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REPAIR AND REHABILITATION OF BOILER COLUMN

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Abstract- **Boiler supporting structure is one of the most important structures employed in any power plant project. A typical boiler supporting structure will be of 92.7 m height to a concentrated loads in the range of 15000 tons to 20000 tons from the top. The need to improve the ability of the existing boiler column is by repair, rehabilitation. This paper gives the details about all the repairing techniques and methods.**

1.INTRODUCTION TO BOILER COLUMN:

It is a supporting structures to the boiler which gives the sufficient strength to the boilers up to its overall height. And also it is a steel component so there is a connection between adjacent columns are braced together for its stability.

Fig. 1.1 Boiler column

1.1Structural data :

Structural data- Boiler supporting structure.

1. Column size at bottom (Square) 1.80 X1.80 m

2. Total height of structure 92.7 m

3. Main Brace Levels- 7 levels of 15.00, 28.70, 42.80, 55.40, 64.60, 77.20, 92.70

2. LOAD DETAILS:

Wind Loads -Dynamic wind analysis using Gust Factor or Gust Effectiveness Factor method is carried out as per IS:875 (Part 3)-1987. However, a minimum design wind pressure of 1.5 kN/Sq.m is considered.

seismic loads -Dynamic analysis of the structure is done as per Response Spectrum Method for Jaipur region (Zone-II), Medium soil. Complete Quadratic Combination (CQC) modal combination method is used. The basic value determination of the seismic action is carried out according IS: 1893 (part 1 and part4)-2002.

Major Defects in steel structures:

- Corrosion
- Rusting

3. CORROSION:

It is defined as an electrochemical process over the surface of the steel, leading to oxidation of the metal.

Types :

- Uniform Corrosion
- Galvonic Corrosion
- Erosion Corrosion
- Pitting Corrosion

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- Stress Corrosion Cracking
- Corrosion Fatigue
- Inter granular Corrosion
- Crevice Corrosion
- Filiform Corrosion
- Fretting corrosion

Uniform corrosion - Uniform corrosion also refers to the corrosion that proceeds at approximately the same rate over the exposed metal surface.

Galvonic corrosion – When two dissimilar conducting materials in electrical contact with each other are exposed to an electrolyte, a current called the galvanic current, flows from one to another.

Erosion corrosion – Erosion corrosion refers to the combined action involving erosion and corrosion in the presence of a moving corrosive fluid.

Pitting corrosion – It is the localized corrosion of a metal surface to a point or small area.

Fretting corrosion – It refers to the deterioration at the interface between contacting surfaces as the result of corrosion and slight oscillatory slip between the two surfaces.

Corrosion fatigue – It occurs in the presence of a corrosive environment, combination of cyclic stress and corrosion.

Crevice corrosion – It refers to the localized attack on a metal surface at, or immediately adjacent to the gap or crevice between two joining surfaces.

4. RUSTING :

Rust is the orange – brown discoloration that builds up on metal. Rust is unattractive and can affect any metal objects and structures which are exposed to oxygen and moisture. Types,

- Process Related rust
- Packaging Related rust
- Environmental rust
- Red rust
- Yellow rust
- Brown rust
- Black rust
- Multiple forms rust

Process Related Rust - whether it is the cleaning process, the metal fabrication process such as cold working, heat treating or machining or the handling process, this aspect of producing a metal part is a primary contributor of corrosion. Much of what is seen in terms of corrosion problems, happen inside the manufacturing plant before it's even packaged. With so many variables inside of a manufacturing setting, maintaining tight control of your processes is critical to preventing rust.

Packaging Related Rust - The type of packaging used to package metal parts is important. Acidic materials such as corrugated and non-treated paper can hold moisture and cause corrosion. Sometimes in a companies' desire to fix a corrosion problem they add more packaging, when in fact the additional packaging can contribute even more to the rust problem.

Environmental Rust - while the weather (temperature and humidity) can certainly be the most obvious environmental factor, other things such as contaminants in the air pose equal areas of concern. As an industry leader in corrosion management products, Armor Protective Packaging® recognizes that offering a high-quality, effective product is only half of the job.

Red Rust - Hydrated oxide $Fe_2O_3 \cdot H_2O$ (high oxygen/water exposure) Rust from Iron (III) oxides forms due to high oxygen and water exposure resulting in red rust.

Yellow Rust - Iron oxide-hydroxide $FeO(OH)H_2O$(high moisture) Rust from Iron (III)

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oxides that is a very soluble iron oxide results in yellow rust.

Yellow rust is distinguishable in recessed areas of the metal parts/equipment where the rust "runs and drips" (solvated rust).

Yellow rust forms as a result of very high moisture content. It frequently found in settings where puddle /standing water has most likely been present.

Fig. 4.1 Yellow Rust

Brown Rust :

Oxide Fe_2O_3(high oxygen/low moisture)Rust from Iron (III) oxides with high oxygen and low moisture results in brown rust.

Brown rust is a drier rust than those mentioned above.

Black Rust :

Iron (II) oxide – Fe_3O_4(limited oxygen)Rust from Iron (III) oxides with limited oxygen and low moisture results in black rust.

This type of rust is a more stable rust layer that does not propagate as rapidly as other rust forms.

Multiple Forms Rust :

Multiple forms of corrosion can be present at once. Brown rust has a lower moisture content and is most likely the result of atmospheric conditions.

Effects of Rusting:

One of the first things an individual affected by rust will notice is the sight of unattractive burnt orange/brown that clearly indicates corrosion. The dismal appearance is especially disturbing when it attacks the outside of a car, where speedy attention is needed to avoid further damage and the spread of rust. Once rust begins to develop, it can spread like an infection.

Prevention methods:

Rust resistant alloy

Bluing

Organic coating

Powder coating

Painting the metal

Electro plating

Use aluminum

Corrosion protection methods :.

- Active corrosion protection
- Passive corrosion protection
- Permanent corrosion protection
- Temporary corrosion protection

5. CONCLUSION:

After the detail discussions about all of repair works, by studied above protective methods we are gaining the knowledge of repair and rehabilitation of column, painting is the most suitable and economical way to the boiler column repair because which is more efficient and simplest work.

6. REFERENCES:

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