Gas Cleaning System
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Blast furnaces have been changed, through growth in size along with higher pressure, to an energy-saving and power-saving type in response to the needs of the times. Similarly, blast furnace gas cleaning system has been changed in response to such needs. Nippon Steel Engineering has had abundant experiences for a long time and advanced technologies concerning environment-responsive equipment, and has consistently developed and provided the blast furnace gas cleaning system conforming to these needs.

System lineup

- **2-stage venturi scrubber**
  It is a representative system that has been adopted in high-pressure blast furnaces, and has been highly evaluated with high performance stability (outlet cleanliness of 5mg/Nm3 or lower) and reliability.

- **1-tower 2-stage V. S.**
  It is a compact type 2-stage V. S. (venturi scrubber). It has dust collection performance, top pressure control function and noise reduction function at the same time, and has achieved high performance and long life.

- **VS-ESCS**
  It is the system that high-performance Electrostatic Space Cleaner Super (E. S. C. S.) is incorporated in the secondary mist separator, and has the characteristics of stability in VS method and low pressure loss and high performance in ESCS system at the same time.

- **2-stage venturi scrubber + Dry type bag filter**
  It is the system which has achieved lower pressure loss and higher performance than ESCS method by the installation of dry type bag filter system.

- **Multi-vessel electrostatic precipitator**
  It is the newest system that is made from the technologies which have been cultivated in ESCS and multi-vessel dry type bag filter, and has achieved much lower pressure loss and higher performance than the dry type bag filter system.

**BF**: Blast Furnace  
**DC**: Dust Catcher  
**VS**: Venturi Scrubber  
**ESCS**: Wide electrostatic precipitator  
**PCVS**: Top pressure control type VS  
**TRT**: Top pressure Recovery Turbine  
**SV**: Septum Valve
Multi-vessel electrostatic precipitator (E.S.C.S.), instead of the existing 2-stage venturi scrubber, is arranged in the system, and dust and water drops are removed by electric energy in ESCS located in the gas turnover/rising section in each vessel, which generates clean gas.

### Feature

1. **Low pressure loss**
   Since there’s no pressure loss in water spraying gas and filter in 2-stage V.S., the pressure recovery is maximized in the system.

2. **Low heat loss**
   Since there’s no water spraying in 2-stage V.S., the system has a heat loss similar to that in the dry type bag, and the heat loss is minimized.

3. **No limitation on exhaust gas temperature**
   Because there’s no risk of damage to the equipment, including filter, etc., even in case of abnormal operation, such as gas blow-out in blast furnace, the operation rate of the equipment will be enhanced.

### Table

<table>
<thead>
<tr>
<th>Top gas</th>
<th>Wet-type</th>
<th>Bag filter type</th>
<th>Multi-Vessel Electrostatic Precipitator-type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pressure loss, kPa</td>
<td>about 10</td>
<td>about 10</td>
<td><strong>about 4</strong></td>
</tr>
<tr>
<td>Temp, loss, °C</td>
<td>about 90</td>
<td>about 10</td>
<td><strong>about 10</strong></td>
</tr>
<tr>
<td>TRT output, MW</td>
<td>19.0</td>
<td>24.0</td>
<td><strong>25.0</strong></td>
</tr>
<tr>
<td>Energy loss due to Gas Cooling, %</td>
<td>-</td>
<td>5</td>
<td><strong>0</strong></td>
</tr>
<tr>
<td>Annual Electricity Generated, GWh</td>
<td>165</td>
<td>200</td>
<td><strong>220</strong></td>
</tr>
</tbody>
</table>

*In the case of 5000m³ BF*

### The amount of Electricity Generated is:

- **10% larger** than bag filter type.
- **30% larger** than wet-type.