

Green Chemistry to enhance Pulp Bleaching



B. Chandrasekhar

ABSTRACT

This paper gives overview on how a disruptive technology based on the probiotic technology platform addresses certain challenges faced in Pulp bleaching by minimizing the consumption of certain hard chemicals thereby minimizing cost and load on the effluent and scope of this technology in other applications.

INTRODUCTION:

Increasing environmental concerns combined with their high cost of its implementation, Paper Mills in India are constantly looking for green alternatives. Probiotic based technology fits in that space by minimizing the consumption of certain hard chemicals thereby minimizing cost and load on the effluent in the bleaching process.

CHEMISTRY BEHIND THE PROBIOTIC TECHNOLOGY:

Probiotics have been traditionally used in human and animal health applications. Our bio-chemicals are derived from fermentation of a consortia of naturally occurring Probiotic microbes using a proprietary formulation process. This unique fermentation protocol delivers end products that are robust and powerful with characteristics that are similar to biosurfactants. These formulations are multi-functional and deliver excellent results even while they are completely safe to the users and environment.

CHEMISTRY BEHIND OUR TECHNOLOGY FOR PULP AND PAPER INDUSTRY

Bleach Enhancers:

Metal ions of Magnesium, Copper and Iron form complexes with Peroxide and tend to decompose the same and impair the bleaching performance. In order to

optimise the performance of Hydrogen Peroxide, it is necessary to deactivate these metal ions through chelation or other processes. It is well known that bio-chemicals produced by probiotics have high antioxidant ability and are known to chelate Magnesium / Copper / Iron ions due to the physiological chelators that exist in the intracellular cell-free extract of probiotics.

Odour Control

Typically odour is caused by volatile compounds of sulphur and nitrogen. There are two mechanisms of odour reduction by ProCharta products:

1. The biochemicals present in the formulation have the ability to react with the volatile organic compounds and convert them to non-odour causing soluble compounds and hence reduce odour
2. Two microbe species present in product, which are resistant to high temperatures, are also capable of using Sulphur and Nitrogen as their energy source and hence consume the same, thereby reducing the generation of odour causing volatile compounds.

Yield & Kappa Improvement

Our formulations developed for application at Cooking are essentially

biodegradable bio-surfactants which are free of anthraquinone. The surfactant character enables better penetration of cooking liquor which results in an improved and balanced cooking. This helps in enhancing the yield marginally even while reducing the kappa number

BLEACHING BOOSTER FOR RECYCLE PAPER

Bleaching Booster is manufactured through a unique proprietary fermentation process using a robust probiotic technology. The resultant biochemicals have high surfactant and powerful metal chelating property that aids in inhibiting the adverse effects of these metal ions thus controlling the transition metal ions that consume bleaching chemicals used in DIP.

Bleaching booster inherently possesses characteristics to boost performance of Deinking chemicals and it also prevents scaling in separation equipment used in Deinking plant.

Unique properties are:

- Can be used in all white grades of paper and board manufacturing
- Compatible with all chemicals and enzymes
- Suitable for all types of furnishes used in Deinking

Enhances efficiency of reductive bleaching chemicals while reduced use of the same without impacting the quality

Advantages:

- Lower Operating Costs:
 - o Inhibits Transition metal ions and reduces dosage of bleaching chemicals
- o Possesses surfactant characteristics that helps to reduce surface tension between fibre and ink particles due to which it aids in reducing dosage of DIP chemicals.
- Better Quality: Inherent surfactant characteristic maintains brightness with relatively less dosage of H₂O₂

- Reduces Scaling: Inherent anti-scaling property helps in minimising scaling in separation screens.

Application:

Typical dosage recommended is 250 – 350 grams/ton of pulp while reducing H₂O₂ and Stabiliser anywhere between 20 -35%.

CASE STUDY OF A REPUTED MILL IN SOUTH INDIA:

Application: At 250 grams per ton of Bleach Enhancer dosage in 1:3 dilution with water and added before the addition of NaOH and H₂O₂

Furnish %		H ₂ O ₂ consumption		Bleach Enhancer Dosage In Kg/ MT	Brightness			Residual Peroxide Kg/Ton
SOP	Indigenous Waste	Blank	With Bleach Enhancer		Floation2 outlet	Bleach Tower Outlet	Brightness Gain	
50	50	24-26	16-17	0.25	60-61	69-70	9	0.2 – 0.25
60	40	23-25	15-17	0.24	61-62	69-71	9 -10	0.22-0.25
70	30	22-25	15-17	0.24	61-63	70-72	9-11	0.22 – 0.30

Observations:

- R-420 Brightness values are maintained with reduced H₂O₂ levels.
- High Residual H₂O₂ levels indicates scope for reduced H₂O₂ consumption and enhanced reactivity of Peroxide

Conclusion:

Reduction in H₂O₂ and stabiliser by 25% while maintaining the brightness

Unique Features

- Formulation is a consortium of biochemicals
- Non-toxic and readily biodegradable
- Not an enzyme-based product
- Can be stored at ambient temperatures up to 50°C
- One-year shelf life
- No change required in process conditions
- Can be applied at a broad pH and Temperature range

Typical Characteristics:

- Appearance : Honey Brown Color
- pH (of 100% solution) : 2.95 +/-0.4
- Biodegradability : 100%
- Storage : Room temperature (no special condition)
- Stability to electrolytes : Stable to electrolytes used in pulping and paper industries
- Shelf Life : One year from date of manufacture
- Packaging and Handling : All products are liquids packed in HDPE drums. These products are safe to handle, and no major precautions required