NOx Control Issues for a Power Generator

Coal Research Forum

Mr. Guy Sharp
Agenda

• Introduction
• Overview of Ferrybridge C Power Station
• Historical Plant Modifications for NOx control
• Consequences of NOx control equipment
• Engineering Developments
• Future Plant Modifications for NOx control
• Other Challenges
Overview of Ferrybridge C Power Station

- Situated on the River Aire, in West Yorkshire.
- It is the third coal-fired power station to be built on the site since 1924.
- Ferrybridge C first fed electricity into the national grid in February of 1966.
- It consists of 4 x 500MW pulverised fuel units
- Each consuming 200Te/hr
- Storage capacity of approx 1 million tonnes
Historical Plant Modifications for NOx Control

1966: Turbulent Burner

1998: Low NOx Burners

2008: BOFA

2010 Combustion Review
Consequences of NOx Control Equipment

- Poor combustion (high CIA) due to the Low Nox Burner design and installation of BOFA
- Burners are oversized which is reflected in the low windbox pressures therefore fans not on auto.
- The PF/PA velocity is greater than the secondary air velocity. Long unattached flames impinging on rear wall.
- Even if more air is supplied to burners (i.e. taken off BOFA) combustion does not improve (high CIA and CO) and NOx increases.
- 5 % fuel is being combusted in the convective sections of the unit
- Combustion is not being held within furnace
Figure 21 - Full Furnace Models - 10,000 ppm CO Mole Fraction Iso-Surfaces
### Unit 3 Continuous Emissions Monitoring

<table>
<thead>
<tr>
<th>GAS ANALYSIS</th>
<th>Stack Gas (After FGD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SO₂ 2625 mg/Nm³</td>
<td>41 mg/Nm³</td>
</tr>
<tr>
<td>NO₂</td>
<td>294 mg/Nm³</td>
</tr>
<tr>
<td>Dust 14 mg/Nm³</td>
<td>253 mg/Nm³</td>
</tr>
<tr>
<td>CO 196 mg/Nm³</td>
<td>3 mg/Nm³</td>
</tr>
</tbody>
</table>

#### SIGNAL STATUSES
- DUCT TEMPERATURE
- DUCT PRESSURE
- MOISTURE
- OXYGEN
- SO₂
- NO₂
- Erwin-Sick
- Dust

#### TRENDS
- 15 minutes
- Click for full page trends

#### Time Periods
<table>
<thead>
<tr>
<th>1/2 Hour</th>
<th>1 Hour</th>
<th>48 Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>SO₂</td>
<td>38 42</td>
<td>38 45 116 133</td>
</tr>
<tr>
<td>NO₂</td>
<td>308 334</td>
<td>308 350 447 457</td>
</tr>
<tr>
<td>Dust</td>
<td>3 3</td>
<td>3 3</td>
</tr>
<tr>
<td>Load</td>
<td>505 507</td>
<td>505 506</td>
</tr>
</tbody>
</table>

#### Alarms
- Gas Turbine Comms Failed
- DC Seal Oil Pump TRIPPED

**513 MW**

**Wed 06/02/2012 12:23:41**

**SSE**
Future Options for NOx Control at Ferrybridge

2013: ULN Burner

2016: Modified BOFA

2020: Secondary measures i.e. SCR

2030
Other Challenges

» Fuel Distribution
» Air Distribution
» Mill Performance
» Airheater performance
» ID fan capacity
» Fuel Characteristics
» Feed heating issues
» Frequency Response
» Tube Leaks