**Project:**

**MULTI FUEL CFB BOILER SIMULATOR**

<table>
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<tr>
<th>Author:</th>
<th>Approved:</th>
<th>Language:</th>
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<tbody>
<tr>
<td>JJA</td>
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**Document title:**

**SYSTEM DESCRIPTION**

**SOOTBLOWER SYSTEM**

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<tr>
<th>Submitted for:</th>
<th>Customer reference:</th>
<th>Other information:</th>
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1 GENERAL

Thirty-six (36) sootblowers are installed to remove fly ash buildups on the gas-side heat transfer surfaces of the convection pass. Sootblowers are located on left side of the boiler in back pass and convection pass. All sootblowers are half-retractable type sootblowers.

Each sootblower is a separate motor-driven device controlled from either the control room or at the locally-mounted control box. Steam pressure at each sootblower can be adjusted for the desired blowing pressure and should be checked annually.

Excessive buildups of fly ash on the heat transfer surfaces will reduce boiler efficiency. The operator or the control system will have to increase fuel feed to compensate for the reduction in boiler efficiency due to the reduction in heat transfer. This increases the operating cost of the boiler and has a negative impact on normal operations.

Steam after reheater one (RH I) is used for the sootblowing system. The use of steam is an energy loss and it will have a negative impact on operating costs.

The type of peat burned at the Lough Ree Power plant will determine how often the operator needs to use the sootblowing system. If the fuel has a low amount of ash, 10 - 15%, the operator will not have to blow soot as often as if the fuel has high ash content, above 30%. Other factors such as air heater exit gas temperature and CO emissions will influence the frequency and pattern of sootblower operation. If the exit gas temperature is high, that indicates that the effectiveness of the heat transfer surfaces have been reduced by ash build up. Normally once per shift should be adequate to prevent big ash build up’s.

Fuels exhibiting low combustion reactivity have a tendency to produce high levels of CO by accumulating high carbon ash on the back pass tubes that gasify and produce CO. In this case, it will be necessary to operate the sootblowers serving the superheaters more frequently to control the formation of CO. This may require more operation of the sootblowing system than the exit gas temperatures would otherwise dictate.

Each operator must be aware of the fuel characteristics and must balance the cost of sootblowing against the cost of reduced efficiency due to high economizer exit gas temperatures or emissions control.

All sootblowers are cycled either when economizer exit flue gas temperature increases 15 C above expected or once every 24 hours, whichever occurs first. This schedule can be altered with operating experience and using selective soot blowing. It is an operator function to initiate soot blowing; however, sequencing of sootblowers is programmed into the controls. Sootblowing sequence will normally follow the gas flow path, top to bottom on the boiler. Blowing soot at least once every 24 hours will prevent overloading of the fly ash system and DE-SOx plant.
Keep in mind that these are only general guidelines. The blowing pressure of each sootblower has been preset about 12-14 bar and will be adjusted as required during startup and initial operation of the boiler. If necessary, this pressure can be adjusted individually at each blower; higher set pressures will cause increased tube erosion.

During initial operation of the boilers, Foster Wheeler startup engineers will monitor these indications and will recommend how often the sootblower system should be operated. If fuel or limestone conditions change over the life of the boiler, the plants management will need to modify the sootblowing frequency and sequence.

There are motor driven drain valves at the outlet of the sootblowing steam lines. Pipes are sloped, to be selfdraining to the valves. There is an orifice by-pass round the drain valve to prevent condensate collecting. From the drain valves the pipes are led to the blow down tank.

When the sootblowing steam piping is warm the motorized sootblowing steam valve opens entirely, and the sootblowing steam pressure rises to normal.

When the sootblowing steam temperature in all lines is greater than the temperature set value the drain valve closes. If the sootblowing steam pressure is greater than the pressure set value sootblowing is released, and if sootblowing is on automatic control the first sootblower of the selected sequence is started.

The actual sootblowing sequence and frequency is determined by operating experience. Flue gas temperatures and pressure differences indicate the need for sootblowing. As a basis for initial operation the sootblowers should be operated once a shift and the frequency reduced or increased according to the operating conditions.

Ash that is removed by sootblowing is carried away by the flue gases and falls out in the hoppers or is captured in the dust collector. Note there will be an increase in fly ash flow during sootblowing periods.

### Design Data

#### Blowing fluid steam

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>Value</th>
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<tbody>
<tr>
<td>Pressure max.</td>
<td>bar</td>
<td>40</td>
</tr>
<tr>
<td>Temperature</td>
<td>°C</td>
<td>300</td>
</tr>
<tr>
<td>Output per lance</td>
<td>t/h</td>
<td>11</td>
</tr>
</tbody>
</table>
3 EQUIPMENT DATA

3.1 Sootblowers 64 pcs

Manufacturer: Diamond
Type: IK-1MTE (Electric motor driven)
- Multi-Nozzle Rotating Element Sootblower
  - steam flow: t/h 11
  - steam pressure: bar 30
  - steam pressure lance: bar 17.7
  - steam temperature: °C 300

Lance materials:
- S1 HCB20/30 101…114 (253MA???)
- S1 HCB20/30 10_…114 (304 stainless steel???)
- S1 HCB40/50 103…120 (carbon steel???)

3.2 Sootblowers 4 pcs

Manufacturer: Diamond
Type: IK – 525B (Electric motor driven)
- Long Retractable Oscillating Sootblower
  - steam flow: t/h 11
  - steam pressure: bar 30
  - steam pressure lance: bar 17.7
  - steam temperature: °C 300

Lance materials:
- S1 HCB40/50 101…102 304 stainless steel / carbon steel

3.3 Piping

Size: mm 50
Material: SA335P11

After close valve
Size: mm 100
Material: A106B
4 AUTOMATION AND INSTRUMENTATION

In this section automation is explained only basic level and more detailed descriptions can be found in Automation Descriptions.

When sootblowing sequence is started steam valve opens 5% and start to heat up selected lines. After preset time valve will open fully and sootblowing will start when temperature measurement in drainage line indicate that no moisture exists in sootblowing steam. Selected lances will make they move to inside while steam is flowing through it. When lance get it’s outer limit next selected sootblower will start it’s move.
5 OPERATION

Sootblowing is taken from reheat steam system’s I B inlet header.

5.1 Start-up pre-check

- Check that local safety switches are in 1. position. If someone of the sootblowers is in maintenance, turn safety switch 0. position. Then the sootblowing logic passes this sootblower.
- Check, that all equipment and instrumentation are operative.
- Check that the sootblowing manual check/shut-off (S1 HCB10 AA001) valve is open.
- If sootblower has been disassembled sootblowing steam pressure have to be adjusted / ensured to 30 bar in popet valve casing, what equals 11 t/h. See instructions from manufacturers manuals.
- Check, that there is special rod(s) present for the case of sootblower motor brake down. If electric motor will brake, it is needed to roll the sootblowing lance by hand to the home limit (typically from the end of the e –motor).

5.2 Start-up

Operate sootblowers with the group control/sequence in the preset order (numerical sequence) of sootblowers downstream in the flue gas flow direction.

5.3 Normal operation

- Carry out boiler sootblowing once a shift and monitor the operation of the sootblowers.
- Monitor flue gas side pressures at the back pass and temperatures, and carry out sootblowing when necessary. Flue gas temperatures shows the affect after sootblower, how much better the heat transfer then is (can be also noted from the heated medium).
- Monitor also combustion chamber vacuum, that it stays normal at the set value and stable.
- Note, that flue gas expands from the sootblowing when there is higher moisture presence and therefore ID –fan(s) is a bit more loaded (can be seen from control “is” value or rpm).

5.4 Shut down

At the sequence sootblowing, when the last sootblower of the group has operated, the sootblowing motor shut-off valve is closed.
5.5 Operating Disturbances

5.5.1 Power failure

When you get power failure sootblowing sequence stops and sootblower stops. Turn the sootblower out by hand and shut the manual steam shut-off valve to be get the proper cooling from the sootblowing lance.

5.5.2 Protections and start-up releases

Sootblowing will be discontinued if:
- sootblowing steam temperature decreases too low
- sootblowing steam pressure decreases too low
- sootblowing steam valve is not open
- sootblower is not on home position or safety switch is not on zeroposition.
- boiler interlocking is not in order

These conditions are checked in sootblowing automation every time when the following sootblower is taken into operation.

6 CONNECTED SYSTEMS

<table>
<thead>
<tr>
<th>System</th>
<th>Code</th>
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<tbody>
<tr>
<td>Reheat steam system</td>
<td>S1 HAJ_-MFB0001</td>
</tr>
<tr>
<td>Flue gas system</td>
<td>S1 HN__-MFB0001…0003</td>
</tr>
<tr>
<td>Blow down system</td>
<td>S1 HCB_-MFB0001</td>
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7 APPENDICES

Control- and logic diagrams