Assessment Method to Reduce Silica from Boiler Feed Water to Improve Boiler Performance of the Plant

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ABSTRACT:

During routine of boilers, water examination of impact heater, it was seen that, silica, conductivity and PH esteem increments when contrasted with typical worth, additionally wheel chamber pressure and pivotal relocation of the drive with response type turbine increments. Subsequent to checking it is discovered that, the demineralised water plant has submitted botch during recovery. The structure particular of the heater and DM plant needs to give DM water not exactly < 0.02 ppm (20 ppb) of Silica (Sio2), yet it was giving water, more than > 0.02ppm (20 ppb) of Silica. Subsequently to accomplish structured worth, different parameters influencing the evaporator execution are concentrated in detail. The best technique after hypothetically perception is seen as the strategy for Ultra filtration. This filtration strategy gives water at structured rate and additionally brings about diminished in silica level, conductivity, fuel utilization and steam age is expanded.

Key words: Ultra filtration, Demineralization Plant, Conductivity, Silica

1. INTRODUCTION

Silicon is one of the earth's second more available after oxygen. It is not available free in nature, but it's have the dioxides like, Sio2 and these silicates are the compounds of silicon, these compounds are relatively insoluble. The natural waters used in industries as a source which contains the silica up to the 100ppm.

The total silicon compounds are present in the water & these can be divided into two forms like, „reactive"(dissolved) and „non-reactive" (un-dissolved) silica. The half of the silicon compounds in the water source may be in the form of non-reactive (colloidal silica) and these also must be reduced significantly by the pre-treatmentprocess, by converting non-reactive silica into the reactive silica form in the boiler. The silica is present in the water in reactive form or dissolved silica. In surface waters, a small quantity of the non-dissolved silica (colloidal silica) may also be present especially during the rainy season. The water may passes through and over the various soils of different locations finally comes into the lakes and rivers. Under this situation or due to this, the formation of carbon dioxide and organic acids may takes place and resulting from microbial activity & results in the acid degradation of the silicate components.This corrosive assaults the minerals will breaks down the iron, aluminum, and so forth and the cooperation of these parts with silica may brings about arrangement of the non-responsive or colloidal silica. By and large, the water treatment process includes the progressive phases of filtration. By and large, the substance items are utilized in the physical-concoction treatment process. Ultra filtration is a physical procedure wherein, the two phases are

completed at the same time. This filtration method includes the death of water through the permeable layers. The Ultra filtration is the partition procedure where, it utilizes the layers with the pore estimates in the scope of 0.1 to 0.001 micron. Ordinarily, the Ultra pressure gives a sign of the measure of foulingon the film surface. On the off chance that the weight distinction arrives at roughly 20 psi a cleaning of the films is required by taking the framework disconnected and ensuing re-circling low and high pH cleaning arrangements

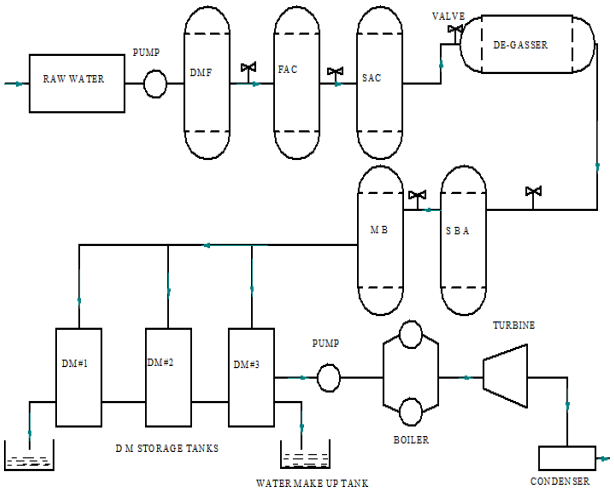

Fig. 2: Feed water to the Boiler before Modification

3. CALCULATION

A) Fuel Saving:

$$=\frac{100+(ta-tb)}{T+32-tb} \quad \text{..... (i)}$$

Where,

ta = feed water temperature after

tb = feed water temperature before

T=temperature of steam

$$=\frac{100(107-97)}{485+32-94} \text{..... (ii)}$$

= 2.61 TPH

A. Boiler Efficiency:

$$\eta b= \frac{Q(H-h)}{q+gcv} \text{.....} \quad \text{..... (iii)}$$

Where,

Q = Steam flow rate in kJ/kg

H = Enthalpy of steam in kcal/kg

h = Enthalpy of feed water temperature

q = Fuel firing rate in TPH

GCV = Gross calorific value in kcal/kg

B. Corex Gas utilizing as a Fuel in Boiler:

1) Before:

At 62 kg/cm^2 and 4850C enthalpy of steam (H) is WKT, 1kg/cm^2.981 bar At 62 bar & 4850℃

H = 3419.88 kJ/kg

Enthalpy of feed water temperature (h) = 1050℃

Steam flow rate (Q) = 80

TPH Fuel firing rate (q) = 39.838 TPH

$$\eta b =\frac{80(816.76-97)}{39.933+2000} \text{..... (iv)}$$

= 72.26%.

2) After:

Fuel terminating rate (q) = 37.22TPH, in the wake of sparing the fuel of 2.61 TPH. Enthalpy of feed water temperature (h) = 1070℃

$$\eta b =\frac{80(816.76-103)}{37.22+2000} \text{..... (v)}$$

= 76.27%.

In this manner, increment in heater effectiveness is about 4.01%

C. Impact Furnace Gas as an in Fuel in Boiler:

1) Before:

At 62 kg/cm^2 and 4850C enthalpy of steam (H) is, WKT, 1kg/cm^2 = 0.981 bar At 62 bar & 4850℃

H = 3419.88 kJ/kg Enthalpy of feed water temperature

(h) = 970C Steam flow rate

(Q) = 85 TPH Fuel firing rate

(q) = 109 TPH

$$\eta b=\frac{80(816.76-97)}{109+820} \text{..... (vi)}$$

= 64.42%.

2) After:

Fuel firing rate (q) = 106.39 TPH,

after saving the fuel of 2.61 TPH.

Enthalpy of feed water temperature (h) = 1070℃

$\eta b = \frac{80(816.76-107)}{106.39+820}$ ..... (vii)
= 65.08%.

In this way, increment in heater productivity is about 0.66%. Thus, after decreased the silica content in the feed water, the heater proficiency is increment about 4.01%by utilizing Corex as fuel and is about 0.66% expanded utilizing BFG as a fuel.

4.RESULT &DISCUSSIONS

Description	Units	Before	After
Silica in drum water	ppm	3.0825	0.6845
Silica in feed water	ppm	0.0237	0.0125
Feed water temp	0_C	97	107
Fuel firing rate (BFG)	TPH	109	106.39
Fuel firing rate (corex)	TPH	39.839	37.22
Boiler efficiency (BFG)	%	64.42	65.08
Boiler efficiency (corex)	%	72.26	76.27

Table1: Before & After Modification

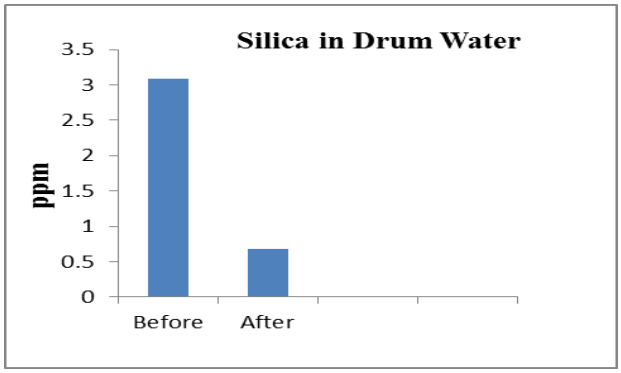

Fig 3: Silica level in Drum water

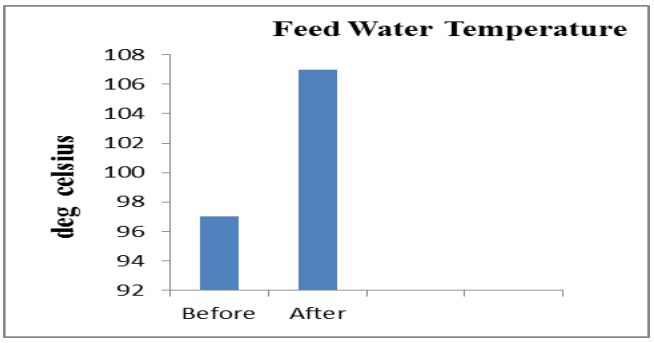

Fig 4: Silica level in Feed water

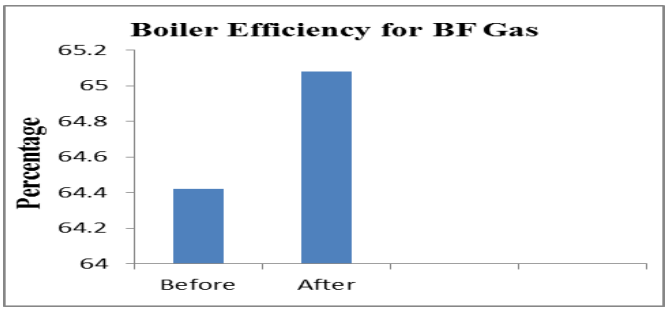

Fig 5: Feed water Temperature

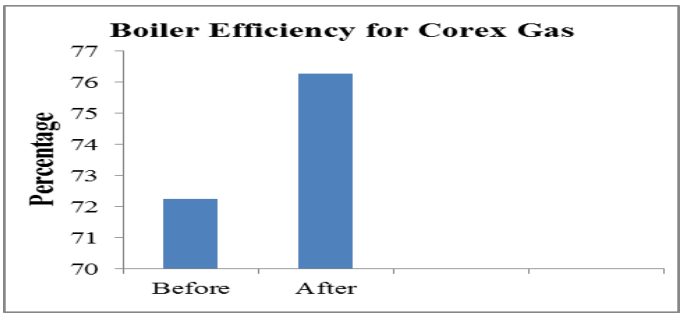

Fig 6: Boiler Efficiency for BF Gas

5. CONCLUSION

- After receiving the above strategy the accompanying improvement are watched,
- The synthetic utilization of water treatment is decreased.
- The pivotal uprooting of the turbines are goes under control.
- The consumption and scale arrangement inside the kettle drum and heater inward surface may lessen.
- The effectiveness of the kettle increments up to 4.01% utilizing Corex gas as a fuel and 0.66% utilizing Blast Furnace Gas as a fuel.

- Helps to spare the up to 2.61 TPH.
- Help in diminishing the plant shutdowns to a base.

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