Increasing Efficiency of Boiler: A Case of Sugar Manufacturing Industry

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ABSTRACT

This work describes the boilers efficiency improvement as a case of sugar industry in Maharashtra. It is necessary to improve efficiency of boiler for performance improvement. Here boiler efficiency is improved by increasing various tubes and addition of super heater.

Keywords: Boilers Efficiency, Super Heater Tubes.

I. INTRODUCTION

This project describes the modern boilers in the karmayogi shankaraoji Patil, sahakari sugar industry and ways to improve the boiler efficiency. Boiler is device which is used for any developing industries for production. It is necessary to improve efficiency of boiler for performance improvement. Here boiler efficiency is improved by increasing various tubes and addition of super heater. Along with this, extension of side wall headers and tubes (LH & RH), modification of front wall tubes headers & roof tubes, addition of furnace bottom tubes & headers, modification of screen tubes, addition of tertiary super heater coils, modification of steam drum to front header down comers, addition of front header to bottom header down comers, modification of steam drum & addition of relief tube. Improvements in mentioned parameters lead to performance improvement of boiler of super heater.

II. METHODS AND MATERIAL

Way of increasing boiler efficiency.
When the following Modification is given

(A) EXTENSION OF SIDE WALL HEADERS & TUBES (LH)
(B) EXTENSION OF SIDE WALL HEADERS & TUBES (RH)

The Extension of side wall header to extent the tubes then the area is increasing. The increasing the boiler efficiency of boilers water cooling tubes along the side walls of said furnace, a cross drum, and connections from the upper ends of said side wall tubes to said drum, said connections comprising upwardly extending tubes entering said drum at points spaced longitudinally along said drum, the lower ends of said last-named tubes being spaced from each other in directions transversely of said drum. e.g. the old tubes size is 76.2OD*4.06*11332 then the increasing size is 76.2OD*4.032*12332, so the heating area is increasing to increasing boilers efficiency. The extension side wall tubes is increasing heating area is 425°C. The increasing efficiency by this case 2.8%.

1. MODIFICATION OF FRONT WALL TUBES HEADERS & ROOF TUBES
A) ADDITION OF FURANACE BOTTOM TUBES & HEADERS
B) MODIFICATION OF SCREEN TUBE

The modification of front wall tubes headers that the addition of tubes to increase the area so that the increasing in the boiler efficiency. The Increases the area to increasing the boilers efficiency. E.g. the old tube size is 76.2OD*4.06*12525 and new tubes size is 76.2OD*4.06*13129. when the area increasing to increase the boilers efficiency. The heating area increasing this condition to increasing efficiency by 2.08%

3. ADDITION OF TERTIARY SUPER TUBE HEATER COILS
A) MODIFICATION OF STEAM DRUM TO FRONT HEADER DOWN COMMERS
B) ADDITION OF FORNT HEADER TO BOTTOM HEADER DOWN COMMERS

Due to modification of steam drum increases heating area so increases the boiler efficiency. The modification and addition of steam drums tube to increasing boilers efficiency.

E.g. the old tube size is 76.2OD*4.06*16506 and new tubes size is 76.2OD*4.06*17289. The heating surface is increases when the increasing the boilers efficiency. When this modification of steam drums to front headers down commers efficiency increases by 1.01%.

5. MODIFICATION OF STEAM DRUM AND ADDITION OF RELIEF TUBES

When we add super heaters to increasing the boilers efficiency. The heating area is increases to increasing the boilers efficiency. The addition of super header tubes that the increasing heating coils and heating area. This case to increasing boilers efficiency by 3.87%
Modifications of steam drums and addition of relief tubes that the bend of tubes from the upper headers to drum, we are the addition of relief tubes to increases the heating surface area. When the increasing the surface heating area to increasing the boiler efficiency, by using this method increases boilers efficiency nearly by 1.78%.

### III. RESULTS AND DISCUSSION

1. **Extension of side wall headers & tubes**

<table>
<thead>
<tr>
<th>Tube Size</th>
<th>New Tube size</th>
<th>I%</th>
</tr>
</thead>
<tbody>
<tr>
<td>76.2OD<em>4.06</em>11332</td>
<td>76.2OD<em>4.032</em>12332</td>
<td>2.18%</td>
</tr>
</tbody>
</table>

2. **Modification of front wall tubes**

<table>
<thead>
<tr>
<th>Old tube size</th>
<th>New tubes size</th>
<th>I%</th>
</tr>
</thead>
<tbody>
<tr>
<td>76.2OD<em>4.06</em>12325</td>
<td>76.2OD<em>4.06</em>1329</td>
<td>2.08%</td>
</tr>
</tbody>
</table>

3. **Tertiary super heater coil**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Old</th>
<th>New</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity</td>
<td>80</td>
<td>90</td>
<td>TPH</td>
</tr>
<tr>
<td>Working pressure</td>
<td>53.3</td>
<td>53.3</td>
<td>Kg/cm²</td>
</tr>
<tr>
<td>Super heater outlet temp</td>
<td>440</td>
<td>490</td>
<td>°C</td>
</tr>
<tr>
<td>Heating surface area</td>
<td>2700</td>
<td>2929</td>
<td>m²</td>
</tr>
<tr>
<td>Super heater outlet pressure</td>
<td>45</td>
<td>45</td>
<td>Kg/cm²</td>
</tr>
<tr>
<td>Heating surface area coils</td>
<td>368</td>
<td>571</td>
<td>m²</td>
</tr>
</tbody>
</table>

4. **Modification of steam drums tubes**

<table>
<thead>
<tr>
<th>Old Tubes size</th>
<th>New tubes size</th>
<th>I%</th>
</tr>
</thead>
<tbody>
<tr>
<td>76.2OD<em>4.06</em>80606</td>
<td>76.2OD<em>4.06</em>81070</td>
<td>1.11%</td>
</tr>
</tbody>
</table>

5. **Addition of front header tubes**

<table>
<thead>
<tr>
<th>Old Tubes Size</th>
<th>New Tubes size</th>
<th>I%</th>
</tr>
</thead>
<tbody>
<tr>
<td>76.2OD<em>4.06</em>16506</td>
<td>76.2OD<em>4.06</em>17289</td>
<td>1.01%</td>
</tr>
</tbody>
</table>

6. **Addition of relief tubes**

<table>
<thead>
<tr>
<th>Old Tubes size</th>
<th>New tubes size</th>
<th>No. of tube old</th>
<th>No. of tube new</th>
<th>I%</th>
</tr>
</thead>
<tbody>
<tr>
<td>76.2OD<em>4.06</em>7827</td>
<td>36.2OD<em>4.06</em>743</td>
<td>10</td>
<td>12</td>
<td>1.78%</td>
</tr>
</tbody>
</table>

By using this concepts we increases the boiler efficiency up to 12%.

### IV. CONCLUSION

We increase the efficiency of boiler by increasing no of tubes & adding super heater. Boiler efficiency also increased by reducing heat losses & increasing heat input. This heat input is increased by adding oxygen in the furnace area so more heat input is transferred to boiler process so increases the efficiency of boiler. By increasing length of tube boiler & adding super heater boiler gives max heat input to the process so increases ton capacity of boiler. In this way we get profit by increasing efficiency of boiler.

### V. ACKNOWLEDGEMENT

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### VI. REFERENCES


