

## Performance Check of Retrofitted 65 TPH FBC Boiler

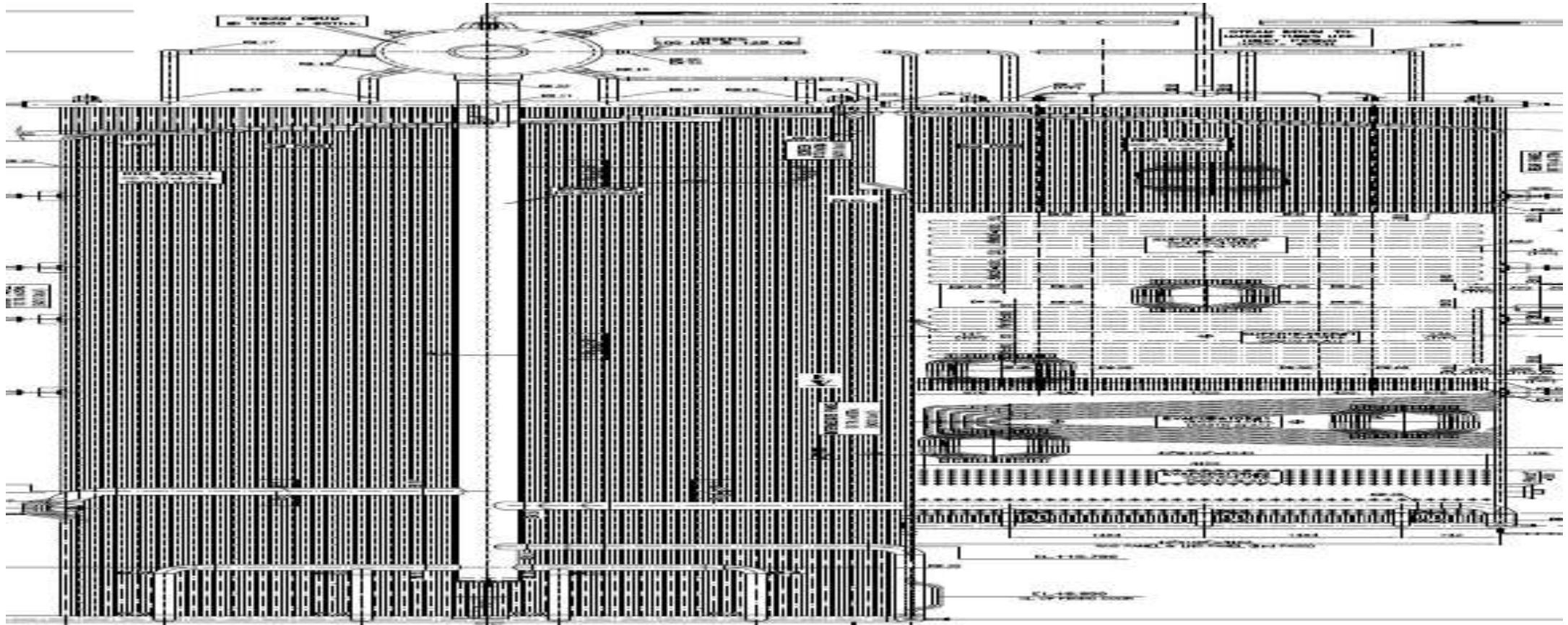
**Client: Tech N Soft Engineering Enterprises, Trichy**

**Project: KVK Bio Power, Chattisgarh**

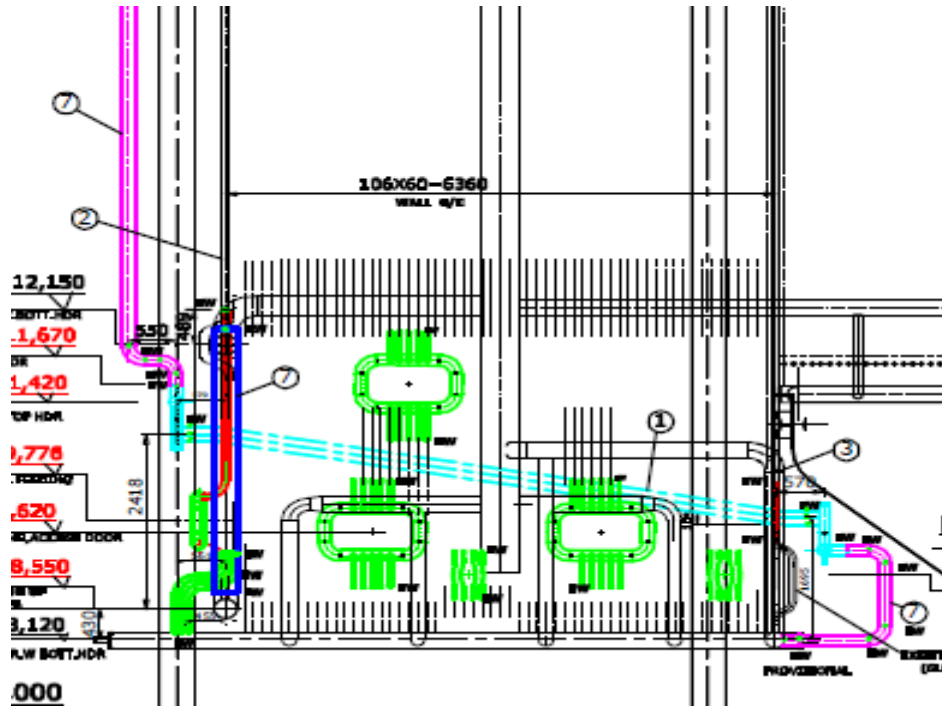
### Scope: Performance check

- Performance check of an existing 65 TPH Atmospheric Bubbling Fluid Bed Combustion (BFB) boiler for 100% Coal and 100% Rice Husk firing to analyze the reason for shortfall in main steam temperature
- Fuel analysis verification
- Submission of a report with recommendations to achieve design steam temperature

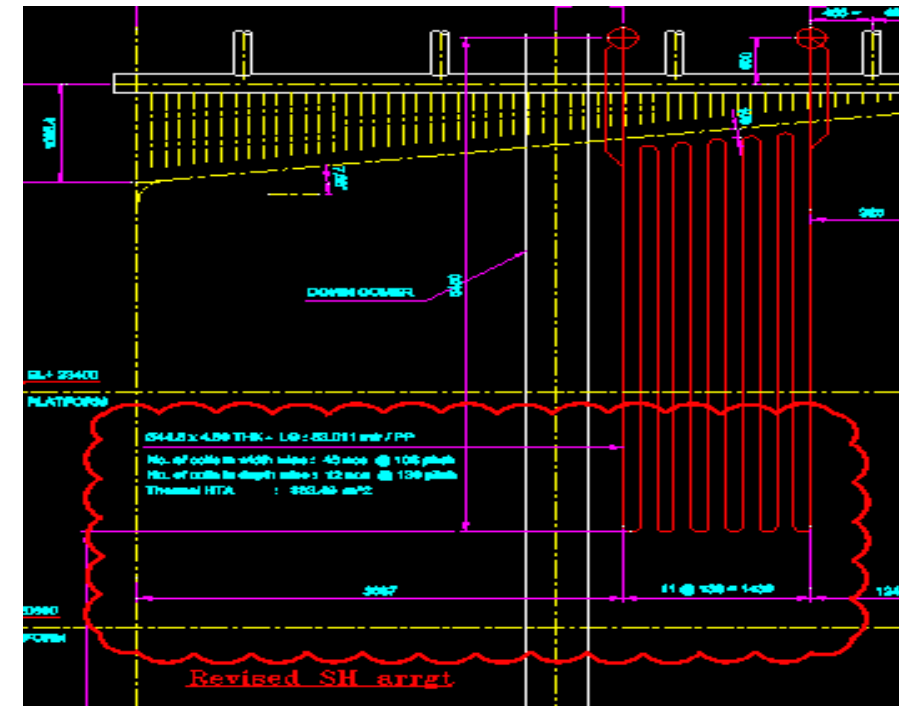
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Suggestion on Bed coil modification



Suggestion on Pressure parts modification

## Performance Check of Retrofitted 65 TPH FBC Boiler

Client: Tech N Soft Engineering Enterprises, Trichy  
Project: KVK Bio Power, Chattisgarh



Ref: AES / Engg / 0821 / 008

dated 12 August 2021

Tech N soft Engineering Consultancy  
Trichy

Kind Attention: Mr. Venkatesan / Mr. Ramesh Babu

### REPORT on Performance Checking of a 65 TPH boiler - KVK Bio Energy Private Limited, Chhattisgarh

AES has been requested to carry out a performance check on the KVK Power's existing boiler by TechNSoft Engineering Consultancy, Trichy. The request was made through an email dated 07 August 2021. Pressure parts arrangement of the boiler and input details received from end client were provided.

It is understood that the boiler in question has originally been designed as a traveling grate boiler by Thermal Systems Limited, Hyderabad and later on converted into a fluid bed boiler by client using a local consultant.

The arrangement drawing provided did not have any in-bed tubes in the fluidization zone, but a row of screen tubes just above the fluidized bed. No operating data was available. It is reported earlier that the boiler has been operated only for two days after conversion, and was stopped due to forced maintenance since there was some issue with the ESP.

It is also reported that the traveling grate boiler also did not achieve the desired SH outlet temperature of 495 deg C, but this was not a verified information.

AES has completed the performance checks and sent the predictions to TechNSoft on 11 August 2021. The salient points in that interim report are as below:

1. The bed temperature of 920 deg C given by end client appears to be not correct. The bed tubes are not immersed in the fluidization zone and act more like screen tubes. Hence, the heat balance in bed occurs only at around 1050 deg C at higher excess air levels (around 60%) in the absence of in-bed heat exchangers, with coal firing.
2. This high bed temperature is not practical since there will be a high degree of agglomeration and clinkering with coal firing.
3. However, theoretically if we work out with this temperature, we can achieve the superheat temperature, and the predicted gas temperature profile is as below:

### Report on Performance checking



AES did carry out another performance check again on 12 August 2021. Our findings are as below:

#### Option 2a: 20EA 920BT

- In this option 20% excess air at 920 deg C Bed temperature was considered.
- For this FSH requires additional area of 800 sq.m to achieve the desired final SH (FSH) outlet temperature of 495 deg C. Existing Primary SH literally is not effective.
- Furnace EPRS is around 275 sq.m.

#### Option 2b: FSH 450 FURNACE 75%REF

- In this option 20% excess air at 920 deg C Bed temperature was considered.
- Furnace EPRS considered 70% only (EPRS 190 m2)
- The FSH heating surface area is increased to 450 m2. Effective length has been increased from 4.2 to 6.2 m. But, maximum temperature at final SH we could achieve is only 450 deg C.

#### Option 2c: SH 495 WITH ADDI COIL

- In this 20% excess air with 920 deg Bed temperature considered.
- Furnace EPRS considered 75% only (EPRS 192.5m2)
- To meet Final outlet temperature, Effective length has been increased from 4.2 to 6.2 m.
- In deep, coils are increased from 12 to 16 numbers. Number of tubes wide are 45 in number.
- With this arrangement the radiant SH heating surface is increased to 630 sq.m
- FSH temperature of 495 C could be achieved.

#### Performance Parameters for Option 2C at 100% load with Coal firing:

##### Gas temperature profile:

New Radiant SH: 830 C cooled to 640 C  
Secondary SH: 630 C cooled to 525 C  
Primary SH: 525 C cooled to 460 deg C

##### Steam temperature profile:

New Radiant SH: 360 C heated to 495 C  
Secondary SH: 310 C heated to 360 C  
Primary SH: 291 C heated to 320 deg C  
10 deg C drop in desuperheater

### Performance checking for Various options