Wet Flue Gas Desulphurisation Technology With Limestone-Gypsum
1. Company Overview

- **Employee Strength:** Over 4,000 nos.
- **Registered Capital:** CNY 547 Million
- **Total Assets:** CNY 8.12 Billion

**Zhejiang Feida Environmental Science & Technology Co., Ltd.**

- **The Largest National Flagship Enterprise in the Environmental Protection Equipment Industry of China**
- **Established by Government of China in 1969**
- **Listed in Shanghai Stock Exchange in 2002**
1. Company Overview

Company Location

- Beijing
- Shanghai
- CHINA
- 1. Company Overview
- Jiangsu Baoying Industrial Base
- Jiangsu Yancheng Industrial Base
- Zhuji
- Hangzhou
- Head Office of FEIDA
- Zhuji, Zhejiang Province
1. Company Overview

Main Products

- **Flue Gas Cleaning System**: FGD (Wet FGD, Semi-dry FGD), NO$_X$ Removal, Particulate Removal, etc
- **Others**: Solid Waste Treatment, Water Treatment, electrical control equipment, etc
2. Wet Limestone-Gypsum FGD

Flue Gas Cleaning System for Coal Fired Power Plant
There are many materials can be used as absorbent:

- limestone $\text{CaCO}_3$
- lime $\text{CaO}$, slaked lime $\text{Ca(OH)}_2$
- ammonia $\text{NH}_3$
- magnesium oxide $\text{MgO}$
- sodium-carbonate $\text{Na}_2\text{CO}_3$
2. Wet Limestone-Gypsum FGD

The 1st Advantage of Limestone as Absorbent Material:

Simple and reliable process technologies
2. Wet Limestone-Gypsum FGD

The 2nd Advantage of Limestone as Absorbent Material:

- Produce environmental neutral by-product:
  - Commercial-grade gypsum

  Can be used as follows:
  a) Use as cement retarder
  b) Produce gypsum product, such as plasterboard

Hydrocyclone / Belt Filter Arrangement
Other Advantages of Limestone as Absorbent Material:

✓ Good absorbent availability world-wide

✓ High removal efficiencies feasible

✓ Cost optimum technologies (investment and operation)

✓ For standard application

✓ Extended operating experience
3. Absorber Technologies

① Normal Single-Loop Absorber

② Perforated Plate Absorber

③ Dual-Loop Absorber
3.1 Normal Single-Loop Absorber

**Design Concept**

- Single loop open spray absorber

**Advantages**

- Stable chemistry
- Power consumption adjustable to SO$_2$ load
- High operational reliability
- Less inspection and maintenance
3.2 Perforated Plate Absorber

Design Concept

- Installed with perforated plates under the lowest spray layer

Advantages:

- Reduce spraying liquid quantity
- Increase desulfurization efficiency and dust removal efficiency
- One of the best choice to meet the ultralow emission-
  - 35 mg/Nm$^3$ SO$_2$ Emission
  - 5 mg/Nm$^3$ Particle Emission
3.3 Dual-Loop Absorber

**Design Concept:** 2-loop Design

- Secondary loop: high pH-value improves desulfurization efficiency, gypsum formation and crystallization
- Primary loop: low PH-value improves oxidation, limestone dissolution

**Advantages:**
- Suitable for high SO₂ concentration and high removal efficiency requirement
4. The Secret of High Efficiency

Absorber Inlet Technology

Excellent Oxidation Method

High Efficiency Spray Layers
4.1 Absorber Inlet Technology

Absorber Inlet:
- Bad working condition, prone to corrosion and scaling

- Collect the wall flow, reduce the risk of scaling
- Improve the gas flow distribution
4.2 High Efficiency Spray Layers

Spray Layers

- Key Equipment
- Use Stepped Pipeline
- Adopt Staggered Arrangement
### 4.2 High Efficiency Spray Layers

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<tr>
<th>Tangential Cone</th>
<th>Opposite Tangential Cone</th>
<th>Twin Tangential Cone</th>
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- ✓ Different options will make differences
- ✓ Installed downward direction
4.3 Excellent Oxidation Method

**Side-entry Oxidation Agitator:**
most widely used in the world

**Features:**
- **High air-utilization percentage:**
  Permits small absorber liquid retention volume
- **Less scaling and plugging problems**
5. Reference Projects
5.1 Normal Single-Loop Absorber Reference Projects

**FGD Ningxia Daba Unit 1 & Unit 2 (600MW each)**

- Newly constructed, 1 absorber serves 1 unit
- 2378 160 m³/h (STP, wet) flue gas flow rate
- 2480 mg/Nm³ (STP, dry) SO₂ inlet
- 110 mg/Nm³ (STP, dry) SO₂ outlet
- 95.5% SO₂ removal efficiency

Completion time 12 months
Start-up Aug. 2008
FGD Huarun Haifeng Unit 1 & Unit 2 (1000MW each)

- Newly constructed
- 1 absorber serves 1 unit
- 3,497,185 m³/h (STP, wet) flue gas flow rate
- 4,800 mg/Nm³ (STP, dry) SO₂ inlet
- 100 mg/Nm³ (STP, dry) SO₂ outlet
- 97.9% SO₂ removal efficiency

Completion time 24 months
Unit 2 Start-up Aug. 2014
Unit 1 Start-up March 2015
5.2 Perforated Plate Absorber References Plants

**FGD Shangdu Unit 5 & Unit 6 (660MW each)**

- Ultra Low Emission Retrofit Project
- 1 absorber serves 1 unit
- 2,689,236 m³/h (STP, wet) flue gas flow rate
- 4,221 mg/Nm³ (STP, dry) SO₂ inlet
- 35 mg/Nm³ (STP, dry) SO₂ outlet
- 30 mg/Nm³ (STP, dry) particle inlet
- 5 mg/Nm³ (STP, dry) particle outlet
- 99.2% SO₂ removal efficiency

Completion time 8 months

Unit 5 Start-up Dec. 2016,
Unit 6 Start-up May 2017
FGD Fujian Kemen Unit 1 & Unit 2 (600MW each)

• Ultra Low Emission Retrofit Project
• 1 absorber serves 1 unit
• 2 146 156 m³/h (STP, wet) flue gas flow rate
• 2415 mg/Nm³ (STP, dry) SO₂ inlet
• 30 mg/Nm³ (STP, dry) SO₂ outlet
• 25 mg/Nm³ (STP, dry) particle inlet
• 5 mg/Nm³ (STP, dry) particle outlet
• 98.6% SO₂ removal efficiency

Completion time 8 months
Unit 1 Start-up July 2017,
Unit 2 Start-up June 2018
5.3 Dual-Loop Absorber Reference Project

FGD Shanxi Datuhe Unit 1 & Unit 2 (350MW each)

- Newly constructed
- 1,365,546 m³/h (STP, wet) flue gas flow rate
- 8,547 mg/Nm³ (STP, dry) SO₂ inlet
- 35 mg/Nm³ (STP, dry) SO₂ outlet
- 99.6% SO₂ removal efficiency

Completion time 24 months
Start-up Dec. 2017
Thank you!