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Membrane Based Ultrafiltration of Toxic Effluent to Combat Groundwater Crisis

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Abstract. The paper observe and tries to evaluate the character of effluents generated from fabric bleaching and dyeing factories positioned at Kalikapur region beneath the Maheshtala region, West Bengal, India and to offer a sustainable control of surface water sources thru putting in CETPs with 0 liquid discharge plants. Effluents from medium, small and tiny factories of this place are producing 2000 MLD. Studies with forty small scale units for 4 years (2012—2016) positioned on this region exhibited following implied values of various physic-chemical variables: pH: 9, BOD: 608 mg/l, COD: 1824 mg/l, TDS: 6410 mg/l, TSS: 926 mg/l and hazardous metals which include Pb: 0.43mg/l, Cr : 0.031 mg/l, Zn: 0.74 mg/l, Ni: 0.07 mg/l and Cd: 0.03 mg/l. These values exceeded the usual permissible limits stipulated through FAO (1985) and WHO (2003). The wastewater encumbered with poisonous hint metals is adversely affecting the surroundings and human fitness and additionally degrades the best quality of each surface and groundwater and constantly lowering the level of underground water aquifer.

Keywords. Wastewater; Textile, Treatment; Membrane; Ultrafiltration

1. Introduction

The most important purpose of the study is to evaluate the character of wastewater generated and to offer a sensible and sustainable groundwater control through putting in common effluent treatment plant [1] with 0 liquid discharge device thru implementation of membrane primarily based totally on ultra-filtration, opposite osmosis with recourse (Agarwal et al. 2010) to recycling of bleaching and dyeing effluent at Kalikapur, West Bengal, India to keep groundwater, surroundings and human fitness of a thickly populated region and 15 KM from Calcutta. The research work carried out in Chatta and Kalikapur region (1.85 sq.km) which belongs to Maheshtala fabric hub (44.67 sq.km), an city region having administrative head zone at Alipore of South 24 Parganas district of West Bengal (see Figures 1 and 2). The region lies among 10.450 N latitude to 75.900 E longitude having more than one thousand small and tiny bleaching and dying factories as according to Economic Survey (2014), West Bengal Government where groundwater level shrinks each day according to SWID, West Bengal Government.

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Figure 1. Map of Maheshtala Region

Figure 2. Map of Chatta Kalikapur

2. Methods

Samples had been accumulated from SSI units within the observe region at periodical intervals in 2012-2013. Samples have been taken to the laboratory and analyzed as per the usual methods described and suggested by American Public Health Association [2]. Temperature and pH had been measured through a mercury thermometer having variety from 00C-1000C and with transportable pH meter respectively at site. Total dissolved solids, dissolved oxygen, salinity and turbidity had been decided through Water Quality Analyser PE- 371 (Systronic). Alkalinity of samples had been assessed through titrimetric apparatus. For evaluation of COD, samples had been stabilized through acidifying with H2SO4 under 2 and it became measured through dichromate titration approach [2]. The awareness of nitrate withinside the samples become decided through UV spectrophotometric screening approach with Zuconyl indicator. Sodium, potassium and calcium had been measured through Flame-photometric approach. Heavy steel samples had been analyzed after filtration through Whatman filter–paper no. forty after which acidified samples had been digested with focused HNO3 (0.1%) acid. The metals had been measured with atomic absorption spectrophotometer (OMA and 300 system analyzer).

3. Results and Discussion

The pH suggests the effluent is alkaline, heavy chemical substances and dyes available in TDS, and presence of trace metal suggests that the untreated effluent is bad for ecological imbalances within site the place and required instant treatment. The physicochemical parameters of wastewater generated from the bleaching and dyeing units after initial treatment observed the parameters as pH (7.7), BOD (20 mg/l), COD (120 mg/l), TDS (2234 mg/l), TSS (22 mg/l)) lower than the parameters of WHO, 2003 and FAO, 1985; Hazourdas metals Pb (0.33mg/l), Cr(0.021 mg/l), Zn(0.54 mg/l), Ni (0.00 mg/l) and Cd (0.02 mg/l may be cleaned after membrane and primary treatment named as

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advanced treatment plant facilities (ATP) depicted in Table-1.

The present review clearly highlights the fact that the role essayed by these membrane-based treatment procedures in producing reclaimable textile effluents is quite physical. This technique is being practiced in CETPs working in 800 m3/day CETP at Ramtek textile cluster near Nagpur, 1.5 MGDCETP at Pali textile hub, Rajasthan. The careful selection of the appropriate membrane based method is, however, inclined by the quality of the treated process stream wanted, characteristics of the membrane and the rheological heterogeneity of the effluent at hand, as well as the position of the process in the cost range. For instance, the quality of water recuperated through microfiltration or ultrafiltration usually does not fulfil the criteria for reuse in acute processes such as dyeing of fibres; this reclaimed water is regularly recycled in rinse vats or as wash water in textile industries. Subsequent NF and/or RO processes are therefore necessary for producing best quality treated effluent that can be directly recycled in the primary textile stages such as dying, which claim clean and constant supply of softened water. Additionally, NF and RO concentrates from membrane based single or hybrid treatment systems, can be treated further using moderately energy efficient membrane crystallization units and/or membrane distillation monitored by burning of the MD concentrates so as to take about successful effectuation of the concept of zero liquid discharge (ZLD). CEPT process flow chart of 500MLD capacity depicted in Figures 3 and 4, respectively

Table 1. Efficacy evaluation of enhance remedy strategies (ATP) after primary treatment:

Sl.No.	**Parameters**	**Feed**	**Perametar from Reverse Osmosis Ultrafiltration**	**Reverse Osmosis**	**Concentrate from**
1	Appearence	Clear	Clear	Clear	Muddy
2	pH	7.7	7.7	6.0	7.8
3	Alkalinity	345(±15.2)	325(±14.1)	12(±1.4)	1100(±51.7)
4	Suspended solids	22(±1.6)	ND	ND	ND
5	Total dissolved solids	2234(±57.7)	2196 (±53.0)	40(±1.8)	7584(±195.4)
6	COD	120(±1.6	20(±1.2)	ND	ND
7	BOD	20(±1.2)	3(±1.2)	ND	11(±1.2)
8	Total Kjeldahl nitrogen	ND	ND	ND	ND
9	Phosphate	1.1(±0.08)	0.066(±0.05)	ND	0.22 (±0.06)
10	Sulphides	1.6(±0.20)	ND	ND	ND
11	oil and grease	1.4(±0.20)	<1(±0.1)	ND	3.3(±0.40)
12	Chlorides	494(±29.1)	483(±28.4)	12(±0.80)	1653(±97.8)
13	Calcium	330(±11.1)	325(±11.0)	3(±1.1)	1125(±112.90)
14	Magnesium	164(±14.6	143(±12.7)	2(±0.60)	493(±42.5)
15	Sulphate	350(±37.0)	307(±32.7)	ND	1070(±114.1)
16	Sodium	289(±14.0)	264(±12.9)	3(±0.9)	917(±122.9)
17	Potasium	15(±2.00)	<1(±0.20)	<1(±0.20)	1(±0.200)
-All values are expressed in mg/l except pH ; values in parenthesis are standard deviation; ND: not detectable; [a]Tertiary treated effluent from feed tank of ATP , Source : [3]					

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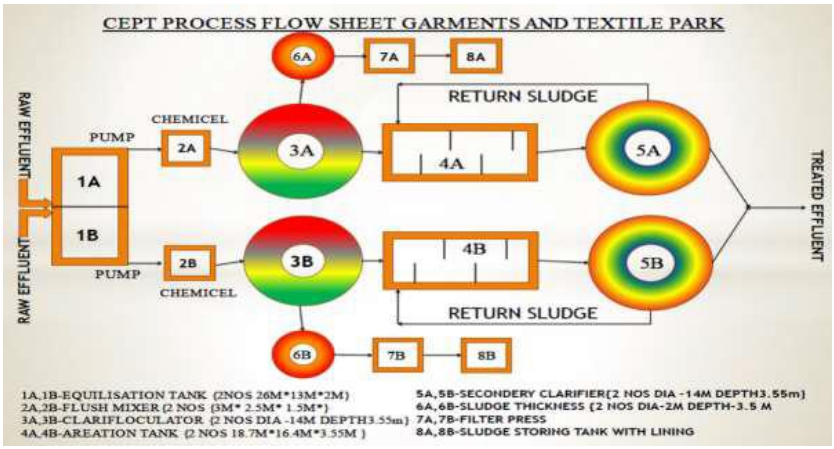

Figure 3. CEPT Process Flow Sweet Garments and Textile Park

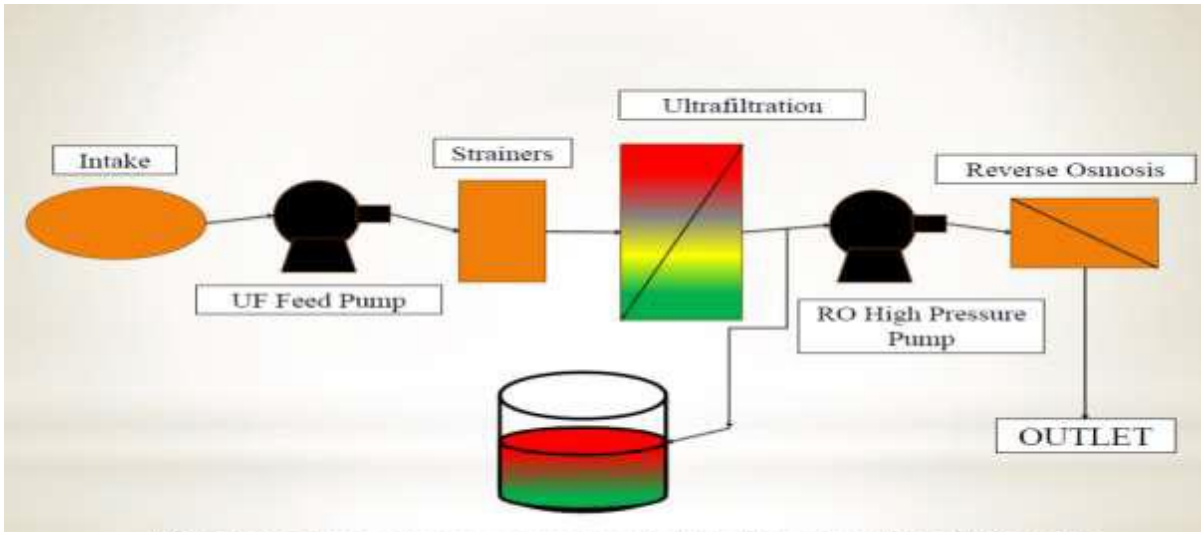

Figure 4. Flow Chart of Wastewater remedy with Ultrafiltration UF and RO device

4. Conclusion

The CETP facilities can consequently store ground water from depletion and degradation. Transfer of contaminants to agro-horticulture produces thru the food chain could be curtailed and consequently human health hazard could be minimized. The entire treatment and reusing of treated water will help to preserve 2000 MLD underground water in the cluster area to save water and save life as the entire India & World is moving towards water paucity due to climate change.

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Conflicts of Interest

The authors declare that there is no conflict of interest.

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