

Successful Implementation – Energy Conservation Measure

Measure
Reduction in Blow down Losses through automatic blow down controller in a packaged boiler
Equipment
Boilers
Industry / Sector
Pharmaceuticals
Year of Implementation
1999
Cost Benefit Analysis
o Type of Measure: Medium investment
o Annual Energy Savings: 7.2 kL of furnace oil
o Actual cost savings: Rs. 0.57 lakh
o Actual investment : Rs.1.80 lakh
o Payback: 3 years
Implementation Highlights
<ul style="list-style-type: none"> ☞ Can be implemented in all types boilers such as fire tube and water tube boilers ☞ Implementation of the measure has resulted in energy savings and also ☞ Avoided operators frequent intervention ☞ Avoided frequent testing of blow down for TDS ☞ Suitable for poor water quality installations

Summary

Installation of a blow down controller resulted in controlling the excess blow down as well as avoiding high TDS level. Significant energy savings result after installation of a blow down controller.

Background

A leading pharmaceutical company has one 4 tph boiler to meet the steam requirement of the plant. The boiler uses furnace oil and consumes about 900 kL of furnace oil per year, which accounts for about Rs. 60 Lakh.

The boiler house has a softener for makeup water treatment. The actual feed water TDS is about 5 ppm. The maximum permissible water TDS in the boiler drum is 3500 ppm.

Intermittent blow-down from the boiler was provided manually every shift by opening the valve for 30-40 sec. Before the blow down, the water level in the boiler drum was raised considerably and the valve is opened.

The blow down analysis indicates that TDS varied in the range of 100 – 500 ppm. Such a low TDS calls for huge blow down quantity resulting in significant sensible heat loss and water losses.

Principle

The process of steam raising inevitably results in the concentration of dissolved and suspended solids in the boiler water. Above certain level of concentration, these solids are deposited as scale inside the boiler and can cause over heating which in turn lead to tube failure. The scale also impedes heat transfer and reduces the boiler efficiency.

Hence it is necessary to control the level of concentration of the solids, achieved by the process of "blow down". A certain volume of water is drawn off and is automatically replaced by fresh feed water thus maintaining the optimum level of total dissolved solids (TDS).

Blow down is given either of

- Instantaneous
- Instantaneous & continuous

This loss varies between 1% to 10% and depends on number of factors. Such as

- TDS allowable in the boiler water (100-3000 TDS)
- The quality of makeup water
- The amount of contaminate condensate
- Boiler load variation

% Blow down requirement is given by $(S1 \times 100) / (S2 - S1)$

Where S1 : TDS in the feed water in ppm

S2 : Desired TDS in the boiler in ppm.

Excessive blow down more than required will results in loss of energy losses due to loss of hot water. Hence it is advisable to have the blow down quantity with in optimum limits by maintaining the TDS levels in the required range. Maintaining of the TDS in with in limits can be achieved by adopting automatic blow down control system.

Details of techno-economics:**Blow down details – before implementation**

Particulars	Value	Units
Blow down nozzle diameter	40	mm
Drum pressure	8.5	Kg/cm ²
Feed water ppm	5	ppm
Approximate blow down quantity (based on raise in water level in the blowdowntank)	950	kg/shift
Average steam generation	2850	kg/day
Design TDS for the boiler drum	1400	kg/h
Heat in the blow down	3500	ppm
Equivalent FO	416100	kcal/day
	43.34	kg/day

Results after implementation ie., after installation of controller:

Reduction in blow down quantity	: 500 kg/shift
TDS in the boiler drum	: 1500-2500 ppm
Saving of Furnace Oil	: 7.2 kL/year
Annual value of savings	: Rs. 0.57 lakh
Investment	: Rs. 1.80 lakh
Simple Payback Period	: 3 years

Implementation issues

- ☞ Required stoppage of the boiler for considerable time
- ☞ High pay back period in case of smaller capacity boiler
- ☞ Requires periodic verification of the control unit, to ensure proper operation of the boiler
- ☞ Requires approval from boiler statutory authorities