NID™
Modular and Multi-Pollutant Control Technology
- Fundamentals and Operational Experience

Jürgen Dopotka, Alstom, US
Jiangtian Zhang, Alstom, CN

Knoxville, TN
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ALSTOM
Shaping the future
Agenda

• Introduction

• NID Process and Benefits

• Alstom NID Experience

• Conclusion
Evaluation Criteria for AQCS Equipment

#1 Environmental Compliance
  • Removal efficiency requirements
  • System reliability, availability, and maintainability

#2 Cost and Schedule
  • Initial capital expense and recurring operating expenses
  • Delivery and construction time

#3 Footprint and General Layout
  • Greenfield and retrofit
  • Space requirements
  • Layout flexibility

NID Excels in All Three Categories
Alstom NID Applications

**Power**
- Fuel: Coal, oil-shale, pet coke
- A total of 12 GW in operation or currently under construction

**Waste to Energy**
- Fuel: Various waste types
- Installed base of over 4 million Nm³/h or 2.5 million scfm treated

**Industrial**
- Application: Iron & Steel
- Installed base of over 1 million Nm³/h or 0.6 million scfm treated

Global Reference Base and Broad Applications Portfolio
Agenda

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NID Process

NID DFGD Design

- Large gas flow range
- Unitized compartment design
- Compact footprint
- Gas cooling by thin film evaporation
- Very high solids recirculation
- Fluid bed / dust recirculated continuously
- No external hydrator
- No external dust recycle
- No slurry handling
- Free flowing dry end product

![Diagram of NID process](image-url)
# FGD Technology Evaluation Criteria

<table>
<thead>
<tr>
<th>Criteria</th>
<th>WFGD</th>
<th>SDA/FF</th>
<th>NID/FF</th>
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<td>Remedy existing PM emission issue</td>
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<td>Byproduct flexibility</td>
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<td>Footprint</td>
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<td>Water consumption</td>
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<td>Fuel flexibility</td>
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<td>Re-use existing stack or No GGH</td>
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<td>O&amp;M staffing requirements</td>
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<td>Project lead time</td>
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<td>HAPS capture</td>
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1 – **Best** Score: Product Most Suited  
2 – **Medium** Score: Product Suited  
3 – **Worst** Score: Product Least Suited

Project-specific results may vary depending on applicable criteria and their importance.

**NID Scores Best When Evaluated Against WFGD and SDA**
Modular Design

Modularization Offers Design and Layout Flexibility
Modular Design

• Shop fabrication drastically cheaper than field fabrication

• NID allows high degree of shop fabrication even with truck shipment
  – Reactors
  – Inlet ducts
  – Day silos
  – Mixers
  – Hydrators

• Barge access allows further pre-assembly
  – Fabric filter compartments
  – Inlet/outlet plenums

Modularization Lowers Construction Costs
Key Benefits of NID

• Multi-pollutant control: High efficiency removal of SO$_2$, SO$_3$, PM, HCl, and HF
  - SO$_2$ removal: ≤ 98%
  - SO$_3$ emissions: < 1 ppm
  - PM (filterable): < 15 mg / Nm$^3$

• Lime-based semi-dry FGD technology
  - Patented, integrated hydrator/mixer – no slurry handling
  - Zero liquid discharge – no waste water/treatment
  - Low water consumption; ability to use
    low quality water: CTB, WFGD purge

• Simple, compact design
  - Small footprint offers retrofit advantage
  - Low capital cost
  - Low BOP/construction cost
  - Low O&M cost

• Modular design
  - High reliability
  - Good turndown
  - No scale-up issues

• Fuel flexibility of up to 2.5% sulphur coal or higher

Meeting Most Stringent Regulations at Minimized Cost
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World-Wide NID Installations

- **Seward 1&2**: 2x285 MW
- **Gilbert 3**: 300 MW
- **Spurlock 4**: 300 MW
- **Indian River 4**: 440 MW
- **Brayton Point 3**: 630 MW
- **Homer City 1&2**: 2x670 MW
- **Boswell 4**: 652 MW
- **Gallatin 1-4**: 2x275 MW, 2x290 MW
- **Flint Creek 1**: 558 MW

- **Sandreuth 3**: 53 MW
- **Fifoots 1-3**: 3x125 MW
- **Zilina**: 260 MW
- **Narva**: 8x100 MW
- **Vaasa**: 37 MW
- **VKG**: 2x50 MW
- **Astana**: 120 MW
- **Elektrėnai 8**: 150 MW
- **Laziska 1&2**: 2x120 MW, 80 MW
- **Cherepetskaya**: 2x225 MW

- **Mai Liao**: 2x150 MW

- **Zhejiang 8**: 70 MW
- **Dong Guan 5&6**: 2x70 MW
- **Binjiang TPP**: 13 MW
- **Jiuying TPP**: 70 MW
- **Jiulong Paper**: 135 MW
- **Bautou 2**: 200 MW
- **Hua Ying Shan**: 100 MW
- **Xinyuan TPP**: 25 MW
- **Jingmen TPP**: 2x200 MW
- **Liwen Paper 1&2**: 2x30 MW
- **Sanfangxiang**: 2x25 MW
- **Shenyang**: 2x50 MW
- **Wuxi TPP**: 25 MW
- **Xinwang 1&2**: 2x135 MW
- **Zibo 7&8**: 2x100 MW
- **Hebei TPP**: 2x135 MW
- **Juhong TPP**: 135 MW
- **Taizhou 6**: 135 MW
- **Yima TPP**: 78 MW
- **Shenhai**: 200 MW

NID – Modular and Multi-Pollutant Control Technology – 3-Oct-2013 , PGA – P 13

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Why Choose Alstom NID?

1. NID surpasses WFGD for low- to medium-sulphur applications by offering
   - lower capital and total lifecycle costs
   - high multi-pollutant removal efficiencies
   - zero liquid discharge (no waste water)
   - cost and schedule advantages of reuse of existing stack without GGH

2. NID outranks competitor DFGD products by offering
   - smaller footprint allowing maximum flexibility for retrofits
   - modular design enhancing constructability and minimizing field-erection, and affording great turndown without gas recirculation
   - integrated hydrator/mixer design slaking CaO internally, thereby eliminating need for slurry handling and separate hydration

3. NID has over 15 years of successful operation in 18 countries and a total of 12 GW of installed base

4. Continuous in-house R&D to help our customers meet tomorrow’s ever-more stringent environmental requirements

NID is a great Choice for Flue Gas Desulphurization