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Utilization of Treated Effluent of STP's in Delhi

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Abstract:
Population growth, increasing living standards, but also environmental hazards with global climate change as the most significant are all contributing to an increasing water stress in many parts of the world. While access to fresh water for drinking water is getting more costly due to environmental pollution, uses of drinking water conflicts with water needs for agricultural and industrial use, which are in need of substantial water quantities. The use of reclaimed wastewater for non-potable purposes provides a solution for this. Reuse of wastewater for irrigation is a practice that is already applied around the world for many years. This is not new and has in fact been applied in many regions as the main water management approach. As water scarcity becomes more severe, also the need for more sustainable and holistic approaches to deal with our limited fresh water resources becomes more and more obvious. The traditional one-way water handling approach, with end-of-pipe treatment releasing "clean" effluent water to nature, has to be converted into a society-internal water reuse scheme where different water qualities and water uses are considered as an integral part of the water cycle.

Keywords: DJB, DDA, SDMC, PWD, DPCC, Tube-Well, Treated Effluent, Reused Water, Waste Water, Recycled Water, Reclaimed Water, Sewer Treatment Plant (STP), Water Management, BOD, COD, PH Value, TSS Value.

1. INTROUDCTION

Water reuse is the reclamation of treated wastewater for a beneficial use, such as hydraulic fracturing, agricultural irrigation and industrial cooling. Reuse has been and continues to be an important component of water management toolbox. Industries have been reusing water within their facilities for decades to reduce operating costs. Many municipal and industrial wastewater treatment plants discharge treated water to streams and lakes, or land apply reclaimed water for additional treatment prior to recharging a groundwater aquifer. In many of these cases, the reclaimed water becomes a portion of the source water for a potable drinking water supply. Water is a valuable resource, and should be allocated to the highest practical use.

1.1 Benefits of Water Reuse

1. Reuse reduces demands for surface water or groundwater resources to be used for hydraulic fracturing.
2. Reuse reduces demands on valuable water supplies used for drinking water and irrigation.
3. Reuse replenishes groundwater and surface water sources.
4. Reuse helps reduce pollutant loading to surface water.
5. Reuse may postpone costly investment for development of new water sources.
6. Reuse can allow for non discharge alternatives which are especially useful in Special Protection Watersheds.

1.2 Definitions

1. Reclaimed water – Treated wastewater used in accordance with applicable guidelines for a beneficial purpose as a substitute for water withdrawn from a surface or groundwater source. The term "reclaimed water" includes both recycled water and reused water.
2. Recycled water – Treated wastewater obtained from an application or process that is intended to be used again in the same application or process.
3. Reused water – Treated wastewater obtained from one application or process that is intended for use in another application or process.
4. Wastewater – The combination of the liquid or water-carried wastes removed from residences, institutions, and commercial and industrial establishments.

1.3 Area Where Treated Effluent Used

1. Agriculture: Irrigation with reclaimed wastewater is one of the most important applications as roughly 2/3 of all water use goes to agriculture irrigation. The alternative combines recycling of both water and nutrients.
2. Industry: Wastewater reuse for industrial applications includes water used for cooling, boiler make-up water; industrial process water in pulp & paper, chemical, petrochemical, coal & cement industries, etc.
3. Groundwater augmentation: Augmentation of aquifers provides storage of reclaimed water for subsequent retrieval and reuse, helps to minimize or prevent ground subsidence caused by decreased groundwater levels. This reuse alternative may further include infiltration basins, percolation ponds, and augmentation of other natural water bodies for wetland enhancement, wildlife habitat, stream augmentation etc., with or without further use of that water body as fresh water resource for potable use after additional treatment.

2. RESEARCH OBJECTIVE

Delhi does not have its own water resource. Daily demand of water is approximate 900 MGD. It is totally dependent on the other neighborhood state i.e. Haryana, Uttar Pradesh (UP) etc. Almost 320 MGD of Water is being taken from UP and 450 MGD of water from Haryana and rest of water is extracted

from Tube-Wells and from Renny Wells. At present Delhi Jal Board is supplying 830 MGD of water in Delhi for drinking purpose to the population. The sewer generated @ 80% is as per CPHEEO norms and is estimated about 630 MGD. There are 36 Sewer Treatment Plant at 21 different locations in Delhi. The main objective of the research is to use the treated effluent of STP's in many ways. It can be used for Irrigation purpose, Industrial purpose or for any other aspect as well. Now the treated water is drain off into Yamuna River or into any drain. At Oklha, Vasant Kunj and Mehrauli STP's, almost 180 MGD of water is gets treated. This treated water is directly drained off into Yamuna River or in Hauz Khas Lake. This treated water can be utilized in many places. Not only have this treated effluent helps to improve the Ground Water table as well as it generated the revenue as well. It also helps to reduce the environment pollution as well.

3. STUDY AREA

Delhi lies in the latitude/longitude 28_380/77_130. At present, the total quantity of sewage generated is 2,871 million litters per day (MLD), whereas the total capacity of the sewage treatment plants in Delhi is 1,478 MLD (see Tables-1 for detailed capacity of different plants). The remaining 48 % untreated sewage (1,393 MLD) finds its way into the Yamuna River through the 19 major drains which carry sewage and industrial effluents from the city. As a result, the quality of river water has been deteriorating and the water in the river is at present unfit for drinking (even for animals) and for use in agriculture. The sewerage facilities cover only about 75 % of the population. Locations of STP's in Delhi with their respective capacity are mentioned in Table No-1.

Table No.1. respective capacity are mentioned

S.No	Location of STP in Delhi	Capacity (In MGD)
1	Keshopur Ph I,II,III	72
2	Okhla Ph I,II,III,IV,V,VI	170
3	Kondli Ph I, II,III,IV	90
4	Rithala Ph 1,II	80
5	Yamuna Vihar Ph I,II	20
6	Vasant Kunj Ph I,II	5
7	Corunation Pillar Ph I,II,III	40
8	Narela	10
9	Nilothi	40
10	Najafgarh	5
11	Papankalan	20
12	Dr Sen Nursing Home Nalla	2.2
13	Delhi Gate Nalla	2.2
14	Mehrauli	5
15	Rohini	15
16	Ghitorni	5
17	Kapeshera	5
18	CWG Village	1
19	Bakkarwala	0.66
20	Mollarbandh	0.66
21	Timarpur Oxidization Pond	6
Total Capacity		594.72 MGD

Source: Delhi Jal Board

Accordingly, area in vicinity of Okhla and Vasant Kunj STP are being taken into consideration so that the treated effluent can by utilised by finding the potential users in command of them.

4. METHODOLOGY

1. A survey is conducted to identify the potential users to use the treated effluent. Lots of potential user comes to take the treated effluent in large quantity i.e. Jamia University, Escorts Hospital, Green Belt Area on the road, PWD for Horticulture purpose, DDA & MCD for its Park situated in different society, DTC Bus Depots etc..
2. Demand assessment of the potentials users.
3. Output of the plant.
4. Quality check of the treated effluent.
5. Selection of alignment to lay the network and its design part i.e. selection of pipe and route map.

5. RESULT AND DISCUSSIONS

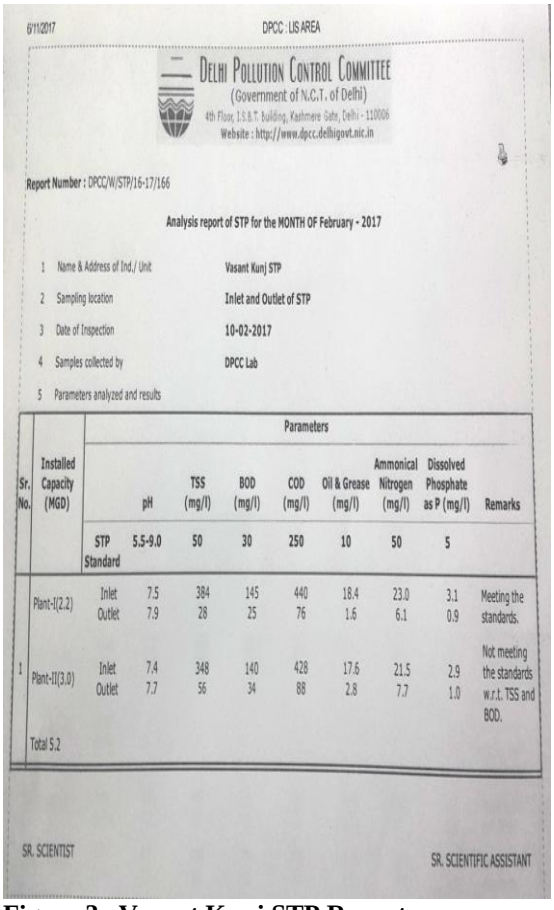
Catchment area of Okhla and Vasant Kunj STP are being surveyed. In vicinity of Oklha STP, it has been observed that about 13 acres of Sarita Vihar Parks and Green belts of DDA, SDMC and PWD exist there. It is proposed to lay approximate 3000 meter effluent main needs to be laid there and it is expected to close 10-12 tube-wells. It will helps to improve the Ground water level as well gives revenue Rs 2.1 Lac per year i.e. @ Rs 7/- Per year. (See Map as Fig No 1). Only One MGD of treated effluent is supplied on daily basis to the proposed network as per the demand of the potentials user to this area.

Figure. 1. Proposed Line Network from Okhla STP.

It is further stated that approximate 90 MGD treated effluent is generated from Oklha STP and is can be utilised by others potentials users i.e. Meerabai Polytechnic at Maharani Bagh, CRRI complex and its staff quarters, green belt area from Apollo hospital to Ashram Chowk, Children Park Bharat nagar, New Friends Colony area, Park under preview of SDMC, DDA at Sarai Julena, Bharat nagar, Ishwar nagar, Tamoor nagar, Sun Light colony, DTC depot Sukhdev Vihar etc. Approximate Three MGD of water being utilised by this system. By providing laying of treated effluent network, we can utilise the treated effluent. Also, generate the revenue as well. It will also help to reduce the environment pollution al well. From Vasant Kunj STP, treated effluent is being used by Horticulture wing of DDA in Sanjay Van Park. This park is situated in 1000 acre. This park has more than fifty thousand tree. The treated effluent is taken into ponds. (See Fig No 2) Further, treated effluent is being supplied to all the corner of the park through line. The whole park is developed with the help of the treated effluent. There is no other source of the water for irrigation purpose.

Figure. 2. Pond at Sanjay Van Park (DDA Horticulture)

The output parameters of the treated effluent are being checked by Delhi pollution Control Committee (DPCC) time to time and reports are available on their website. (See Fig No 3 and 4).



6/11/2017 DPCC : LIS AREA

DELHI POLLUTION CONTROL COMMITTEE
(Government of N.C.T. of Delhi)
4th Floor, I.S.B.T. building, Kashmere Gate, Delhi - 110006
Website : http://www.dpcc.delhigovt.nic.in

Report Number : DPCC/W/STP/16-17/166

Analysis report of STP for the MONTH OF February - 2017

1 Name & Address of Ind./ Unit: Vasant Kunj STP
2 Sampling location: Inlet and Outlet of STP
3 Date of Inspection: 10-02-2017
4 Samples collected by: DPCC Lab
5 Parameters analyzed and results

Sr. No.	Installed Capacity (MGD)	Parameters	pH	TSS (mg/l)	BOD (mg/l)	COD (mg/l)	Oil & Grease (mg/l)	Ammonical Nitrogen (mg/l)	Dissolved Phosphate as P (mg/l)	Remarks
		STP Standard	5.5-9.0	50	30	250	10	50	5	
1	Plant-I(2.2)	Inlet	7.5	384	145	440	18.4	23.0	3.1	Meeting the standards.
		Outlet	7.9	28	25	76	1.6	6.1	0.9	
	Plant-II(3.0)	Inlet	7.4	348	140	428	17.6	21.5	2.9	Not meeting the standards w.r.t. TSS and BOD.
		Outlet	7.7	56	34	88	2.8	7.7	1.0	
	Total 5.2									

SR. SCIENTIST SR. SCIENTIFIC ASSISTANT

Figure.3. Vasant Kunj STP Report

6. CONCLUSIONS AND FUTURE ASPECTS

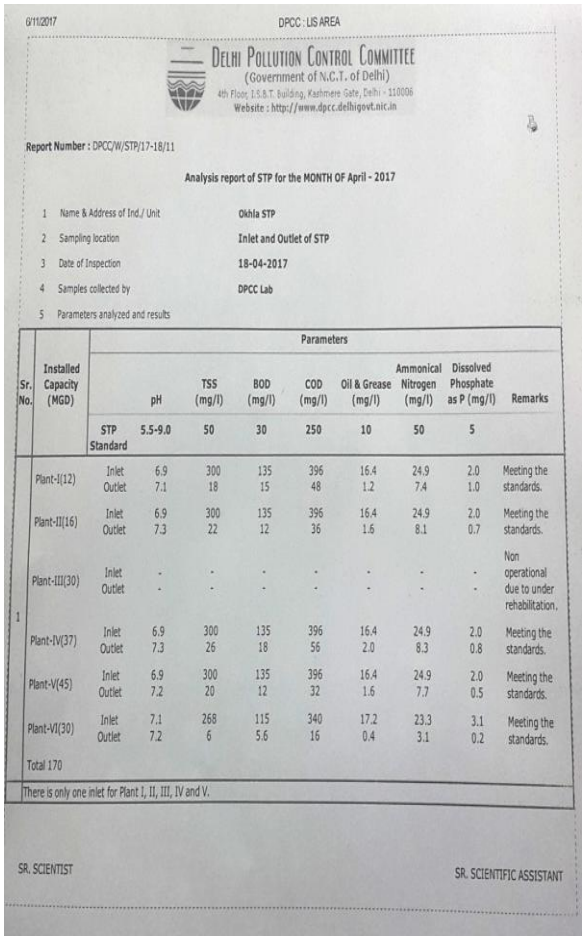
The main overall conclusion from the presented combined assessment of treatment performances, environmental impact and archiving various wastewater reuse quality requirements is that only a consideration including all of these factors can be the way forward to sustainable wastewater reuse systems.

6.1 Treatment Performance

Treatment performance in terms of reaching a certain effluent quality by removal of a number of common but also emerging contaminants, and process stability was a starting point and prerequisite for sustainability evaluation

6.2 Environmental Impacts

The increased environmental impacts, caused by more stringent effluent quality targets that require more advanced treatment processes, become less significant with increasing plant size. This implies that higher quality targets do not automatically imply an increase of environmental impacts.



6/11/2017 DPCC : LIS AREA

DELHI POLLUTION CONTROL COMMITTEE
(Government of N.C.T. of Delhi)
4th Floor, I.S.B.T. building, Kashmere Gate, Delhi - 110006
Website : http://www.dpcc.delhigovt.nic.in

Report Number : DPCC/W/STP/17-18/11

Analysis report of STP for the MONTH OF April - 2017

1 Name & Address of Ind./ Unit: Okhla STP
2 Sampling location: Inlet and Outlet of STP
3 Date of Inspection: 18-04-2017
4 Samples collected by: DPCC Lab
5 Parameters analyzed and results

Sr. No.	Installed Capacity (MGD)	Parameters	pH	TSS (mg/l)	BOD (mg/l)	COD (mg/l)	Oil & Grease (mg/l)	Ammonical Nitrogen (mg/l)	Dissolved Phosphate as P (mg/l)	Remarks
		STP Standard	5.5-9.0	50	30	250	10	50	5	
1	Plant-I(12)	Inlet	6.9	300	135	396	16.4	24.9	2.0	Meeting the standards.
		Outlet	7.1	18	15	48	1.2	7.4	1.0	
	Plant-II(16)	Inlet	6.9	300	135	396	16.4	24.9	2.0	Meeting the standards.
		Outlet	7.3	22	12	36	1.6	8.1	0.7	
	Plant-III(30)	Inlet	-	-	-	-	-	-	-	Non operational due to under rehabilitation.
		Outlet	-	-	-	-	-	-	-	
	Plant-IV(37)	Inlet	6.9	300	135	396	16.4	24.9	2.0	Meeting the standards.
		Outlet	7.3	26	18	56	2.0	8.3	0.8	
	Plant-V(45)	Inlet	6.9	300	135	396	16.4	24.9	2.0	Meeting the standards.
		Outlet	7.2	20	12	32	1.6	7.7	0.5	
	Plant-VI(30)	Inlet	7.1	268	115	340	17.2	23.3	3.1	Meeting the standards.
		Outlet	7.2	6	5.6	16	0.4	3.1	0.2	
	Total 170									

There is only one inlet for Plant I, II, III, IV and V.

SR. SCIENTIST SR. SCIENTIFIC ASSISTANT

Figure.4. Okhla STP Report

It became also clear within the environmental assessment that it would be desirable to consider all downstream impacts, i.e. after the actual water and sludge treatment.

6.3 Future Aspect

It is stated that as the population is increasing day by day at very rapid rate, quantity of water shall be more required for domestic as well for other purpose. But the sources of water on earth are very limited. We have to utilize those resources very efficiently. In Case of Delhi, as it does not have its own water resources sources so it becomes very difficult in future to survive in that case. We have to utilize the treated effluent by finding the maximum potential users so that extraction of

ground water can be minimized. Also the requirement of potable water can be reduced down. Environment can also save by this way. This study provided guidance for process design for indirect and direct potable water reuse of treated wastewater, and wastewater discharge into sensitive water bodies. By recharging the water bodies we can increase the ground water aquifer.

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8. BIOGRAPHIES

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