

New conceptual ETP process of dosing organic coagulant to aeration tank, eliminating physico-chemical treatment and transforming hazardous waste in to value addition - fuel

by:
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In our earlier technical article published in this EPCJournal of March-April 2015 issue we have described the treatment process for minimization of sludge by use of organic coagulant replacing conventional inorganic coagulants. Now, we have further developed a new process which entirely eliminates primary treatment stage and reduces substantial cost in terms of chemicals as well as operation. In conventional secondary / MBBR process FAB media of polymer origin are used that provides more surface area for bacterial activity. However, it is observed that undesired turbidity occurs in the secondary out let. In our new pattern / process we dose organic coagulant directly into the secondary treatment tank-aerator bypassing primary treatment which removes color as well as forms flocs big enough to function as media support after coagulation and flocculation for microorganism culture which consume organic matter leading to COD reduction and removes turbidity The organic sludge produced has added calorific value .

Introduction

All the big or small chemical / textile industries have ETPs having primary, secondary and tertiary treatment stages. The industries are constantly conscious about compliance of stringent, mandatory norms stipulated by the govt. authorities. The unpredicted escalation in price of treatment chemicals and operational expenses compel them to search for performance chemicals and cost effective processes.

The primary treatment involves use of inorganic chemicals like alum, lime, ferrous sulphate and or PAC as flocculants which generate very high amount of sludge creating disposal

and handling problems. We have developed sludge minimization process replacing inorganic coagulants /flocculant with organic flocculants which gives added value in terms of calorific value. (Ref. EPC journal March- April '2015 page 37-40)

Case Study

In order to check viability of our process we conducted case study at one of the leading denim industry. Following are the details of primary treatment and cost involved that we avoid /saved by our new process.

S.No.	Parameter	Value
1.	pH	9.40
2.	Total Dissolved Solids (TDS)	5424
3.	Total Suspended Solids	520 mg/L
4.	Chemical Oxygen Demand	2400 mg/L
5.	Color	9800 Pt.Co.U

Characteristics of Raw Effluent

S.No.	Name of Chemical	Dose,ppm	Quantity Per Day
1.	Poly Aluminum Chloride (9%) Virgin	5300	1325 Liter
2.	Polyelectrolyte	1.5	0.375kg

Primary Chemical Treatment: For the flow of 250 m³/day

Sr.No.	Particular	Dry Sludge Gm/L	Dry Sludge Generation, Kg/Day	Sludge With 80% moisture kg/Day
1.	Chemical Treatment	2.7	675	3375

Chemical Sludge Generation in primary Treatment

Cost Calculation

S.No.	Name of Chemical	Dosage	Quantity	Rate in Rs.	Amount in Rs.
1.	Poly Aluminum Chloride (9%) Virgin	5300	1325 Liter	2.52/Kg	3339
2.	Polyelectrolyte	1.5 ppm	0.375kg/day	180 /kg	67.50
Total					3407

Chemical Treatment

Sludge Cost

S.No.	Particular	Sludge Qty With 80% moisture kg/day	Sludge Handling @ Rs. 0.1 per day	Sludge Disposal @ 4000 Rs/Ton	Total Cost
1.	Chemical Treatment	3375	337	13500	13837

Total Cost

S. No.	Treatment	Chemical Cost	Sludge Cost	Total Cost
1	Chemical Treatment	3407	13837	17244

About the new process / concept (Dosing of organic coagulant in to Aeration Tank)

Since last several months we have implemented the new conceptual practice of adding organic coagulants directly into the Aeration tank eliminating primary treatment at the plant scale. The organic coagulant functions better as

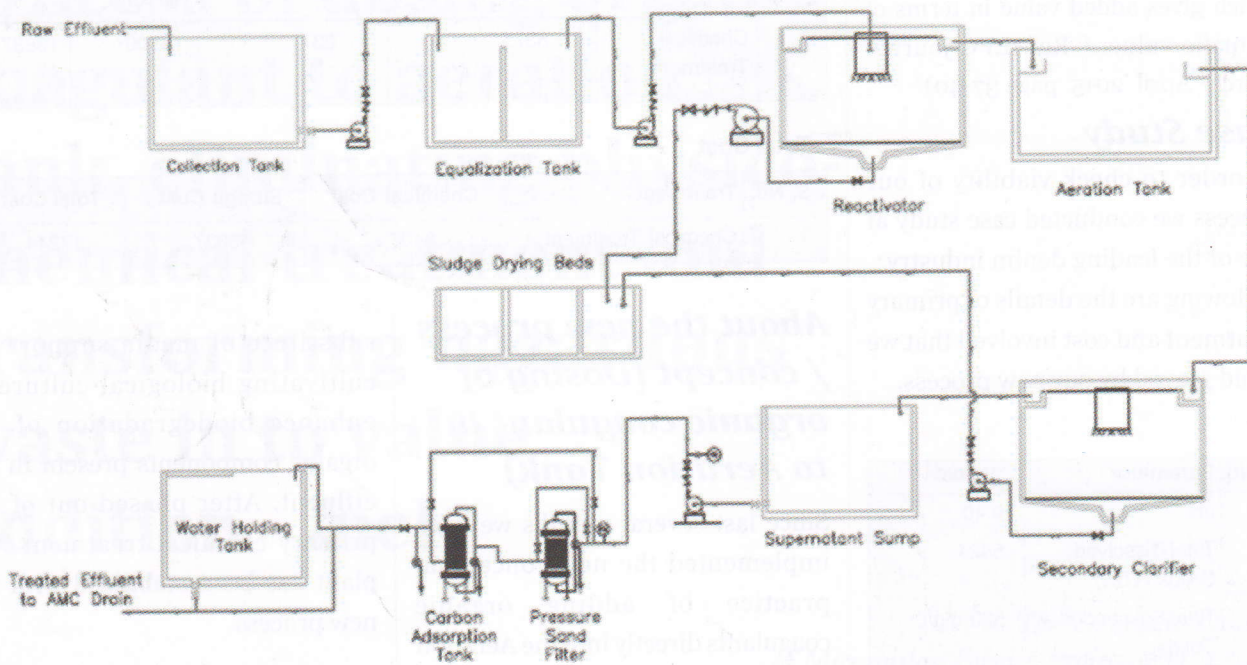
substitute of media support for cultivating biological culture to enhance biodegradation of the organic components present in the effluent. After phased out of the primary chemical treatment the plant has been stabilized with the new process.

Report for the plant Scale

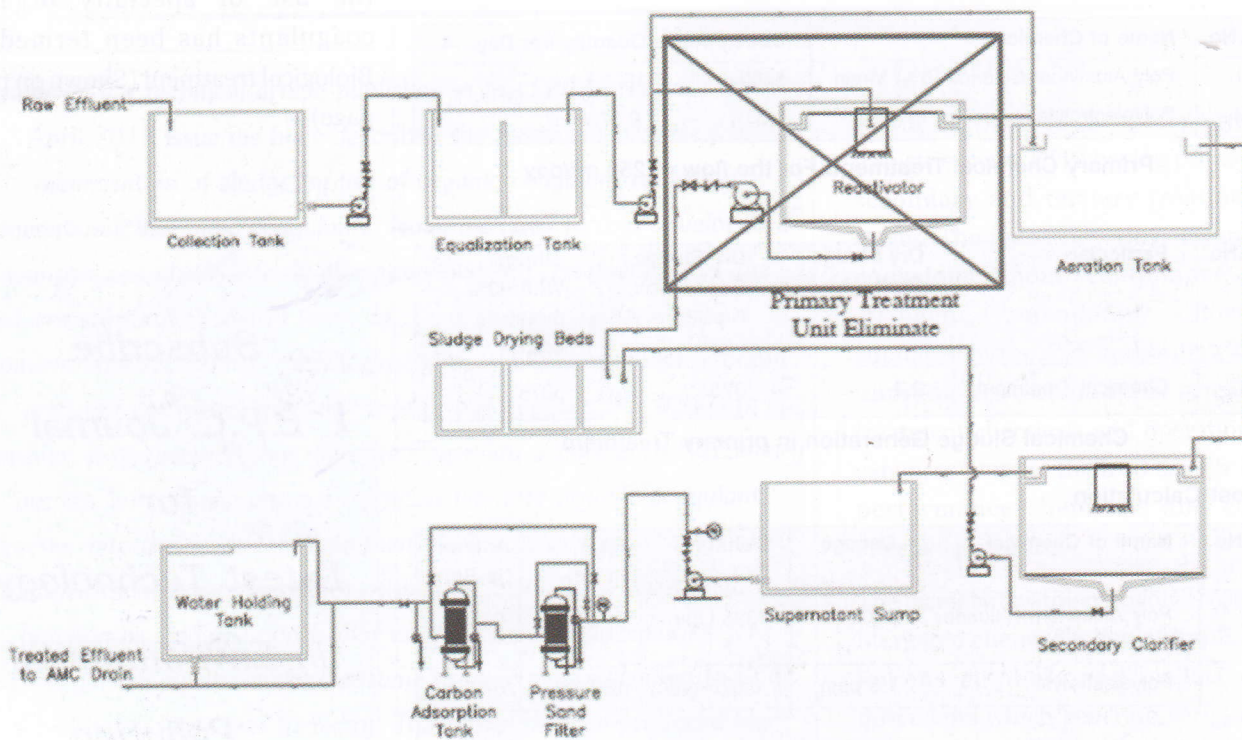
The treatment method used prior to the use of specialty organic coagulants has been termed as Biological treatment (Shown on next page).

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Previous Flow Diagram



Developed Flow Diagram



Flow: 250 m³/day

S.No.	Name of Chemical	Dose,ppm	Quantity Per Day
1.	Spent Sulphuric Acid (Conc.) Dosed in equalization tank	600	150 Liter

Chemical Treatment

S.No.	Name of Chemical	Dose,ppm	Quantity Per Day
1.	BIOPLUS dosed in Aeration tank	250	62.5 kg

Treatment Using organic coagulant (BIOPLUS) in the aeration tank

S.No.	Particular	Dry Sludge Gm/L	Dry Sludge Generation, Kg/Day	Sludge With 80% moisture kg/Day
1.	Treatment with BIOPLUS in aeration tank	1.1	275	1375

Sludge Generation

Cost Calculation

S.No.	Name of Chemical	Dosage	Quantity	Rate in Rs.	Amount in Rs.
1.	Spent Sulphuric Acid	600 ppm	150 Liter	2.5/L	375/day
2.	BIOPLUS	250 ppm	62.5 Kg	75/kg	4687/day
Total					5062 /Day

Biological Treatment (Chemical Cost)

Sludge Cost

S.No.	Particular	Dry Sludge Generation, kg/day	The dried sludge having calorific value in range of 4000 kcal/kg which is equivalent to lignite, so instead of incurring disposal cost, dry sludge is used as fuel thereby conservation of natural resource.
1.	Biological Treatment	275	

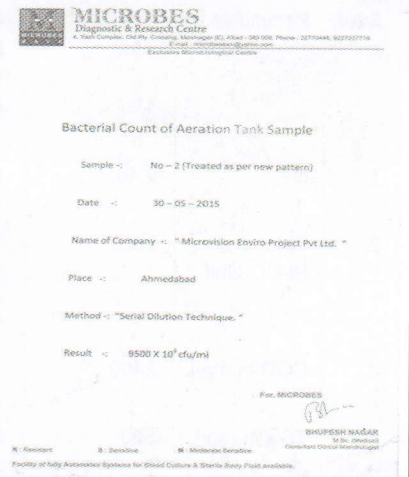
Total Cost

S. No.	Treatment	Chemical Cost	Sludge Cost	Total Cost
1.	Biological Treatment	5062	No cost	5062

Cost saving by elimination of primary treatment:

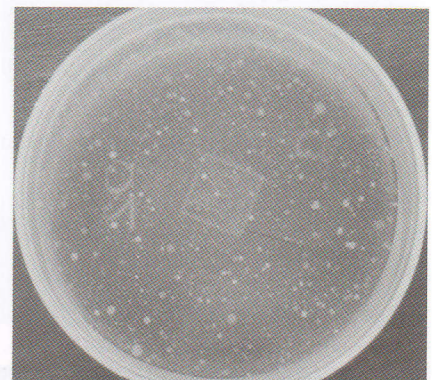
S. No.	Treatment	Chemical Cost	Sludge Cost	Total Cost
1.	Chemical Treatment	3407	13837	17244
2.	Biological treatment	5062	No cost	5062

Therefore cost saving by elimination of primary treatment stage comes to be Rs. 13007/ Day including coal/lignite saving.

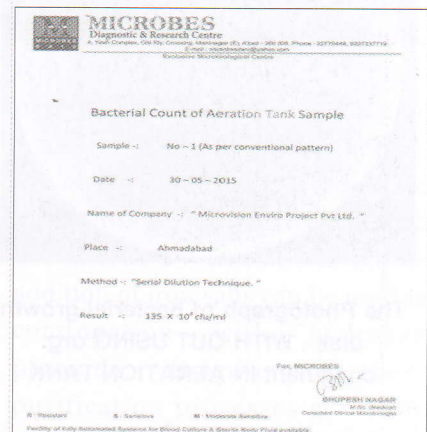


Text of above report-

Bacterial Count of Aeration Tank Sample
 Sample: No -2 (Treated as per new pattern)
 Date: 30-05-2015
 Name of Company: Microvision Enviro Project Pvt. Ltd.
 Place: Ahmedabad
 Method: "Serial Dilution Technique"
 Result: 9500 x 10⁴ cfu/ml



The photograph of Bacterial Count disk - BY USING Org.coagulant IN AERATION TANK



S.No.	Parameter	Inlet (ETP inlet)	Conventional (including Primary) process	New conceptual process with org. coagulant	Test Method
1.	pH	9.40	6.92	7.20 - 1984	IS :3025(Part 11)
2.	Color in Pt-CO Unit	9800	110	84	As per HACH platinum cobalt standard method 8025
3.	COD in mg/L	2400	106	86	IS :3025(Part 58) - 2006
4.	TSS in mg/L	520	56	14	IS :3025(Part 17) - 1984 Reaffirmed 2006 Amend 1 Dec1999
5.	TDS	5424	5682	5460	IS :3025(Part 16) - 1984 Reaffirmed 2006 Amend 1 Dec 1999
6.	Iron as Fe+2	N.A due to High colour	02	BDL	IS :3025(Part 53) - 2003

Analysis Report of ETP Inlet, Primary Outlet & Biological Outlet samples

Text of trailing report-

Bacterial Count of Aeration Tank Sample

Sample: No -1 (As per conventional pattern)

Date: 30-05-2015

Name of Company: Microvision Enviro Project Pvt. Ltd.

Place: Ahmedabad

Method: "Serial Dilution Technique"

Result: 135 x 10⁴ cfu/ml



The Photograph of bacterial growth disk - WITH OUT USING org. coagulant IN AERATION TANK

It is clear that the use of organic coagulant causes less sludge generation and the cost is also less as compared to the conventional treatment methodology.

We have also carried out an analysis of the organic sludge generated from our specialty treatment for the different parameters to use the sludge as a fuel by adopting proper APCM.

The results of the same are as below:

S.N.	Particulars	Value
1.	Calorific Value	4410 Kcal/kg
2.	Volatile Compounds	92.10 % W/W
3.	Ash Content	7.9 % W/W

Usually, the fuel used in textile industry boiler is lignite, which has C. V. of 3800 - 4000 kCal/kg We can substitute or mix the organic sludge with lignite and use the same as a fuel for the purpose removing sludge from the system.

Observations and conclusion

Above all the data including the photographs of colonies of conventional and new pattern / process reveal that by elimination of primary stage and direct dosing of organic coagulant in to the aeration tank facilitates more surface area and scope for cultivation of bacterial colony and give better results with regard to the characteristic of final disposal effluent and saves substantial cost in terms of chemicals ,operation and added calorific value of the organic sludge.

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