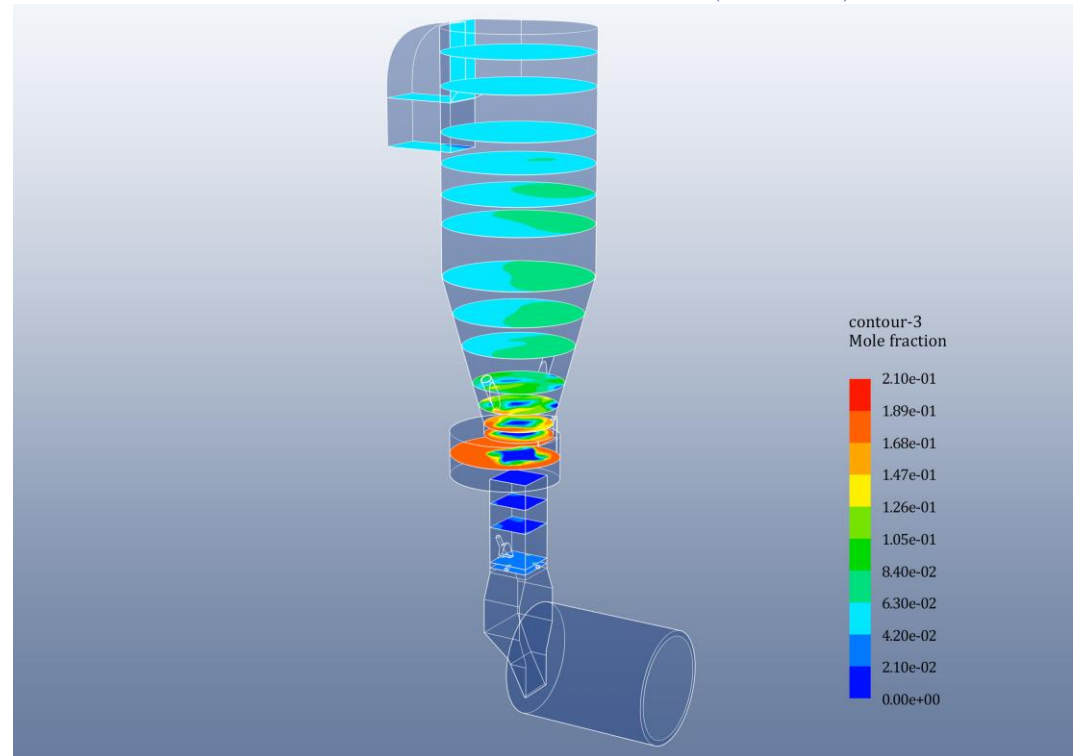


Taiheiyo Two-Stage Combustion System

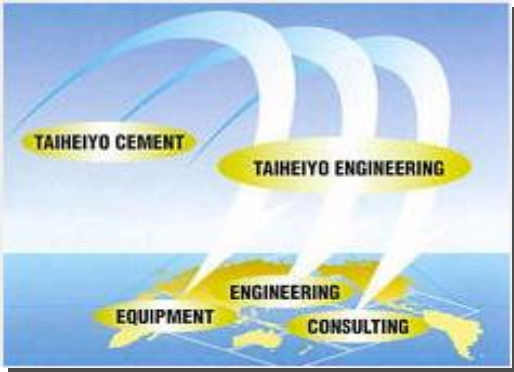
- For Low NO_x Emission -

Simulation Image - In Line (SF Type) Calciner
(For reference)



Taiheiyo Engineering Corporation

TAIHEIYO ENGINEERING has gained extensive Know-how and advanced technology as part of the TAIHEIYO CEMENT GROUP and provides the consultancy, engineering services and special equipment necessary for the construction and operation of cement plants and cement related industries.

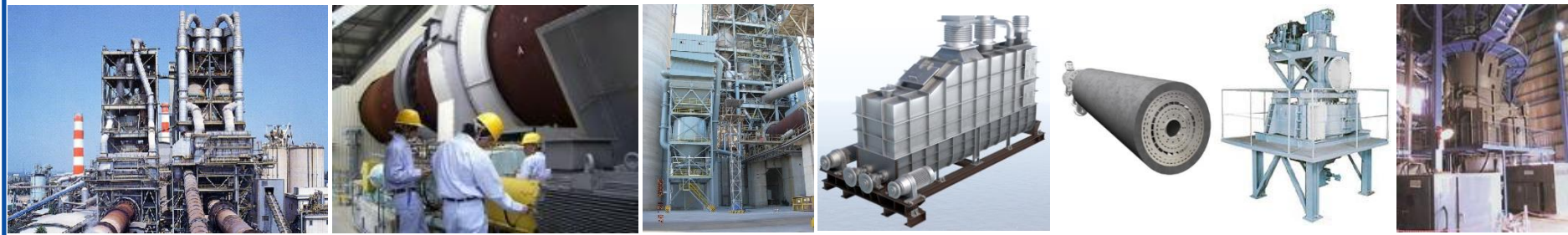
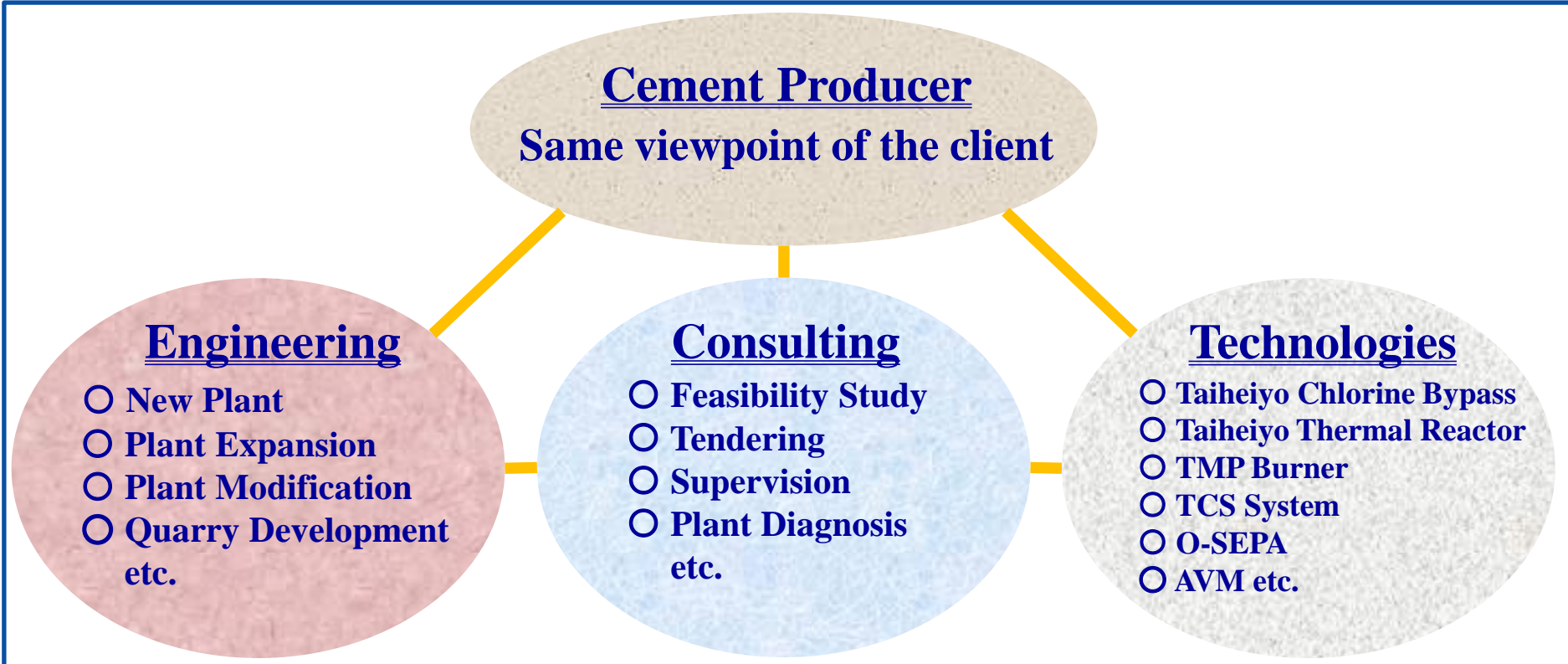


Company Profile

Company Name	TAIHEIYO ENGINEERING CORPORATION
Established	April 1, 1976
Address	SA Building, 5th Floor, 2-17-12 Kiba, Koto-ku, Tokyo 135-0042, Japan
Capitalization	Paid-in Capital: 490 million Japanese Yen
Number of Employees	173 as of April 1, 2021



Unique Characteristics of Taiheiyo Engineering

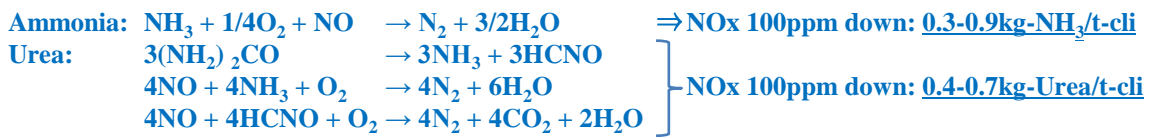


Background

Strict regulation of NOx emission

Conventional countermeasure

Selective Non-Catalytic Reduction process (SNCR)
(De-nitration by ammonia/urea water spray)



Considerable running cost required

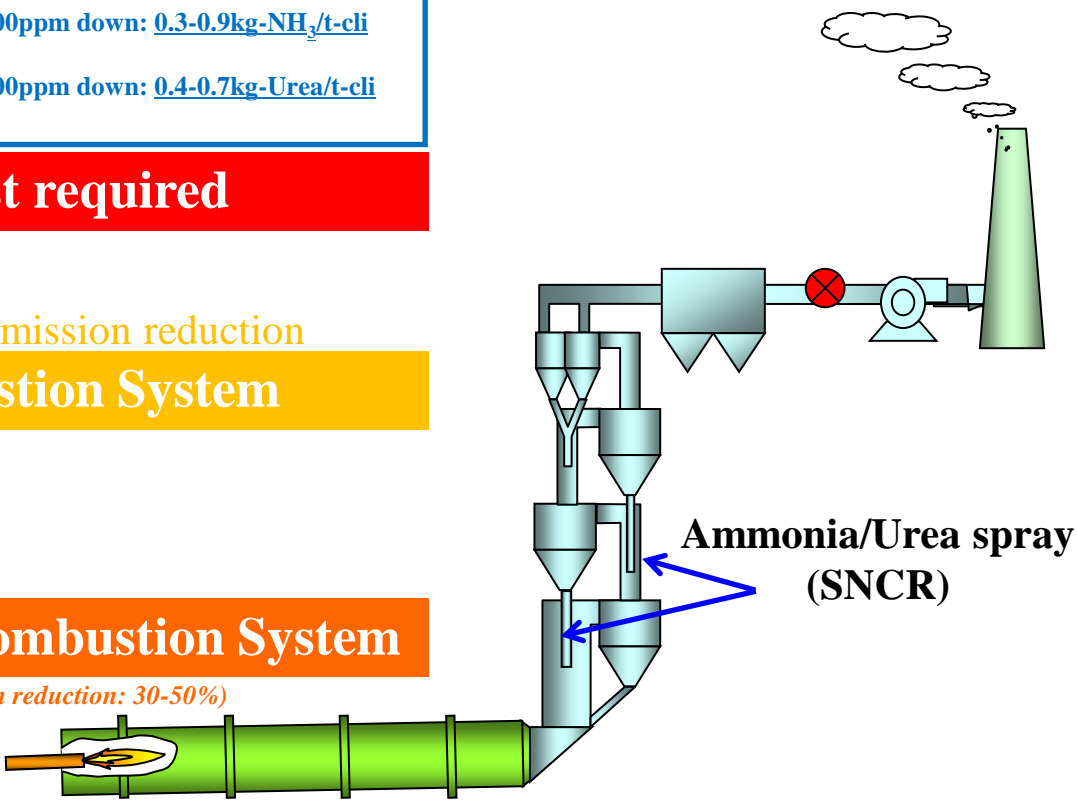
Newly developed countermeasure for NOx emission reduction

Taiheiyo Two-Stage Combustion System

- No impact for clinker production process
- No / Less running cost for De-nitration agent
- High De-NOx efficiency (NOx emission reduction: 30%)

Taiheiyo Advanced Two-Stage Combustion System

- More De-NOx Zone = Higher De-NOx efficiency (NOx emission reduction: 30-50%)
- Less coating trouble at De-NOx Burner area = Easy operation



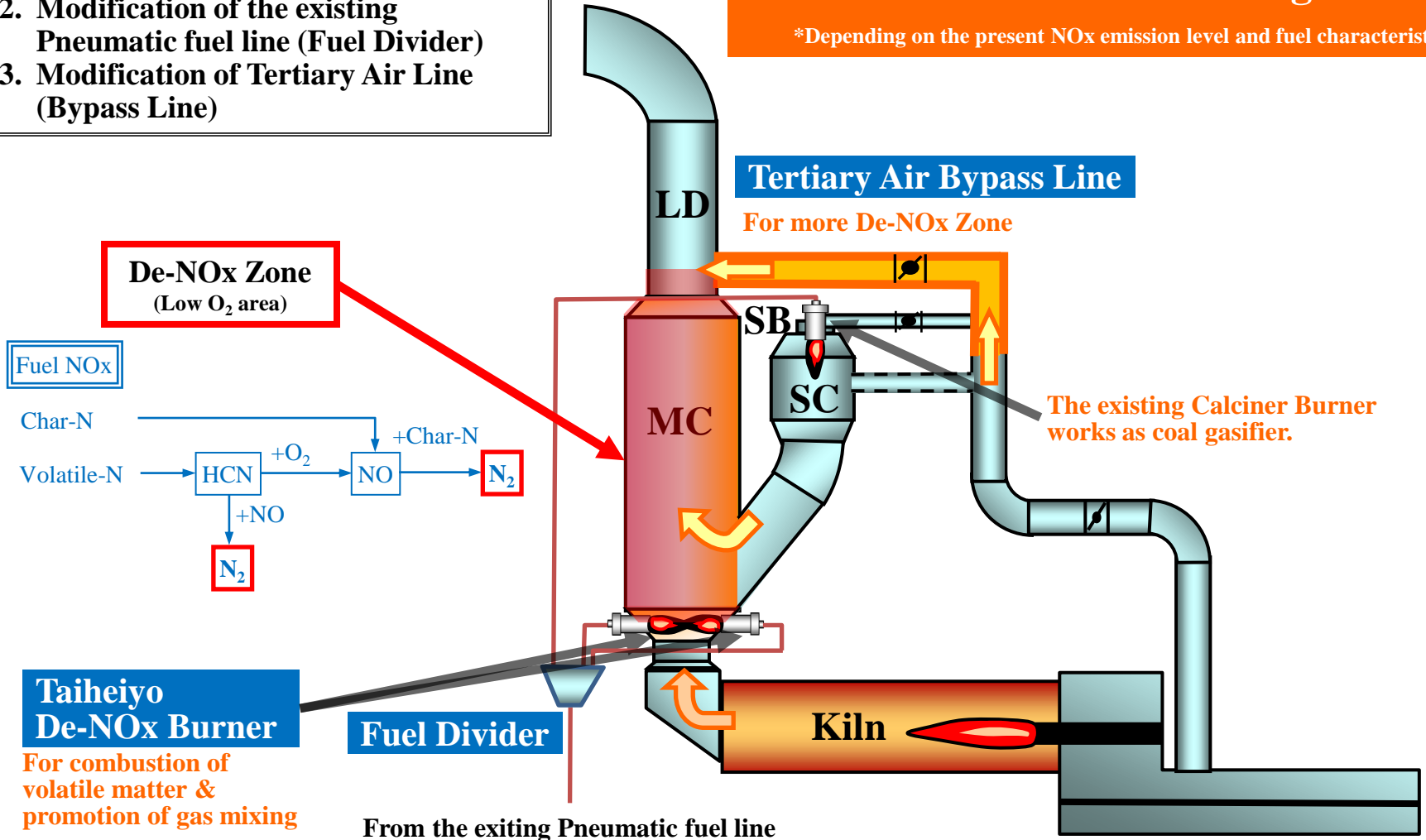
Taiheiyō **Advanced** Two-Stage Combustion System Flow to Taiheiyō RSP Calciner

More De-NO_x Zone = More NO_x emission reduction

1. Taiheiyō De-NO_x Burner (2-4 pcs)
2. Modification of the existing Pneumatic fuel line (Fuel Divider)
3. Modification of Tertiary Air Line (Bypass Line)

NO_x emission reduction: Target 30-50%

*Depending on the present NO_x emission level and fuel characteristics



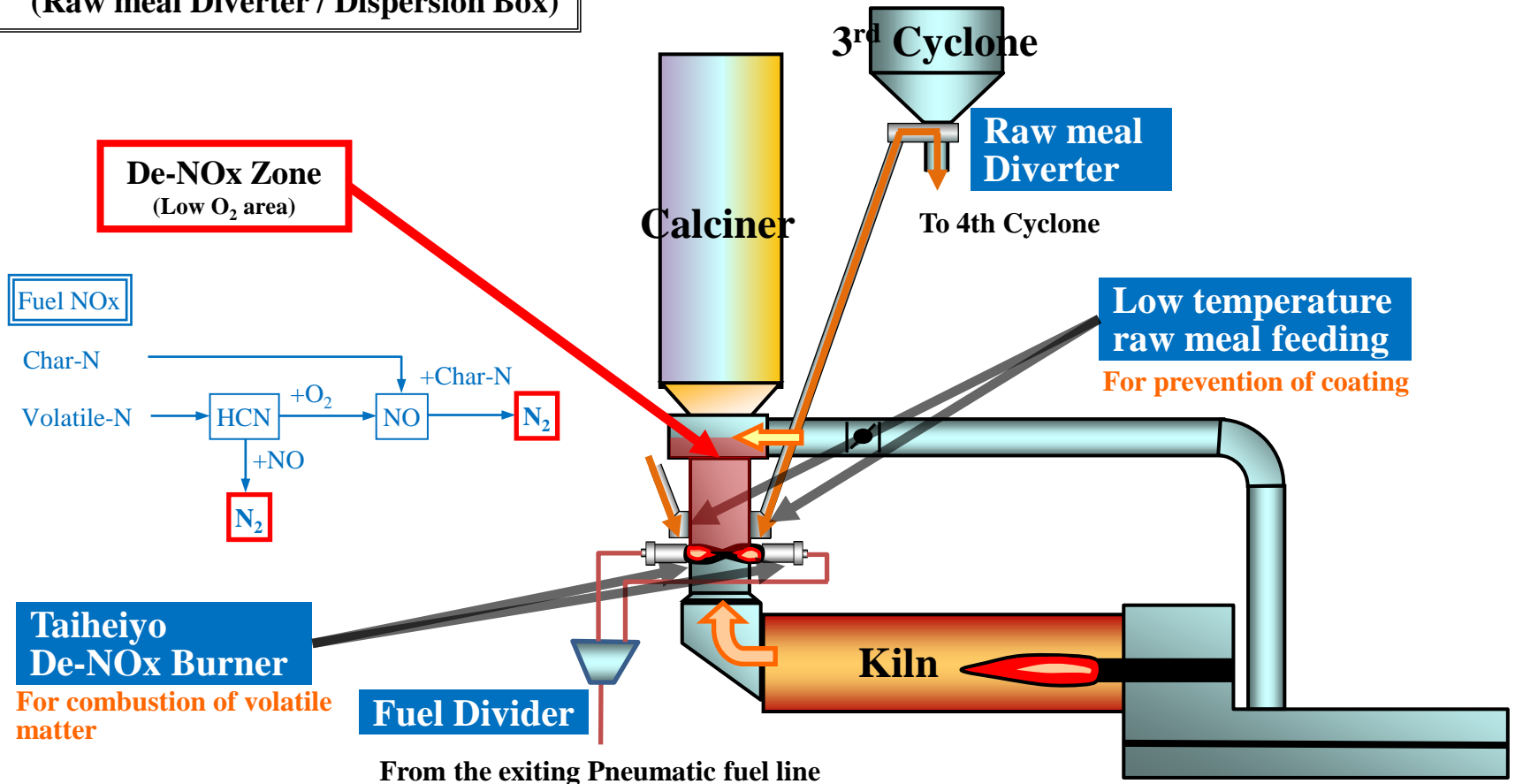
Taiheiyo **Advanced** Two-Stage Combustion System Flow to In-Line (SF Type) Calciner

More De-NO_x Zone = More NO_x emission reduction

1. Taiheiyo De-NO_x Burner (2-4 pcs)
2. Modification of the existing Pneumatic fuel line (Fuel Divider)
3. Low temperature raw meal feeding (Raw meal Diverter / Dispersion Box)

NO_x emission reduction: Target 30-50%

*Depending on the present NO_x emission level and fuel characteristics



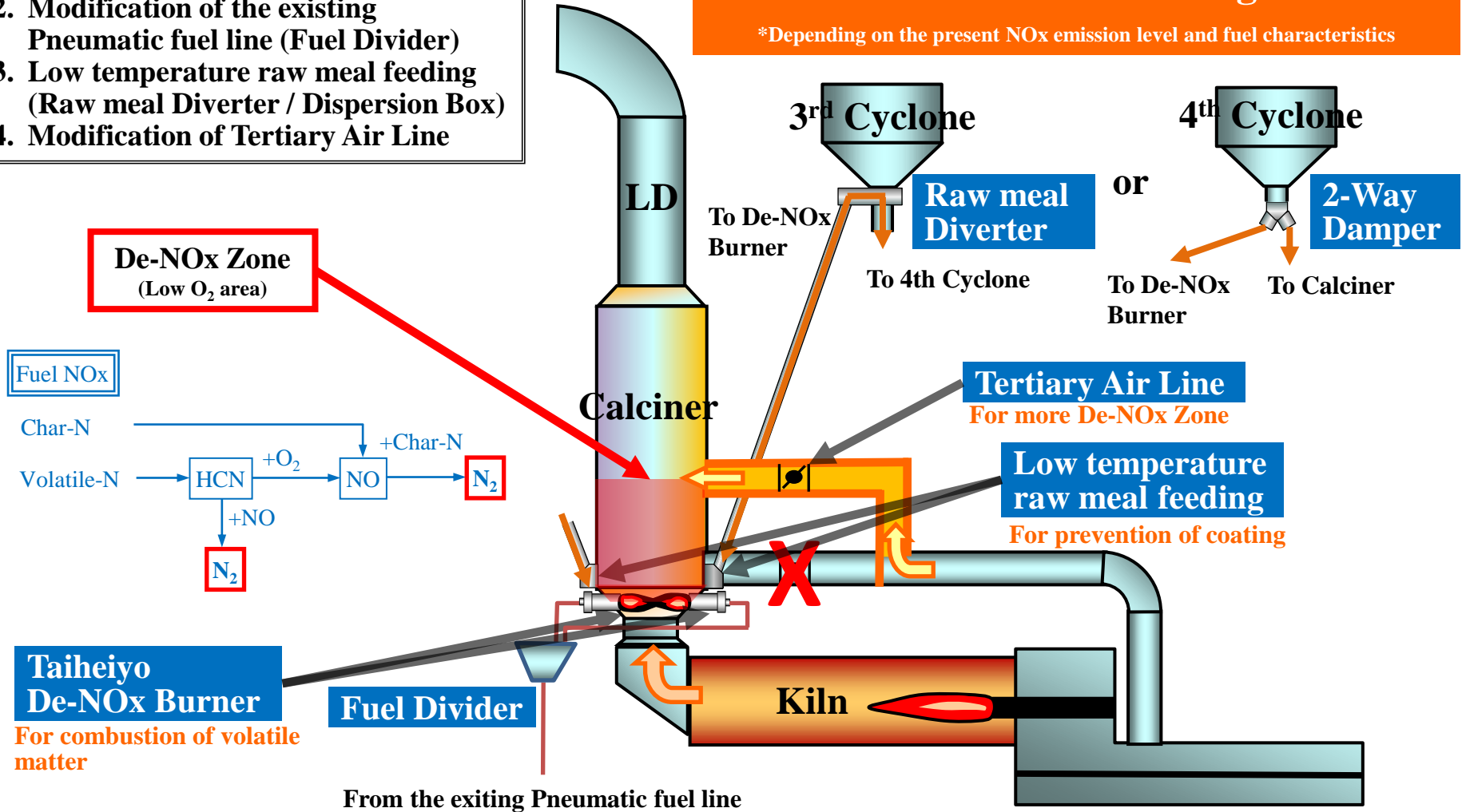
Taiheiyo **Advanced** Two-Stage Combustion System Flow to In-Line Calciner

More De-NO_x Zone = More NO_x emission reduction

1. Taiheiyo De-NO_x Burner (2-4 pcs)
2. Modification of the existing Pneumatic fuel line (Fuel Divider)
3. Low temperature raw meal feeding (Raw meal Diverter / Dispersion Box)
4. Modification of Tertiary Air Line

NO_x emission reduction: Target 30-50%

**Depending on the present NO_x emission level and fuel characteristics*



Reference List of Taiheiyo Two-Stage Combustion System

Year	County	Capacity	Calcliner Type	Before Introduction	Before Introduction	After Introduction	Result
2013	China	4000 t/d	RSP	Raw Material Feed (t/h)	307.9	310.0	NOx Reduction 50% (Regulation value: 390 ppm)
				NOx (O2: 10%) Stack outlet (ppm)	743	320 – 380*	
				Kiln Feed end O2 (%)	4.0 – 4.4	2.9 – 3.2	
				SNCR Urea Consumption (m ³ /h)	0.65	0.0	
2014	Taiwan	3200 t/d	RSP	Raw Material Feed (t/h)	220-230	220-230	NOx Reduction 35%
				NOx (O2: 10%) Stack outlet (ppm)	520-550	320 – 380	
				PH outlet O2 (%)	0.7-0.9	0.7-0.9	
				SNCR Urea Consumption (m ³ /h)	Small quantity*	0.0	
2014	China	4000 t/d	RSP	Raw Material Feed (t/h)	266-286	267-291	NOx Reduction 33% Urea consumption reduction 50%
				NOx (O2: 10%) Stack outlet (ppm)	967*	560-740*	
				Kiln Feed end (%)	3.1-3.9	2.5-3.2	
				SNCR Urea Consumption (m ³ /h)	Average 1.27	Average 0.62	
2015	Taiwan	5000 t/d	RSP	Raw Material Feed (t/h)	276	299	NOx Reduction 20%
				NOx (O2: 10%) Stack outlet (ppm)	345	276	
				Kiln Feed end (%)	2.2	4.0	
				SNCR Urea Consumption (m ³ /h)	0.0	0.0	
2015	Vietnam	4800 t/d	RSP	Raw Material Feed (t/h)	324	325	NOx Reduction 25% NOx 331ppm with SNCR operation
				NOx (O2: 10%) Stack outlet (ppm)	815	609	
				Kiln Feed end (%)	2.9	5.5	
				SNCR Urea Consumption (l/h)	0.0	17.7*	
2016	China	5000 t/d	In-Line	Raw Material Feed (t/h)	415	383	Ammonia water consumption reduction 58%
				NOx (O2: 10%) Stack outlet (ppm)	200	200	
				Kiln Feed end (%)	-	-	
				Ammonia water Consumption (m ³ /h)	Average 1.68	Average 0.7	
2018	China	5000 t/d	RSP	Raw Material Feed (t/h)	430.3	429	Urea consumption reduction 31.7%
				NOx (O2: 10%) Stack outlet (ppm)	260-270	260-270	
				Kiln Feed end (%)	-	2.15	
				SNCR Urea Consumption (m ³ /h)	1.20	0.82	

Taiheiyo Two-Stage Combustion System

Thank you



Taiheiyo Engineering Corporation

<http://www.taiheiyo-eng.co.jp>

overseas_sales@taiheiyo-eng.co.jp