

"Corrosion management in pulp and paper industry"

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INTRODUCTION

Shree Datta Shetkari Sahakari Sakhar Karkhana Ltd., Shirol, Paper Division is a Bagasse based Plant and went in to production (20 TPD Capacity) in 1983. It has settled down to a furnish of 75-85% Bagasse Pulp and balance Wood Pulp (Imported) as a long fibre component. It is manufacturing cultural papers for writing and Printing purpose in the range of 44 to 60 GSM with this furnish.

"Corrosion in general terms refers to deterioration caused when a metal reacts with its environment" OR

"Corrosion is the effect of exposure to environment conditions upon equipment".

Management is concerned with the direction and control over the various activities and work for the attainment of the objectives laid by the administration.

Factors Influencing Corrosion

1. Affect of pH
2. Affect of dissolved gases
3. Affect of dissolved solids
4. Flow rate and temperature

The most important factor in metallic corrosion is 'ACIDITY'. Under low pH conditions, in the absence of protective films Iron, Steel, Aluminium, Zinc and many other metals are susceptible for rapid corrosion. The effect of other corrosive agent such as Chlorine, Oxygen and Salts is much more pronounced at a lower pH than at normal or alkaline conditions. The effect of 'DISSOLVED OXYGEN' in a low pH medium is drastic than the effect of low pH.

Other than dissolved oxygen, Gases like CO_2 , H_2S and SO_2 play a vital role in the corrosion phenomenon.

The effect of CO_2 is due to the formation of CARBONIC ACID. Where as SO_2 forms SULPHUROUS ACID and SISLPHONIC ACID with moisture and oxygen. Corrosion as a result of CO_2 is pronounced in steam and condensate lines due to the release of CO_2 from Boiler Water as a result of decomposition of Carbonates.

The presence of higher concentrations of Ionifiable Salts greatly influences the rate of corrosion. Mineral Salts like Nacl, Na_2SO_4 , Cacl, and Mgcl, add up to the corrosion rate extensively. The corrosion is due to greater conductivity of the water resulting from these dissolved Salts. The increased conductivity accelerates the galvanic action thus aiding in increased rate of corrosion.

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1. BAGASSE HANDLING AND STORAGE

During the storage period the residual sugar present in the Bagasse are converted to "ALCOHOLS" by fermentation which are further oxidised to "ALDEHYDES" and then to "ACIDS". As a result the, pH of the effluent draining from the piles, drops to about four.

The abrasiveness of Bagasse due to presence of sand and its acidious nature posed severe corrosion and corrosion problems in the plant. Wear out of pump impellers, press spindles failure of welding joints in the piping were common due to severe corrosion. The snub pulleys, return idlers (mild steel) of belt conveyors often corroded due to contact of metal with low pH water carried over by Bagasse.

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2. BAGASSE DEPITHING

Bagasse by nature is an abrasive material. This is further accentuated by the presence of sand, grits and other foreign material. It is therefore expected when Bagasse with sand goes through the feeding conveying and depithing operations, rapid wear out of depither hammers, screen brackets, screw conveyors etc. takes place. Further when pith is separated from bagasse in the depithing operation and fed to boiler for burning, the sand causes rapid wearout of conveying equipment, baffle plates, fans etc.

3. DIGESTER

Corrosion is not a serious problem with continuous digester as it is with batch digester. Because continuous digester are not subjected to frequent temperature cycles, further there is no exposure of the metal to air.

WASHING & SCREENING

Carry over of sand with the pulp created problems of erosion in washers, screens and cleaners. Sand accumulation occurs in washers vats, repulper throughs, feed headers causing frequent damage to the wire cloth and deck wires.

4. BLEACHING

Bleach plant process liquors are basically oxidising in nature and hence are corrosive to metals. Chlorine, Hypochlorite, peroxide, Chlorine dioxide, oxygen which are the most common oxidising agents used for bleaching of pulp, will also degrade stainless steel. Residual oxidants like chlorine, chlorine dioxide are primary causes for corrosion in bleach plants. "Recycling of filtrates further accentuates corrosion problems." It leads to low pH in all acidic washing stages,

Vacuum filters used in bleach plant installations are more affected because there are more parts exposed to the corrosive material and in "addition passage of air through the filter increases oxidation and corrosion." The attack is caused by excess chlorination, Chlorine from filtrate forms small droplets of condensation which is highly corrosive.

Proper material selection also plays a vital role in selection of the control valves for example the butterfly control valves used for the chlorine tower launder dilution flow control in the chemical bagasse pulping line went out of order within two years of operation. The control valve disc and seating Neoprene were completely corroded. The disc and seating were changed to SS 316 with an anticorrosive weld coating using "EUTECTRODE 6800" and valve was put back in service.

Hypochlorite bleaching is usually carried out in alkaline medium with consequences of corrosion. SS are much less subjected to pitting or crevice corrosion. Hypochlorite washers are made of SS 316 to resist crevice attack.

5. REFINING

In the thermo mechanical refiners (pressurised) used for production of mechanical pulp from bagasse wearout of Refiner Segments, and Corrosion of segments due to cavitation was also noticed. The valve body subjected to severe erosion/corrosion. The valve body reconditioned with hard facing done with chrom carb N 6006, The body again failed within a month of in operation. After hard facing with "EUTECTRODE 6800" the performance of the valve improved,

6. PAPER MACHINE

The use of Bagasse pulp together with the carry over of sand with the pulp have created erosion problems in the paper machine rolls. The calender rolls were found to be affected most. When using Bagasse furnish the calender rolls required conditioning once in three months as against normal expected life of six months. The SS 316 piping of the wet end system showed signs of erosion at bends, elbows, welding joints etc. The frequency of changing doctor blade at granite roll can come down by removing sand in pulp mill.

CONCLUSIONS :

Two principle types of corrosion experienced in the Bagasse based paper mills, While the abrasiveness of Bagasse accentuated by presence of sand causes corrosion. The ACIDIOUS nature of Bagasse is responsible for low pH corrosion.

Selection of proper materials of construction and system design to eliminate sand as much as possible from Bagasse Fibre, assume greater importance in combating the corrosion problems.

1. At pilh storage yard all base structures of belt conveyors needed cement encasing with an epoxy coating in order to avoide corrosion effects of pith.
2. To reduce carry over of sand with fibre a pilot "SAND RIFFLER" to be introduced.
3. Anodic protection is another useful technique for both crack and corrosion protection in digester.
4. Replacing SS Centricleaners with "POLYURETHENE" cleaners.
5. SS 316/317 are converted bleach plant alloys metals are chosen for equipments such as washers etc. where as non-metals like "fibre reinforced plastic, PVC are used for piping.
6. The pulp flow and Cl_2 flow control valves in chlorination were replaced by DIAPHRAGM valves (Glass lined).
7. Recently we used Thermax Chesterton paste for vacuum pumps corrosion problem that has given good result.

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