

Use Of Bio-Culture At Effluent Treatment Plant In Paper Industry A Successful Story At Murli Industries Ltd.- Vododa

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ABSTRACT

To meet present day stringent pollution control norms, there was a high stress on paper mills to deliver highest quality work with low operating cost within the budgeted limitations. Keeping this in view, biological treatment procedure is adopted. Use of blend of bacterial colonies in place of conventional urea & DAP dosing have proven to be cost effective solution. By using bio-culture in the system, help in complying with pollution board's norms have been observed.

Introduction

Murli Industries Ltd. Unit-Vadoda is located on Bhandara road in the Nagpur district of Maharashtra. In search of an opportunity to explore further Quality Improvement Strategy on branded products & comparing with that of leading competitors, is the real strength of the Unit-Vadoda of Murli Industries Ltd..To add up the beauty to the new knowledge gained on Quality front, Unit has beget new questions in search of improved answers further on an Environment front process improvements also with the help of Bio-Culture inoculation in the system of effluent treatment in line with international bench marking in paper making industries, first ever in Paper making Industry, in India. This Paper deals with introductory value additions of bio-culture in the system of effluent treatment & benefits derived by replacing DAP & Urea with Bio-Culture at the end. Ultimate hunger is to conserve energy.

LITERATURE :-

Multiple properties - manifold uses

The bio-culture allows to improve bio-degradation & in turn allows us to handle more organic loads to be treated. These cultures are typically used for;

- Improving performance of ETP.
- Stabilisation of ETP in face of shock loads.
- Reduction in commissioning time for ETP.

Microbial cultures used in aerobic treatment system consist of blend of microorganisms which are non-

pathogenic, saprophytic & fast growing. They act as converting complex organic substances in to simple sugars.

This bio-culture is powerful, biologically active, powdered formulation containing a blend of bacterial strains, specially developed to treat effluent and sewage wastes.

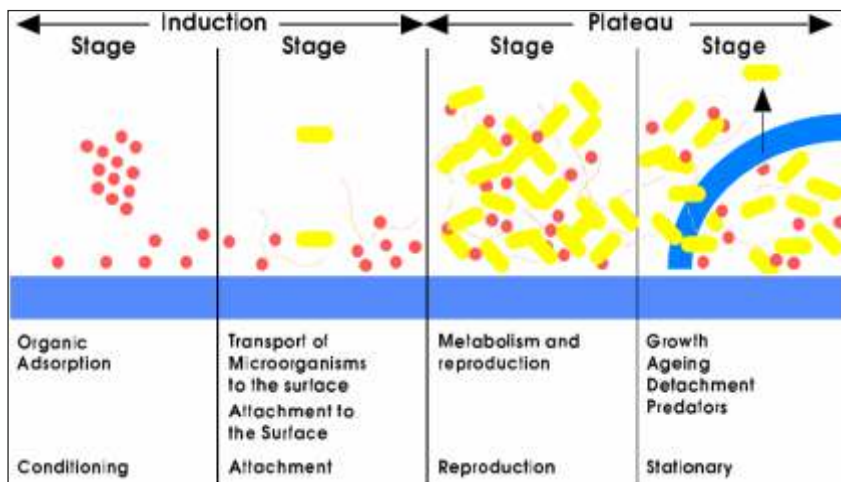
They are designed to degrade excess residual waste products in pipework systems, holding tanks and effluent treatment plants. The specialised strains will also help to digest grease, fats, sewage, starch and other organic compounds. The degradation of paper, protein and waste product residuals is greatly increased and the odours that these produce are reduced.

The biological activity in the effluent treatment plant is greatly increased so improving its ability to deal with more effluent. The obnoxious smells and scuppers normally associated with overloaded or blocked systems are eliminated.

Some of the important advantages are;

1. Re-activates biological activity in the system.
2. Clean the system blocked by organic wastes.
3. Does not bio-accumulate in the environment.
4. It will avoid bulking of the bio mass sludge.
5. It will prevent fibrous growth of bacteria in the system.
6. It will aid de-watering property of the bio mass molecules thus producing compact sludge in the secondary clarifier bottom.
7. Due to compact biomass settled at the bottom of secondary clarifier, it will be easy to re-circulate it in the aeration basin.
8. It eliminates foaming & frothing problem in the aeration basin.
9. It helps to achieve better reduction of COD & BOD at the secondary clarifier out-let.

Process of reproduction of the bacterial species can be summarised briefly as follows:-



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The above phases of the growth for bacterial species show how the colonies of the strains will be multiplied in the aeration systems to maintain desired MLSS/MLVSS level after satisfying other required physical conditions.

Beauty of such system of introducing the bio-cultures in the effluent treatment systems is the reduction in the uses of chemicals like DAP/Urea, which supports the growth of bacterial strains in the aeration tank but bio-accumulated in the environment. We can also divert the domestic sewage/effluent to the aeration pond of the effluent treatment plant, where the ready made blend of bacterial strains get supplied to the ETP thereby saving on fixed expenses on separate domestic sewage treatment plant & man power.

EXPERIMENTAL:-

BACTERIAL CULTURE ADDITION:

- The following dosage rate followed as per the following schedule during the trial;

Say, On 14.4.2009

-2.0 Kgs.

15.4.2009 - 22.4.2009

- 1.0 Kgs./Alternate Day/ 4 time

23.4.2009 - 30.4.2009

- 0.5 Kgs./Day

01.5.2009 - 07.5.2009

- 0.5 Kgs/ Alternate Day (Final Doze)

- The above-mentioned quantity of material should be mixed in water quantity of 50 - 100 liters and keep it for four hours. Then start dosing in the type dripping continuously and complete it in 5 - 8 hours time period.

ADDITION OF CHLORINE THROUGH BLEACHING POWDER:

- Since the effluent carries some of the sewage water, it carries more no. of filamentous bacteria which results in reduction in quality of the final treated effluent, poor settling, turbid ness and sludge rising (Bulking).
- To avoid that it is suggested to go with the chlorine dosage to kill the filaments and keep the system as normal.
- Note that the 10 Kgs of Bleaching powder should be dissolved in 100

liters of water and keep it for two hours after well mixing and then use the clear liquid portion and spray one time on the near feed entry point of the aeration tank.

- The above process should be done in the evening, which will be the most right time to control the filaments on a vigorous manner.

WASTING OF BIOMASS FROM SECONDARY CLARIFIER:

- This is the most compulsory thing to be done in every 10 days once at the rate of 5000 - 10000 liters and which can be easily removed through the mixing with our primary sludge and filter it out.
- This process will enhance the new cells population by lending out the old age sludge at some extent from the system.

RECIRCULATION OF BIOMASS OPERATION:

- This also is most important thing to be done to allow the young or new cells to grow in the system to avoid the rising of sludge (Bulking), and turbidity of the final treated water.
- At least 6-8 hours, the recirculation pump can be stopped in the day time, based on our experience at our plant as follows

- o From 8.00 AM - 11.00 AM - STOP RECIRCULATION
- o From 11.00 AM - 2.00 P.M - START RECIRCULATION
- o From 2.00 P.M - 5.00 P.M - STOP RECIRCULATION
- o From 5.00 P.M - 8.00 A.M - START RECIRCULATION

- The above timings are given based on the present running condition of our system and the same can be revised in 15 - 20 days time based on the improvement of the system at your end.

SUGGESTION RELATED TO THE FLOW RATE.

- There should be no variation in flow rate of normal effluent water (along with the rain water, particularly in rainy season).
- SV₃₀ and SVI of the system must be controlled (SV₃₀ 200 to 300 ml and SVI 75 to 100 ml) is the only way to avoid the sludge bulking (RISING).

All above observations cum suggestions are based on our plant running conditions, please.)

Result & Discussion:-

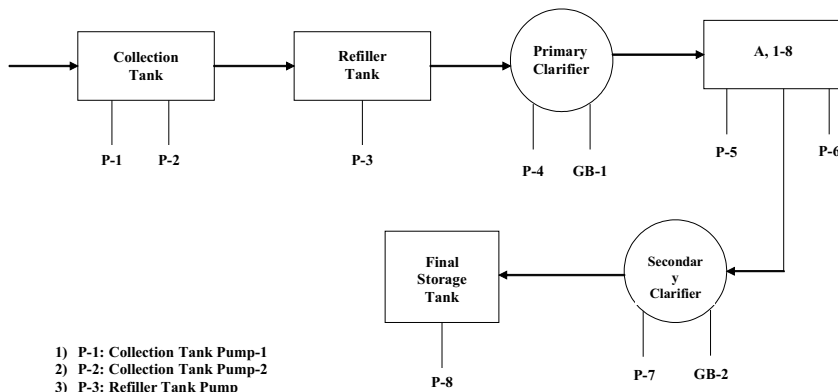
The comprehensive trial of the bio culture tried having following system details;

System Details:-

Particulars	Data
Quantity of the effluent to be treated	20,000 m ³ /day
Raw Effluent BOD ppm	200-500
Raw Effluent COD ppm	1300-1400
PH of the Influent to the Aeration Pond	7.50
Volume of the Aeration Pond	11,000 m ³
Type of aerator	Surface aerator (8 nos.)
H.P of the Aerators	50
COD at the secondary Clarifier out-let	200-250
BOD at the secondary clarifier outlet	30-40

**** We can save the consumption of the electricity at the ETP after introduction of bio-culture in the system since systems demand the aeration diagonally per shift where the two aerators can be kept shut per shift in a day.**

Pulp Mill- ETP



- 1) P-1: Collection Tank Pump-1
- 2) P-2: Collection Tank Pump-2
- 3) P-3: Refiller Tank Pump
- 4) P-4: Sludge pump (Primary)
- 5) P-5: Aeration Tank Pump-1
- 6) P-6: Aeration Tank Pump-2
- 7) P-7: Sludge pump (Secondary)
- 8) P-8: Discharge pump
- 9) Gb-1: Gear Box-1
- 10) Gb-2: Gear Box-2
- 11) A,1-8: Aerator 1-8

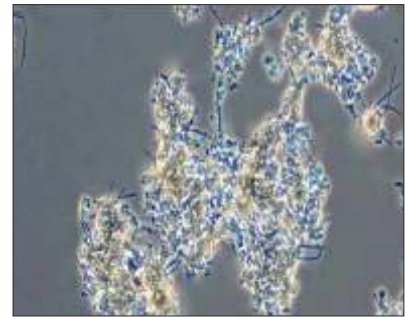
** DAP & UREA have been replaced by dozing BIO-CULTURE at the same place of aeration tank inlet.

Dosages Strategy Planned:-

Description	Initial & One Time dosage	Followup dosage for next 7 days	Maintenance dosage for next 7 days	Regular Dosage
Bio-Culture	02 kgs/day	1 kgs/day	0.5 kgs/day	0.5 kgs/once in a week

SOME VISUAL GLIMPSES OF ADVANTAGES

- A biomass product has helped to eliminate filamentous bacteria growth in the system as shown under.



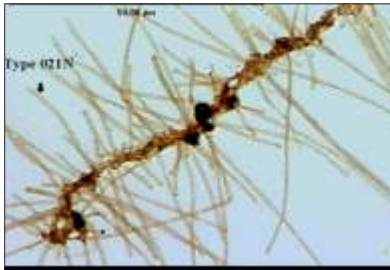
dissolved oxygen climatic condition in the aeration pond when compared with normal micro organisms.

- It has improved supernatant clarity from the secondary clarifier.
- It has helped to achieve better reduction of COD and BOD at the secondary out-let.
- It has helped to save on chemical consumption front as;

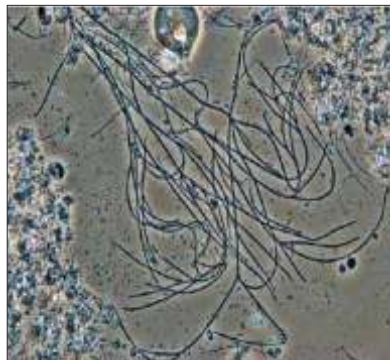
- Before Trial Avg.Chemical Consumption expenses was = 14.00 Lacs
- Annual Impact on cost savings = **Rs.12 Lacs / Annum.**

The monitored observations are;

1. There is no change in the effluent quality observed as such.
2. The secondary clarifier parameters are same as before trial.
3. An increase in trend of the passing away the suspended solid from primary clarifier out-let to aeration tank is observed. Due to which there is a fluctuation in the MLSS of the aeration tank thereby fluctuations in the DO value in the secondary clarifier outlet. This is leading to the bulking in the secondary clarifier (after few days gap of by-pass).In addition shock load received from the machine also adds remarkable effects in bulking.



- Avoid bulking of bio mass sludge as shown under;



- Prevent fibrous growth of the bacteria in the system as shown under.
- Also due to robust nature it was not easily susceptible and vulnerable to create imbalance in the system due to changes in the operating conditions.
- It has got more survival and withstanding power even at a lower

Conclusion:-

Today, effluent treatment in neutral to slightly alkaline pH-values is a worldwide well established technology. Whatever conversions from acid to alkaline still remain, they can benefit from a vast body of experience. Papermakers in India as well as research institutes should keep on working towards further optimizations. New knowledge thus gained will always beget new questions in search of an answer - **which is what progress is built on.**

ACKNOWLEDGEMENTS:-

The author would like to thank the management / Directors of M/s Murli Industries Ltd. for their kind support extended during implementation of the project & publishing the results of the study.

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Exigencies worked out :-

1. Suspended solid in the primary clarifier out-let should be controlled.
2. A trial for identified flocculant"True-Floc" should be carried out to see its viability.
3. Frequent Shock load from the machine should be controlled.
4. Controlling SS in the primary outlet will help us in controlling MLSS in the aeration tank, ultimately bulking in the secondary clarifier, Which ultimately helps to increase DO.