# DESIGN IMPACT ON PERFORMANCE OF SLOP / SPENT-WASH FIRED BOILER

## HOW TO CHECK DESIGN IMPACT ON PERFORMANCE

## WRONG DESIGN PREDICTION lead to start JUSTIFICATION in BOILER

**CONCERN:**

1. **High Economiser Outlet Water temperature**
2. **High Flue Gas temperature at ESP Inlet / APH Outlet**
3. **High Emission from ESP (White Smoke / Fine dust)**
4. **Low Final Steam Temperature @ 100 % MCR load with zero attemperation / spray water**
5. **SCAPH Bypass to control ESP Inlet temperature**
6. **Low Deaerator Outlet Water Temperature to control Boiler Parameters**
7. **High Primary Superheater outlet steam temperature (more than final steam temp.)**

To access the Correct Design, Boiler performance, Operation reliability, Check the Boiler Log data:-

### 1. STEAM DRUM SATURATION TEMPERATURE at Drum Operating Pressure v/s ECONOMISER OUTLET FEED WATER TEMPERATURE

| BASIC DESIGN RULE | ACTUAL BOILER LOG | IMPACT ON BOILER | SOLUTION / CORRECTIVE ACTION |
|---|---|---|---|
| Difference to be kept more than **> 20 degC** at designed deaerator operating temp. in-between Drum & Economiser water temperature | **Slop fired boiler is being operated at very less difference i.e. less than <05 degC only** | Steaming in Economiser,<br>Scaling in Economiser,<br>Disturbed boiler circulation,<br>Pressure Part Failure,<br>Reduce Boiler performance, | Correct the Boiler Design according to Safe temperature difference,<br>Reduce Economiser Gas inlet temperature,<br>Reduce Deaerator Operating temperature from designed temperature (will lead to Dew Point Corrosion in Economiser) |

**Example of Actual Running Boiler Parameter:**

Steam Drum Operating Pressure - 50 Kg/cm2g, Main Steam Pressure - 45 kg/cm2g

Steam Drum Saturation water temp - 264 degC, Economiser Outlet Water Temperature - 259 degC

## 2. ESP PERFORMANCE REDUCTION due to HIGH FLUE GAS TEMPERATURE at APH OUTLET / ESP INLET

| BASIC DESIGN RULE | ACTUAL BOILER LOG | IMPACT ON BOILER | SOLUTION / CORRECTIVE ACTION |
|---|---|---|---|
| ESP Design / Operating maximum Inlet temperature for best performance is **less than < 180 degC**<br><br>**All ESP are designed in-between 140 degC to 160 degC only for best performance** | **Slop fired boiler is being operated at very high ESP Inlet Temperature i.e. more than >205 degC & going upto 240 degC** | High Emission due to high ESP operating temp.,<br>High Gas volume m3/sec at ESP inlet,<br>White smoke having very fine dust particles,<br>Reduce Boiler Efficiency,<br>High ID fan Power Consumption & fan volumetric loading,<br>ESP Internal Parts failures,<br>High APH air outlet temperature,<br>High ash temperature for ash handling system,<br>High Heat Radiation loss from casing, | Correct the Boiler Design to reduce flue gas temperature,<br>Correct the ESP Design,<br>Increase SCA in ESP to reduce emission,<br>Reduce SCAPH - Steam coil Air Pre-heater Operating temperature (will lead to Dew Point Corrosion in APH) |

**Example of Actual Running Boiler Parameter:**

APH Air Inlet temp - 51 degC, APH Air Outlet temp - 195 degC, ESP Inlet gas temp- 215 degC and ESP Collection efficiency will reduced drastically below < 84%.

Usually, SLOP FIRED BOILER is DESIGNED @ 61.5 to 63.5 % Boiler Efficiency on Slop plus Bagasse combination.

Disturbed parameters in boiler due to wrong predicted design value in calculation, deteriorate the Boiler Efficiency and increase steam to fuel ratio and running cost of plant along with higher failures and maintenance. **All affected Boiler Parameters are playing a major role in Boiler Efficiency Calculation.**

## 3. LOW APH AIR INLET TEMPERATURE to control HIGH FLUE GAS TEMPERATURE at ESP INLET

| BASIC DESIGN RULE | ACTUAL BOILER LOG | IMPACT ON BOILER | SOLUTION / CORRECTIVE ACTION |
|---|---|---|---|
| SCAPH is design to avoid Dew Point Corrosion at APH Inlet cold end and temperature is kept more than **> 105 degC**<br><br>At the same time, **Design allow Low Air inlet temperature i.e. 30 degC** without Dew Point Corrosion consideration | **SCAPH bypass / out of service due to Slop fired boiler is being operated at very high ESP Inlet Flue Gas Temperature i.e. more than >205 degC** | High risk of Dew Point corrosion in APH,<br>High ESP inlet Temperature,<br>Reduce Boiler Efficiency (to adjust correction taken in fan air temp rise),<br>High Auxiliaries Power Load | Do Not Bypass SCAPH to avoid dew point corrosion,<br>Reduce SCAPH Operating temperature (will lead to Dew Point Corrosion in APH) |

"ENERGY CONSERVATION & TROUBLE FREE WORK ENVIRONMENT"

**M/s Unite Energy Corporation LLP** is keen to provide the sales & service support to mitigate the irregularities in the plant, minimize breakdown & downtime, improvise design & system performance to improve the overall plant's health and performance.

Regards

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