N2388 Grayling Gen
10/29/09
Boiler

Preventative Maintenance, and Malfunction Abatement Plan, EU BOILER-includes, Mechanical Dust Collector, Selective Non-Catalytic Reduction System (SNCR), & Precipitator; and Start up / Shut Down Plan

Responsible supervisory personnel for overseeing the inspection, maintenance, and repair programs of air-cleaning devices; and for approval of non-routine repairs: Plant Manager.

Responsible supervisory personnel for on-going maintenance and repair of air-cleaning devices: O&M Supervisor.

Responsible supervisory personnel for overseeing regular inspections: O&M Supervisor, and PO2's.

Responsible supervisory personnel for overseeing non-routine repair: Plant Manager.

A. Preventative Maintenance Program

Emission Units (Source): EU BOILER

Item to be inspected	Frequency of Inspections or repairs	Record keeping Method
Grates, including drives and related equipment.	Annually when the boiler is off line.	Operations outage work list or Outage report.
Fire Box	Annually when the boiler is off line.	Operations outage work list or Outage report.
Fuel Distribution Plates & Pulsation dampers	Annually when the boiler is off line.	Operations outage work list or Outage report.
Fuel Distribution Fan	Annually when the boiler is off line.	Operations outage work list or Outage report.
OFA fan motor, housing & dampers.	Annually when the boiler is off line.	Operations outage work list or Outage report.
FD fan motor, housing & damper.	Annually when the boiler is off line.	Operations outage work list or Outage report.
Superheater, Generating & Economizer tube bank.	Annually when the boiler is off line.	Operations outage work list or Outage report.
Dust Collector, including collector tubes, lip seals, & ducting.	Annually when the boiler is off line.	Operations outage work list or Outage report.
ID fan motor, housing, and dampers.	Annually when the boiler is off line.	Operations outage work list or Outage report.
Precipitator	Annually when the boiler is off line.	Operations outage work list or Outage report.
Fuel Feeders and drive units	Annually when the boiler is off line.	Operations outage work list or Outage report.
CO analyzer & associated equipment.	Annual RATA test performed. Along with routine maintenance performed once per year during scheduled outages.	Annual RATA report & CEM log

Item to be inspected	Frequency of Inspections or repairs	Record keeping Method
SO2 analyzer & associated equipment	Annual RATA test performed. Along with routine maintenance performed once per year during scheduled outages.	Annual RATA report & CEM log
NOx analyzer & associated equipment	Annual RATA test performed. Along with routine maintenance performed once per year during scheduled outages.	Annual RATA report & CEM log
CO2 analyzer & associated equipment	Annual RATA test performed. Along with routine maintenance performed once per year during scheduled outages.	Annual RATA report & CEM log
Stack Flow analyzer & associated equipment	Annual RATA test performed. Along with routine maintenance performed once per year during scheduled outages.	Annual RATA report & CEM log
Opacity Analyzer	Annual COMS audit performed. Along with routine maintenance performed once per year during scheduled outages.	Annual RATA report & CEM log
Fuel Train Belt Scales	Monthly calibrations are performed. Inspections and repairs are performed whenever a discrepancy is found.	Preventative Maintenance System
TDF Belt Scales	Monthly calibrations are performed. Inspections and repairs are performed whenever a discrepancy is found.	Preventative Maintenance System
Combustion controls related to flue gas temperatures, boiler draft indicators, steam pressures and temperatures, & air flows	Equipment is inspected and repaired whenever there is a discrepancy.	PO2 log books
Drum level transmitters	Equipment is inspected and repaired whenever there is a discrepancy.	PO2 log books

Air Cleaning Device: Mechanical Dust Collector

Item to be inspected	Frequency of Inspections or repairs	Record keeping Method
Condition of Rotary valves for dust collectors	Annually when the boiler is off line.	Operations outage work list or Outage report
Condition of venturi's for dust collector re-injection.	Annually when the boiler is off line.	Operations outage work list or Outage report

Air Cleaning Device: Electrostatic Precipitator

Item to be inspected	Frequency of Inspections or repairs	Record keeping Method
Rappers for curtains and electrodes	Rappers are inspected and repaired as needed.	PO1 & PO2 log books, Operations outage work list or work orders
High voltage electrodes and curtains are all secured and clearances are maintained.	Annually when the boiler is off line.	Operations outage work list or Outage report
Ventilation compartment fans	Annually when the boiler is off line.	Operations outage work list or Outage report

Air Cleaning Device: SNCR

Item to be inspected	Frequency of Inspections or repairs	Record keeping Method
Urea circulation, & metering skids operation.	Urea systems have back ups. So the equipment for the urea system is inspected and repaired as needed.	PO1 & PO2 log books, Operations outage work list or Outage report and the PM system.

Spare parts list for:

Emission Units (Source): EU BOILER
Based on the manufacture's recommendations, and plant operating experience, we would typically have the inventory of parts included in Appendix A for the boiler.

Air Cleaning Device: Mechanical Dust Collector
Based on the manufacture's recommendations, and plant operating experience, we would typically have the inventory of parts included in Appendix A for the mechanical dust collectors.

Air Cleaning Device: Electrostatic Precipitator
Based on the manufacture's recommendations, and plant operating experience, we would typically have the inventory of parts included in Appendix A for the Electrostatic Precipitator

Air Cleaning Device: SNCR
Based on the manufacture's recommendations, and plant operating experience, we would typically have the inventory of parts included in Appendix A for the SNCR.

Stack Monitoring: CEM
Based on the manufacture's recommendations, and plant operating experience, we would typically have the inventory of parts included in Appendix A for the SNCR.

B. Emission Unit (Source) and Air Cleaning Device Operating Variables to be monitored

Emission Units (Source): EU BOILER

Operating Variable	Normal Range of the Operating Variable	Frequency & method of monitoring and type of record keeping
Steam flow	85 KPPH – 350 KPPH depending on plant load.	Control system records this
Fuel feeder speeds	5% - 80% depending on fuel and plant load.	Control system records this
Grate speed	0-120hz depending on fuel and plant load.	PO1 log – every day
Steam drum water level	6 inches above to 6 inches below the middle of drum.	PO1 log – every day
Steam soot blowers	Soot blowers are blown as necessary to clean boiler tubes.	PO2 log – every day
Excess O2	1.5% - 4.0% PO2 is constantly adjusting his Excess O2 to control his emissions.	PO2 monitors and adjusts continually.
TDF burn rate	TDF screw speed is adjusted between 0 – 100% to control TDF tonnage being burnt.	PO2 monitors tonnage and adjust to feed a maximum of 1.875 tons per hour or 45 tons per day. Daily tonnage is recorded in CEMS & Ops log.

Air Cleaning Device: Mechanical Dust Collector

Operating Variable to be monitored	Normal Range of the Operating Variable	Frequency & method of monitoring malfunction and type of record keeping
Re-injection air for re-injecting char from dust collector.	Supply air -- 30 inches to 45 inches of water.	PO1 log – every day

Air Cleaning Device: Electrostatic Precipitator

Operating Variable to be monitored	Normal Range of the Operating Variable	Frequency & method of monitoring malfunction and type of record keeping
Opacity	0 – 5%	COMS – 1 hour block averages
Controls for transformer - rectifier sets.	Primary voltage on TR sets are above 60 volts	PO1 & PO2 logs – every day
Ventilation compartment air pressure.	Air pressure is above low compartment ventilation air pressure setting.	PO1 & PO2 logs – every day

Air Cleaning Device: SNCR

Operating Variable to be monitored	Normal Range of the Operating Variable	Frequency & method of monitoring malfunction and type of record keeping
Urea circulating skid operation.	Pump discharge pressure is between 6-40 PSI and discharge temperature is between 65 – 115 degrees F.	PO1 & PO2 logs – every day
Urea distribution panels.	Urea pressure between 40 – 95 psi.	PO1 checks pressure every shift. Cleans the urea lines quarterly IAW a quarterly PM.

C. Corrective Procedures or Operational Changes that shall be taken in the event of a malfunction or failure to achieve compliance with the applicable emission limit.

Emission Units (Source): EU BOILER

Malfunction or Failure	Corrective Procedure
Fuel feeder speeds	If the feeders are overfeeding wood, we will put feeders in manual to control them and limit the fuel feed to control our emissions.
Grate speed	If there are problems with the grates, we will use air lances and rakes to move the fuel/ash around and control our emissions.
Steam drum water level	If we are having problems maintaining our drum level, the load will be reduced until we are able to maintain our drum level and correct the problem.
Steam soot blowers	If the soot blowers are not operating correctly they will be repaired and then put back in service.
TDF burn rate	If something was to happen and we lost control of our TDF feed, the system will be run in manual or shutoff until the problem is corrected.

Air Cleaning Device: Mechanical Dust Collector

Malfunction or Failure	Corrective Procedure
The rotary valves, sand classifier conveyor, or sand classifier vibrator for the dust collectors are not operating.	Correct the problem and restore the equipment. If it's been down for a while and we cannot control our emissions, then it will be determined how long the repairs will take. If the repair takes less time than a normal boiler shutdown and startup, then we may run out of compliance until it is repaired. If it is going to take more time than a normal shutdown and startup then we will shutdown and make repairs.

Re-injection air pressure for re-injecting char from dust collector is low.	Correct the problem and restore air pressure. If it's been down for a while and we cannot control our emissions, then it will be determined how long the repairs will take. If the repair takes less time than a normal boiler shutdown and startup, then we may run out of compliance until it is repaired. If it's going to take more time than a normal shutdown and startup then we will shutdown and make necessary repairs.

Air Cleaning Device: Electrostatic Precipitator

Malfunction or Failure	Corrective Procedure
Opacity averages greater than 5% for over 2 hours.	Trouble shoot the problem. If the problem can be corrected quickly by making some online repairs / adjustments, it will be repaired / adjusted. If the problems cannot be repaired on line we will either drop load to maintain emissions or shutdown and make repairs.
Controls for transformer - rectifier sets & rapper controls are not functioning satisfactorily.	Trouble shoot the problem. If the problem can be corrected quickly by making some online repairs it will be repaired. If the problems cannot be repaired on line we will either drop load to maintain emissions or shutdown and make repairs.
If we loose the ventilation compartment air pressure.	Correct the problem and get the air pressure back up. If it's been down for a while and we cannot control our emissions, then it will be determined how long the repairs will take. If the repair takes less time than a normal boiler shutdown and startup, then we may run out of compliance until it is repaired. If it is going to take more time than a normal shutdown and startup then we will shutdown and make necessary repairs.
Ash conveyors, hopper heaters, and high level probes.	Correct the problem and get the equipment running again. If it's been down for a while and we cannot control our emissions, then it will be determined how long the repairs will take. If the repair takes less time than a normal boiler shutdown and startup, then we may run out of compliance until it is repaired. If it is going to take more time than a normal shutdown and startup then we will shutdown and make necessary repairs.

Air Cleaning Device: SNCR

Malfunction or Failure	Corrective Procedure
Urea circulating pump fails.	Put on the standby pump. If both pumps go down maintain emissions with metering pumps until you can get the circulating pumps back in operation. If we cannot maintain our emission limits with the metering pumps, then we will reduce load until we can.
Urea distribution panels are leaking or plugged.	Trouble shoot and correct the problem. If we cannot maintain our emission limits, then reduce load until we can.

Air Cleaning Device: CEM

Malfunction or Failure	Corrective Procedure
Opacity analyzer failure	Contact the maintenance dept for repair. If necessary contact the outside vendor. In the meantime the operation of the Precipitator will be checked every 2 hours and the following parameters will be recorded if the Opacity Monitor is down for >2 hours. Readings will be considered "Abnormal" if they fall outside the range of the previous 7 day's readings for that parameter, at that load level by more than 10%. Abnormal readings will be investigated and resolved. • Secondary Voltage on all fields • Secondary Current on all fields • Spark rate on all fields • Rapper system is Operating.
CO, NOx, SO2, CO2 or Stack Flow analyzer failure.	Contact the maintenance dept for repair. The following steps will be taken. • Based on the stable operation of the boiler and being in compliance with the required emissions levels at the time of the malfunction, continue to operate the boiler within normal parameters, and start repairs of the CEM immediately. • Should it be determined that replacement is required in lieu of repairs, continue to operate the boiler within normal parameters and start to replace the equipment immediately. • Should it be determined that replacement of equipment is going to take an excessive length of time, continue to operate the boiler within normal parameters and arrange for rental of CEM equipment in the interim period.

	• Should it be determined that rental of CEM equipment is not possible, continue to run the boiler at loads where extensive operating experience has demonstrated that the plant always complied with the emissions levels, & continue to correct the problem. • Should all of the above efforts not be acceptable, as a last resort, shut down the boiler until the CEM equipment can be placed in service.

Boiler Start Up and Shut Down Plan

The shutdown and cool down of the boiler takes about 12 hours. Starting the plant up from a cold start takes about 6 hours. The total process takes about 18 hours.

Boiler Start up

- Prior to the introduction of fuel into the boiler, the following checks will be made by the boiler operator and shift engineer via physical inspection and/or confirmed by the control system:
    1. All lockout/tagouts have been removed and all man ways are closed.
    2. The fans, valves, gas burner, stoker feed, grate systems and controls are operational.
    3. There is proper water level in the steam drum.

- The operator confirms that the CEM system is operating. The natural gas burner is started to gradually warm up the boiler. Only natural gas is fired in the boiler for the first 2-3 hours or so to slowly warm up the boiler. Somewhere between 250 – 300 psi steam pressure, wood will gradually be introduced. It takes about 6 hours to get the steam pressure and temperature up to the turbines minimum operating limits from a cold start.

B. PLANNED BOILER SHUTDOWN PROCEDURES

Boiler shut down

- Load is reduced on the unit until we are down to minimum load. The MFR for the boiler is tripped and the turbine is tripped on reverse power. The boiler is then cooled down according to the boiler curves.
- We cool the boiler down by pulling in outside air with the ID fan. It takes about 12 hours to get the temperature in the boiler down low enough so you can enter the boiler and complete any necessary repairs.

Appendix A – Spare Parts List

Emission Units (Source): EU BOILER
Based on the manufacture's recommendations, and plant operating experience, we would typically have the following inventory of parts.
10 Large Grate pads
10 Small Grate pads
30 Finger Grates
30 Grate spacers
5 Skid rails
2 Shaft Bearing Mounts
4 Sprockets
25 Skid pads
10 T-Bars
1 Rear shaft
1 Front shaft
4 Shaft Bearings

Air Cleaning Device: Mechanical Dust Collector
Based on the manufacture's recommendations, and plant operating experience, we would typically have the following inventory of parts.
5 Lip seal assemblies

Air Cleaning Device: Electrostatic Precipitator
Based on the manufacture's recommendations, and plant operating experience, we would typically have the following inventory of parts.
1 CPU board
1 output board
5 boots
2 Fiberglass shafts
1 SCR unit
4 Hopper Heaters
2 Insulators
3 Rapper units
5 Anvils
5 Hammers
5 Springs
1 Capacitance Probe

Air Cleaning Device: SNCR

Based on the manufacture's recommendations, and plant operating experience, we would typically have the following inventory of parts for the SNCR.

1 Pump
1 motor
1 Nox wand

Stack Monitoring : CEM

Based on the manufacture's recommendations, and plant operating experience, we would typically have the following inventory of parts.

For NOx Analyzer
2 Ozone generators
1 o-ring filter set
1 Lens
1 Temperature control unit
1 Ozone generator unit
1 Chopper unit

For CO analyzer
1 Chopper unit
1 Drive belt
1 IR source assembly
1 Filter set

For SO2 analyzer
1 Sample pump
1 lamp
4 Capillaries and O-rings

For CO2 analyzer
1 Sample pump
4 Capillaries and O-rings
1 Chopper unit

For Opacity analyzer
3 Audit filters
2 Humidity indicators
2 Retro Humidity indicators
4 Filters (Blower unit)

For Stack Flow analyzer
No parts because it has no moving parts