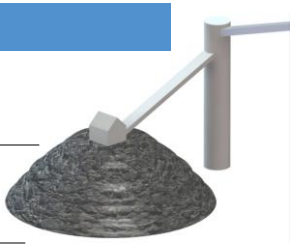
Fuel Factors Checklist



1 **What type of fuel(s) are we firing or co-firing?**

☐ Coal ☐ Biomass ☐ Gas ☐ Oil ☐ _____

2 **Is the fuel supply consistent?** ☐ Yes ☐ No

_____

3 **Do we have two ultimate coal analysis tests to compare?** ☐ Yes ☐ No

HGI *a.* _____ *b.* _____
(Hardgrove Grindability Index)

Slagging index *a.* _____ *b.* _____

T250 temperature *a.* _____ *b.* _____

4 **Do we have two ash mineral analysis tests to compare?** ☐ Yes ☐ No

a. _____

b. _____

5 **Other things to check**

☐ Coal supplier/mine/seam location ☐ Coal size (average & top size)
☐ Sampling method ☐ Ash fusion temperatures (oxidizing & reducing)
☐ Proximate coal analysis (w/high heating value) ☐ Crusher condition

Pulverizer System Checklist

1 **Are all the mills functioning properly?** ☐ Yes ☐ No

_____

2 **Are primary/secondary air flows optimized?**
☐ Yes ☐ No _____

3 ☐ **Are feeder flow rates optimized?** ☐ Yes ☐ No

4 ☐ **Mill temps:** *inlet* _____ *outlet* _____

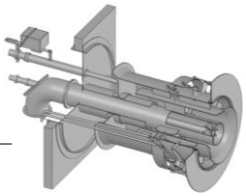
5 ☐ **Air temps:** *primary* _____ *secondary* _____

6 ☐ **Is fuel fineness from transport pipes optimized?** ☐ Yes ☐ No

7 **Other things to check**

☐ Horsepower per ton of coal ☐ Mill loading (typical/design capacity)
☐ Performance capacity (corrected for fineness, HGI, moisture, sizing)

Combustion Checklist



1 Do we have good, complete combustion?

☐ Yes ☐ No _____

2 Oxygen levels

Furnace exit _____

Boiler exit _____

Economizer exit _____

3 Air-to-fuel ratios

Primary _____ Total _____

4 Is fuel distribution to all burners consistently balanced? ☐ Yes ☐ No

_____

5 Gas temperatures

Furnace exit _____ Boiler exit _____

6 Forced draft (FD) fan settings

Current _____

Damper _____

7 Primary air fan (or exhauster) settings

Current _____

Damper _____

8 Other things to check

☐ Burner belt stoichiometry (air per MMbtu) ☐ Feeder flow rates

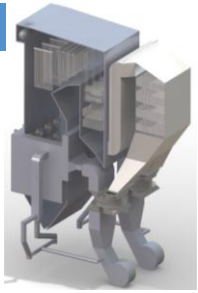
☐ Furnace-to-windbox differential pressure ☐ Furnace exit gas profile

☐ Furnace exit O_2 profile ☐ Over-fire air settings (%, flow, distribution)

☐ Secondary air flow & dampers ☐ Boiler exit velocity profile

☐ Pressure drop across windbox, furnace, convection pass, AH, backend

Steam Cycle and Boiler Reliability Checklist



1 **Are all controllable losses optimized?** ☐ **Yes** ☐ **No**

Turbine cycle heat rate _____

Furnace heat release rate _____

Net plant heat rate _____

2 **Are we able to maintain design steam temperatures?**
☐ **Yes** ☐ **No** _____

3 **Do we have any air in-leakage originating in the boiler?** ☐ **Yes** ☐ **No**

Infiltrations between… ☐ furnace & penthouse ☐ penthouse & airheater

☐ Other _____

4 ☐ **Furnace exit gas temperature** _____
(measured by water-cooled probe)

5 ☐ **Outlet header condition assessment** _____
(recommended every 2-5 years) *(date)*

6 ☐ **Visual boiler inspection** _____
(recommended each outage) *(date)*

7 **During inspections, did we find unburned carbon on tubes in the upper furnace (above the burner belt)?** ☐ **Yes** ☐ **No**

_____

8 **What is our most recent EFOR (Equivalent Forced Outage Rating)?**

Date _____ Rating _____

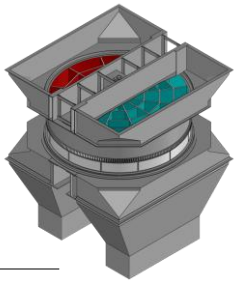
9 **Other mechanical issues to check**

☐ Burner mechanical condition ☐ Condition of soot blowers
☐ Upper furnace/convection pass tube alignment
☐ De-superheating spray flows (superheater and reheater)
☐ Tube metal temperatures

10 **Other process issues to check**

☐ Turbine cycle deviations ☐ Steam/water isolation problems
☐ Feed water heater problems ☐ Long-term condenser issues
☐ Losses from combustion of moisture & hydrogen ☐ Dry gas losses

Airheater Performance Checklist



1 **Is airheater performance optimal?** ☐ **Yes** ☐ **No**

2 **Do we have ports available for representative testing?** ☐ **Yes** ☐ **No**

3 **Do we have representative performance data available?** ☐ **Yes** ☐ **No**

☐ Inlet data ☐ Outlet data ☐ Oxygen ☐ Temperatures ☐ Static pressure

4 ☐ **Oxygen levels**

Airheater inlet _____

Airheater outlet _____

5 **Are the gas outlet flows and/or temperatures stratified?** ☐ **Yes** ☐ **No**

6 ☐ **Performance results**

Leakage _____

X-ratio (air-to-gas) _____

Air-side efficiency _____

Air-side differential pressure (ΔP) _____

Gas-side efficiency _____

Gas-side differential pressure (ΔP) _____

Corrected no leakage exit gas temperature _____

7 **Other things to check**

☐ Recuperative and/or regenerative airheater mechanical conditions *(seals, heating elements/tubes, plates, gears, turn-down, motor, diaphragm, pin racks, fasteners, soot blowers, other components)*

☐ Airheater reliability ☐ Cold-end corrosion

Selective Catalytic Converter (SCR) Performance Checklist

1 **Are we experiencing ammonia slip?** ☐ **Yes** ☐ **No**

If yes, how much? (PPM) _____

2 ☐ **Are we experiencing pressure drop issues?** ☐ **Yes** ☐ **No**

Inlet pressure _____ Outlet pressure _____

3 ☐ **NO_x concentration**

Inlet _____ Outlet _____

4 ☐ **Sulfur trioxide (SO_3) concentration**

Inlet _____ Outlet _____

5 ☐ **SCR temperatures**

Inlet _____ Outlet _____

6 **Other things to check**

☐ Ammonia distribution ☐ Ammonia flow ☐ Gas velocity distribution
☐ Bypass damper position ☐ Mercury oxidation issues
☐ Catalyst poisoning, deactivation and/or accelerated erosion

Sorbent Injection (Spray Dryer) Performance Checklist

1 **What type of sorbent are we using?** _____

2 **Are we over- or under-injecting?** ☐ **Yes** ☐ **No**

Sorbent injection rate _____

3 **Are all the spray atomizers in service?** ☐ **Yes** ☐ **No**

_____

4 ☐ **Percent solids** _____

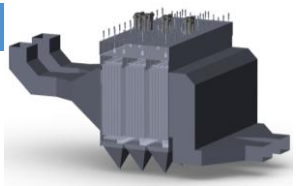
5 ☐ **pH of injected fluid** _____

6 ☐ **Temperatures**

Inlet _____ Outlet _____

7 ☐ **Outlet gas humidity level** _____

Precipitator Performance Checklist



1 **Are secondary voltage and current readings within normal range?** ☐ **Yes** ☐ **No**

_____

_____

2 ☐ **Gas temperatures**

Inlet _____

Outlet _____

3 **What type of fuel(s) are we firing or co-firing?**

☐ **Coal** ☐ **Biomass** ☐ **Gas** ☐ **Oil** ☐ **Other**

_____

4 **Do we have high levels of unburned carbon in ash?** ☐ **Yes** ☐ **No**

How much? _____

5 **Opacity trace trends (spikes, etc.)**

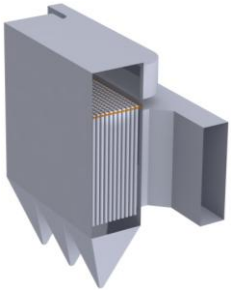
_____

_____

6 **Other things to check**

☐ Primary voltage and current ☐ Spark rate ☐ Flue gas flow rate
☐ Rapper systems (mechanical, programming) ☐ Inlet temp profile
☐ Hopper collection profile ☐ O_2 differential across unit
☐ Chemical injection rates upstream of ESP (SO_3, NH_3, etc.)
☐ ESP fly ash resistivity ☐ Particle size distribution (inlet/outlet)
☐ Hopper catch ash mineral analysis ☐ Mass loadings (inlet/outlet)
☐ Velocity distribution (inlet/outlet) ☐ Pressure differential across unit
☐ Performance of SO_2 injection system (upstream of ESP)
☐ Condition/performance of data collection systems
☐ Condition/performance of economizer & airheater hoppers (upstream)

Baghouse Performance Checklist



1 **Are we experiencing opacity exceedances?**

☐ **Yes** ☐ **No**

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2 **What is the differential pressure (ΔP) before and after cleaning?**

Before _____

After _____

3 **Is cleaning energy sufficient?** ☐ **Yes** ☐ **No**

Reverse air: inches H_2O. Pulse jet: compressed air pressure (PSI)

---

4 **Are we using an appropriate cleaning method (online or offline)?**

☐ **Yes** ☐ **No**

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5 **Are all compartments in service?** ☐ **Yes** ☐ **No**

---

6 **Do we have hopper pluggage/high hoppers?** ☐ **Yes** ☐ **No**

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7 **Other things to check**

☐ Flue gas flow rate ☐ O_2 differential across unit (air in-leakage)
☐ Hopper catch ash mineral analysis ☐ Gas temps (inlet/outlet)
☐ Inlet/outlet mass loadings ☐ Inlet/outlet particle size distribution
☐ Sorbent injection rates upstream of baghouse
☐ Appropriate air-to-cloth ratio (filter area)
R/A, 1.75:1-2.5:1 | Pulse jet, 3.25:1-4.0:1 | Shaker, 2.0:1-2.5:1

Gas Scrubber Performance Checklist

1 **Is scrubber performance consistently optimal?** ☐ **Yes** ☐ **No**

_____

2 ☐ **Temperatures**

Inlet _____ Outlet _____

3 ☐ **Differential pressure (DP, ΔP) between inlet and outlet**

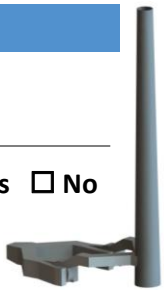
_____

4 ☐ **Scrubber solution pH** _____

5 **Other things to check**

☐ Water makeup ☐ Scrubber efficiency
☐ Energy consumption ☐ Mist eliminator performance
☐ Large particle size (LPA) ☐ Corrosion/alloy condition

Induced Draft (ID) Fan and Stack Checklist



1 **Are we using more fan than in the past?** ☐ **Yes** ☐ **No**

_____

2 **Do we have two sets of stack test results to compare?** ☐ **Yes** ☐ **No**
includes 0_2, CO, CO_2, SO_2, NO_x, temp, PM, Hg, opacity, D&Fs, HCl

a. _____

b. _____

3 ☐ **Fan settings**

Current _____

Damper _____

4 ☐ **Fan inlet temperature** _____

5 **Other things to check**

☐ Continuous emission monitoring system (CEMS) parameters
(all available)