

ANALYSIS OF INSTALLING SOOT BLOWER IN BOILER

Assumptions:-

Specific heat of boiler feed water: 1 kcal/kg. Degree C
Specific heat of super heated steam: 0.45 kcal/kg. Degree C

Calculations:-

As per the data given, Quantity of steam required for 110 MW = 110×3.5 TPH
= 385 TPH

Part-I (Condition before installing steam soot blower)

Let **X** be the super heater temperature and it has to be reduced to 536 degree

Quantity of heat loss by steam = Quantity of heat gained by spray water

$$\begin{aligned} 385 \times 1000 \times 0.45 \times (\mathbf{X}-536) &= 30 \times 1000 \times 1 \times \{ \mathbf{X}-(536-170) \} \\ 173.25\mathbf{X}-92862 &= 30\mathbf{X}-10980 \\ \mathbf{X} &= \mathbf{571.6 \text{ degree}} \end{aligned}$$

Part-II (Condition after installing steam soot blower)

Let **Y** be the super heater temperature and it has to be reduced to 536 degree

Quantity of heat loss by steam = Quantity of heat gained by spray water

$$\begin{aligned} 385 \times 1000 \times 0.45 \times (\mathbf{Y}-536) &= 7 \times 1000 \times 1 \times \{ \mathbf{Y}-(536-170) \} \\ 173.25\mathbf{Y}-92862 &= 7\mathbf{Y}-2562 \\ \mathbf{Y} &= \mathbf{543.2 \text{ degree}} \end{aligned}$$

ANALYSIS

Because of steam soot blower installation, the super heater steam temperature reduced from 571.6 to 543.2 degree Celsius and heat is observed in water walls and economizer of boiler.

$$\begin{aligned} \text{Therefore useful heat observed in boiler} &= (\mathbf{X}-\mathbf{Y}) \times 385 \times 1000 \times 0.45 \\ &= (571.6-543.2) \times 385 \times 1000 \times 0.45 \\ &= \mathbf{4920300 \text{ kcal/kg}} \\ \text{Net heat gained in boiler} &= 4920300/0.80 \text{ (boiler efficiency)} \\ &= \mathbf{6150375 \text{ kcal/hr. (I)}} \end{aligned}$$

Quantity of steam required for steam soot blower = 110 TPD

Quantity of steam required for steam soot blower/hour = $110/24=4.58$ TPH

Energy lost due to extraction of steam for soot blower from main steam line
= $4.58 \times 822.9 \times 1000$
= 3768882 kcal/hr. (II)

Net heat gain = **I-II**
= $(6150375 - 3768882)$ kcal/hr
= 2381493 kcal/hr

Equivalent coal saving = Gain in heat input/GCV of fuel
= $2381493/4600$
= 518 kg/hr that is 0.516 TPH

Annual quantity of coal saving = 0.518×7000 hours
= 3626 T/year

Annual monetary saving = $3626 \times \text{Rs.}1800$
= Rs.6526800
= **Rs. 65.268 Lakhs / year**

Simple pay back period due to repair of steam soot blower

= Rs. 4 crores/0.65268
= 6 Years

From

B.S. Sathiamoorthi Rao (EA-2314)
176-B, TYPE-II QUARTERS,
BLOCK-6,
NEYVELI-3.
607 803.
E-MAIL ADDRESS; sathiasurender@yahoo.com
Phone nos: (04142) 282205
9442656693 (mobile)

To

Mr. Chakaravathi,
Manager,
BEE.

For Expert comments on Issue #1 – [click here](#)