EPC Journal

A Case study of Sludge minimization at ETP in Textile Industries & its use as fuel

by:
The Technical Team
from:
Microvision Enviroproject Pvt. Ltd.

The globe is faced with various serious issues like climate change, green house gases emission, sea level rise following the global warming, ozone depletion, depleting fossil fuels; cobwebbed with socio-economic problems of sustainable development, population growth, poverty eradication, widening disparity and so on. Each joule of energy, each drop of water is valuable. Our mission too being same at MICROVISION ENVIRO PROJECTS PVT LTD., we have been working since last several years to contain pollution and preserve environment.

In the primary treatment of effluent, industries use old conventional inorganic coagulant, which generate huge volume of sludge due to limited functional properties. We have developed and implemented new treatment process using our organic coagulants, which are more efficient and cost effective. Further, the sludge generated being organic in nature has added calorific value. We conducted case studies of Textile Industry in Ahmedabad. The results submitted are in tabular and graphical form which reveals its viability.

Introduction

The effluent generated in the factories contains variety of the suspended and dissolved chemicals compounds. Small particle being of very light weight and bearing negative charge - zeta potential - remains in suspension due to repulsion among them. To neutralize the charge conventional cationic coagulants like alum and or PAC have been in use. However, due to their limited functional properties they generate huge quantity of sludge. Against these conventional inorganic coagulants, we used our organic coagulants on lab scale and implemented successfully on plant scale.

Further, the dry sludge being of organic in nature, we have proposed its use as fuel for boiler after taking successful trial with reputed paddle type sludge drier suppliers and established its calorific value which comes to be about 4000 Kcal/ kg. The industry has to obtain necessary permission from statutory authority for using dry sludge as fuel.

Case Study

Objective

Complete replacement of Inorganic Coagulants with Organic Coagulant

Type of the Company:

Textile Industry, Ahmedabad

About The Practice

We started analyzing the effluent for one month. We collected samples by grab and composite method during the study period and carried out laboratory treatability studies.

After completion of the laboratory studies, we used the organic coagulants continuously at the plant scale. During this period we phased out the inorganic coagulants and then stabilized the treatment plant.

Basic Data and Raw Water Characteristics

The industry was having two types of Primary treatments prior to the implementation of process suggested by us, they carry out primary treatment on the basis of availability of treatment chemicals. The treatment method used prior to the use of organic coagulants has been termed as existing treatment.

Flow: 2000 m3/ day

Cost Calculation is given in tables at the bottom.

S. No.	Parameters	Value
1.	pH	9.82
2.	Total Dissolved Solids (TDS)	7473 mg/L
3.	Total Suspended Solids	544 mg/L
4.	Chemical Oxygen Demand	2626 mg/L
5.	Colour	10500 Pt. Co. Unit

Characteristics of Raw Effluent

S. No.	Name of Chemicals	Dose in ppm	Quantity Per Day
1.	Spent Sulphuric Acid (Conc.)	750	1500 Liter
2.	Ferric Alum	2500	5000 kg
3.	Lime Powder	1000	2000 kg
4.	Polyelectrolyte	1	2 kg

Existing primary treatment 1

S. No.	Name of Chemical	Dose in ppm	Quantity Per Day
1.	Spent PAC liquid	8750	17500 Liter
2.	Polyelectrolyte	1	2 kg

Existing primary treatment 2

S. No.	Name of Chemical	Dose in ppm	Quantity Per Day
1.	Hydrochloric Acid (Conc.)	1250	2500 Liter
2.	Organic Coagulant	500	1000 kg
3.	Polyelectrolyte	1	2 kg

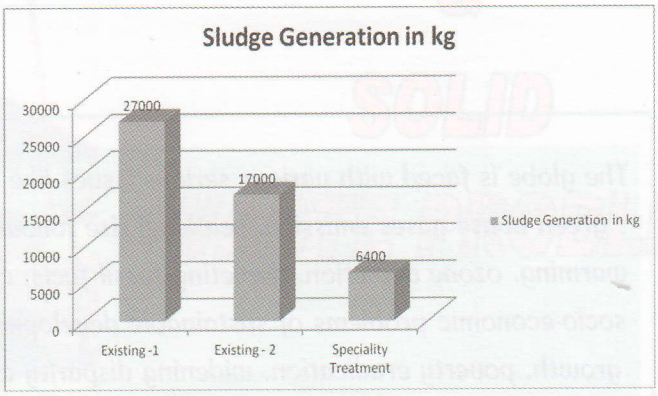
Treatment using organic coagulants

S. No.	Parameters	Inlet	Existing-1	Existing-2	Treatment With Organic Coagulant
1.	pH	9.82	7.5	7.5	7.1
2.	Total Dissolved Solids	7473 mg/L	8340 mg/L	8068 mg/L	7120 mg/L
3.	Total Suspended Solids	544 mg/L	138 mg/L	114 mg/L	12 mg/L
4.	Chemical Oxygen Demand	2626 mg/L	2085 mg/L	1920 mg/L	1658 mg/L
5.	Colour	10500 Pt. Co. U	670 Pt. Co. U	440 Pt. Co. U	104 Pt. Co. U
6.	Fe	N.A	54 mg/L	48 mg/L	08 mg/L
7.	Total Hardness	N.A	1088 mg/L	840 mg/L	240 mg/L

Treated Water Characteristics

S. No.	Particulars	Dry Sludge gm/L	Dry Sludge Generation, Kg/Day	Sludge With 80% moisture kg/Day
1.	Existing Treatment - 1	2.7	5400	27000
2.	Existing Treatment - 2	1.7	3400	17000
3.	Organic Coagulant	0.64	1280	6400

Comparison of Sludge Generation



S. No.	Name of Chemicals	Dosage	Quantity	Rate in	Amount
1.	Spent Sulphuric Acid	750 ppm	1500 Liters/Day	Rs. 2 / L	Rs. 3000
2.	Ferric Alum	2500 ppm	5000 kg/day	Rs. 6 / kg	Rs. 30000
3.	Lime	1000 ppm	2000 kg/Day	Rs. 5 / kg	Rs. 10000
4.	Polyelectrolyte	1 ppm	2 kg/day	Rs. 230 / kg	Rs. 460
				Total	Rs. 43460

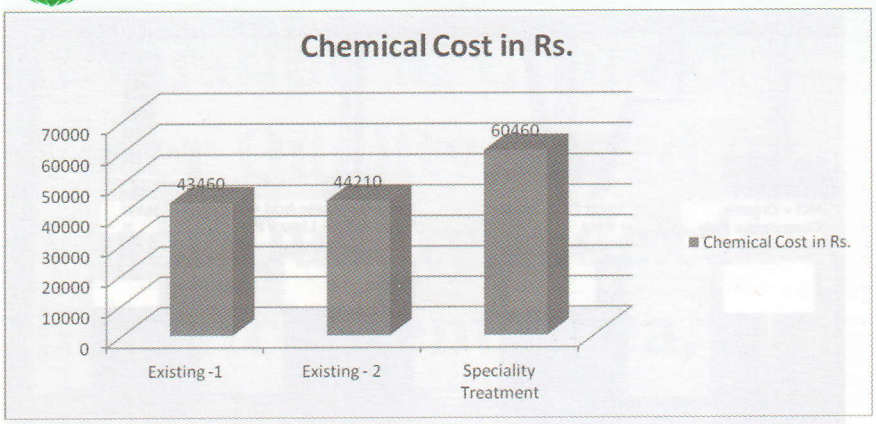
Chemical Cost of Existing Treatment - 1

S. No.	Name of Chemicals	Dosage	Quantity	Rate in	Amount
1.	Spent PAC Liquid	8750 ppm	17500 Liters/Day	Rs. 2.5 / L	Rs. 43750
2.	Polyelectrolyte	1 ppm	2 kg/day	Rs. 230 / kg	Rs. 460
				Total	Rs. 44210

Chemical Cost of Existing Treatment - 2

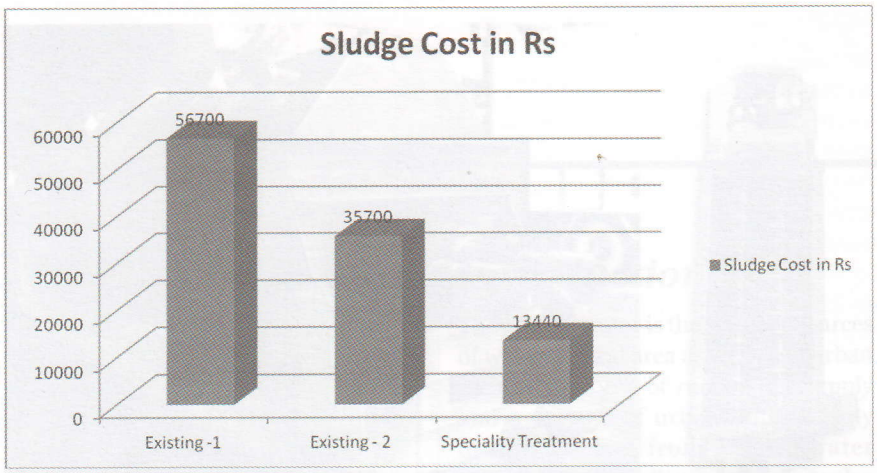
S. No.	Name of Chemicals	Dosage	Quantity	Rate in	Amount
1.	Hydrochloric Acid	1250 ppm	2500 Liters/Day	Rs. 5 / L	Rs. 10000
2.	Organic Coagulant	500 ppm	1000 kg/Day	Rs. 50 / kg	Rs. 50000
3.	Polyelectrolyte	1 ppm	2 kg/day	Rs. 230 / kg	Rs. 460
				Total	Rs. 60460

Chemical Cost with Organic Coagulant Treatment



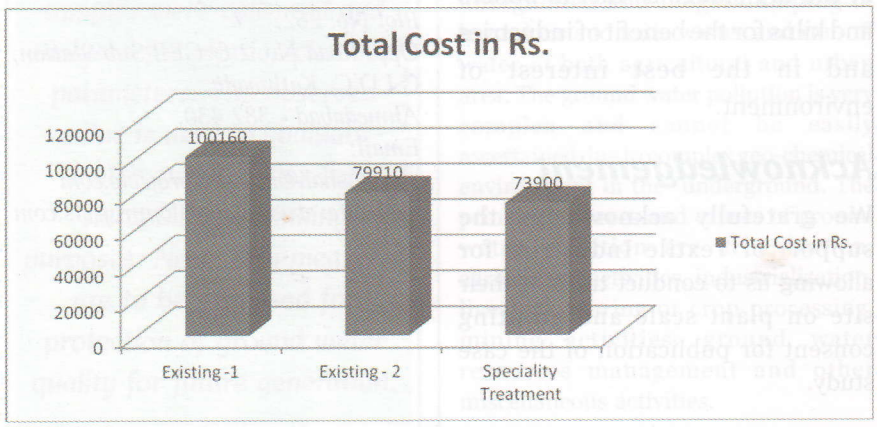
S. No.	Particulars	Sludge Qty. With 80% moisture	Sludge Handling @ Rs. 0.1/Kg	Sludge Disposal @ Rs.2000/Ton	Total Cost
1.	Existing Treatment - 1	27000 kg/Day	Rs. 2700	Rs. 54000	56700
2.	Existing Treatment - 2	17000 kg/Day	Rs. 1700	Rs. 34000	35700
3.	Organic Coagulant	6400 kg/Day	Rs. 640	Rs. 12800	13440

Sludge Handling and Disposal Cost



S. No.	Treatment	Chemical Cost	Sludge Cost	Total Cost
1.	Existing Treatment - 1	Rs. 43460	Rs. 56700	Rs. 100160
2.	Existing Treatment - 2	Rs. 44210	Rs. 35700	Rs. 79910
3.	Organic Coagulant	Rs. 60460	Rs. 13440	Rs. 73900

Overall Cost Comparison



Benefits:

- Easy to Handle
- Low TDS Level
- Removal of heavy metals and reduction in hardness
- Eco friendly process and product
- Recycling of treated waste water becomes easy.

Report on Plant Scale Trials (Average Data)

Chemicals	Dosage in ppm	Consumption Kg per Day
HCl (Hydrochloric Acid)	1120	2016
Organic Coagulant	512	924
Animol- 4020 (Anionic Polyelectrolyte)	1.0	1.8

Flow: 1800 KL/Day

S. No.	Parameter	Inlet (ETP inlet)	Outlet (Primary outlet)
1.	pH	10.0	7.0
2.	Color	9800 Pt. Co. Unit	118 Pt. Co. Unit
3.	COD	2140 mg/L	1450 mg/L
4.	TSS	480 mg/L	14 mg/L
5.	TDS	6048 mg/L	6510 mg/L
6.	Iron as Fe^{+2}	12 mg/L	06 mg/L

Analysis Report of ETP Inlet and Primary outlet samples

Sludge with 80% moisture kg/Day	Dry Sludge kg/Day
6120	1224

Sludge Generated

Observations

TSDF sites are not the real solution for sludge disposal as the sludge needs to be stored in proper manner or else there are all chances of leaching that may cause contamination to fertile land / soil, the severe Environmental Impact.

The impacts can be:

Deterioration of Ground Water

1. Unusable Surrounding Land
2. Gases released due to decomposition of sludge to the air.

our treatment process for the different parameters to check its suitability as fuel by adopting proper APCM.

The results of the same are as below:

S. No.	Particulars	Value
1.	Calorific Value	4410 Kcal/kg
2.	Volatile Compounds	92.10 % W/W
3.	Ash Content	7.9 % W/W

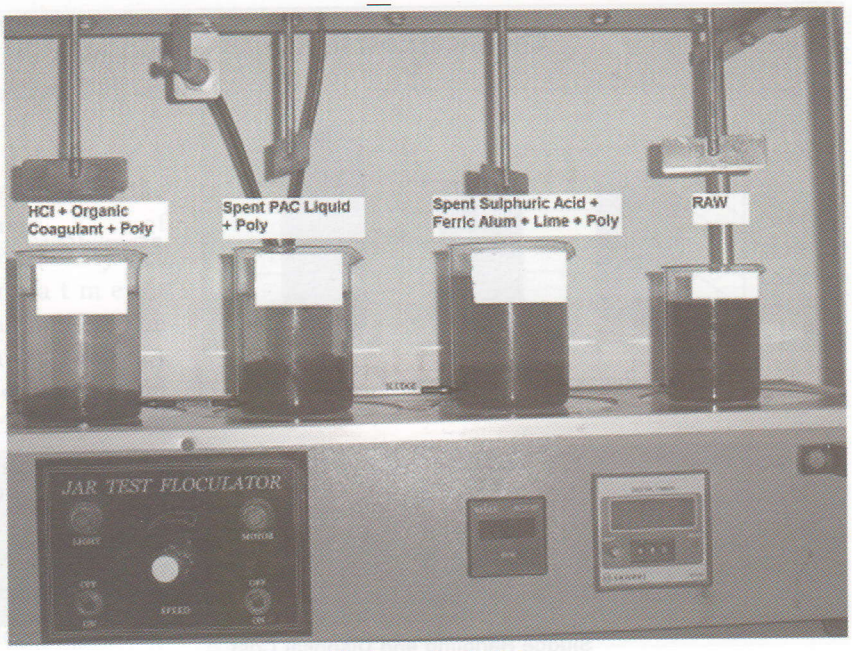
Having observed the above analysis, particularly the huge calorific value of the organic dry sludge, an innovative idea occurred to our team that why not to try it as fuel for boilers or kilns in cement industry. Normally, lignite having CV about 3800 - 4000 Kcal / kg is used as fuel in the boilers for textile industry.

We are quite optimistic that the dry sludge can be fully or partially substituted with the lignite. The above data of the sludge reveals that the dry sludge occupies only 20 % space and if further used as fuel as per our proposal it has added value.

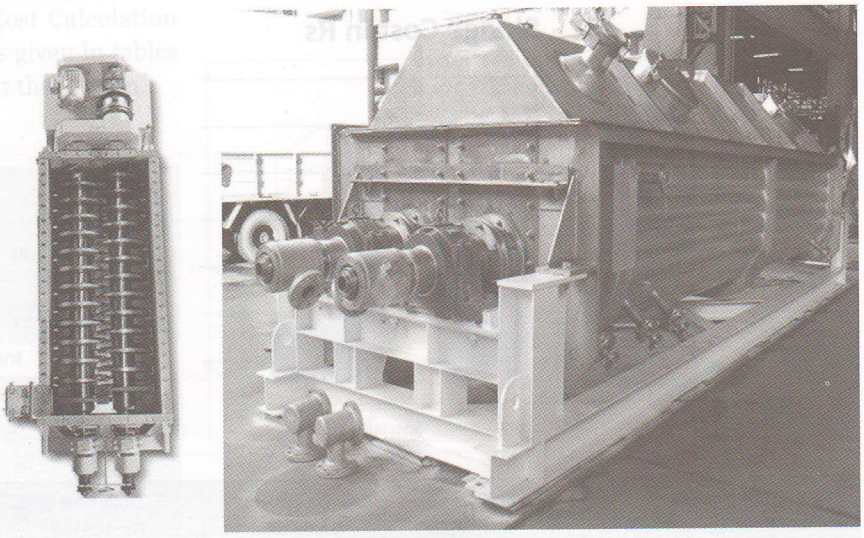
The outcome of our survey is that Conventional sludge beds, filter presses, decanters do not meet growing sludge dewatering demands up to 5.0% moisture content of sludge.

We observed that the Paddle sludge dryer is more suitable, efficient and cost effective as it can easily handle the sludge with moisture content as high as 85% and can reduce down to moisture content 5% or even lesser. It utilizes low steam and power as compared to other thermal drying system available. At the same time, it is more compact and sturdy structure requiring less space.

Based on this study we suggested to our clients to use Paddle sludge dryer as it functions well saving huge cost as indicated above.



Photograph of Trial



Sludge Dryer

Now, we have decided to approach the govt. authorities to allow usage of the dry sludge as fuel in boilers and kilns for the benefit of industries and in the best interest of environment.

Acknowledgement

We gratefully acknowledge the support of Textile Industries for allowing us to conduct trails at their site on plant scale and granting consent for publication of the case study.

About the authors:
The Technical Team
Microvision Group
Plot No: 262,
Opp. Road No. 2 & GEB Sub Station,
G.I.D.C, Kathwada,
Ahmedabad - 382 430.
Email:
alpesh.shah@mvisionprojects.com
Web site: wwww.mvisionprojects.com