Study of Water Treatment Plant Latur

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Abstract- *Water is the most important element for life on Earth, and the availability of potable water is a major global concern for the twenty-first century. All living organisms must have access to pure, uncontaminated water. Water covers more than 71% of the ground atmosphere, yet according to international norms, only about 1% of it is drinking due to numerous pollutants. The primary sources of waterborne diseases include wastewater discharge from industries, agricultural pollution, wastewaters, and climate and geographical changes. Examine the water samples collected from the Wtp. The pH, Total Dissolved Solid, Alkalinity, Conductivity, Chloride, Hardness, Colour, Odour, Turbidity, Calcium, Magnesium, Sulphate, RFC, E.C01i, and Coliform of water samples must be determined. To compare the analyses done in the laboratory survey results. Determine the outcomes, analyses, and planned future applications. This study illustrates the operation of Latur Water Treatment Plant. The prevalence of a variety of pollutants in Latur's house-supplied drinking water was investigated. This is the first reporting of their prevalence in drinking water supplies in an unregulated environment. This data can be utilised to establish research and regulatory priorities as well as develop future monitoring programmes. Raw water is sampled and treated at the water treatment facility. In this investigation, samples were obtained from the water treatment plant in Latur, Maharashtra, on three separate occasions.*

Keywords- Latur,Water treatment plant, treated and untreated water, physico chemical properties.

I. INTRODUCTION

Water is the most crucial compound for life on Earth, and having drinkable water is a key worldwide concern for the twenty-first century. All living things require clean, uncontaminated water as a basic requirement. Water covers more than 71 percent of the earth's surface, but only around 1% of it is drinkable according to international standards due to various contaminations. Wastewater discharge from industries, agricultural pollution, municipal wastewater, environmental and global changes are the main sources of water contamination. Even trace levels of heavy metals, dyes, and microbes are hazardous to human health, aquatic systems, and the environment. According to a United Nations Sustainable Development Group report from 2021, 2.3 billion people now live in water-stressed countries, and 733 million people live in high and critically water-stressed countries. To address water scarcity issues, it is becoming increasingly important to recover water from current wastewater or develop alternate water sources for human consumption. Domestic and industrial wastewater are the two types of wastewater. Domestic wastewater contains sewage, bacteria, viruses, hazardous and non-toxic organisms, sanitary outputs, rubbish, detergents, and other solid and liquid discharges from non-manufacturing processes.

Fig:1 Water treatment plant

Water treatment is any process that improves the quality of water to make it appropriate for a specific end-use. The end use may be drinking, industrial water supply, irrigation, river flow maintenance, water recreation or many other uses, including being safely returned to the environment. Water treatment removes contaminants and undesirable components, or reduces their concentration so that the water becomes fit for its desired end-use. This treatment is crucial to human health and allows humans to benefit from both drinking and irrigation use.

1.1Components of a water treatment plant

A water treatment plant is a simple installation of a plant used to purify water and separate it from contaminated substances. The contaminated substances are made up of solid, liquid, and semisolid particles, making the water unsafe for human consumption. Water treatment plants are installed in various types around the world, depending on the type of contaminated substance being purified.

The drinking water plant's components are interconnected so that when water is drawn from the primary source, it is easily transferred to the intake well and passed through to the water pumping system.

Intake Well:

The intake well, as the name implies, serves as a structure for safely withdrawing water from the water source and discharging it into the withdrawal conduit. It is located at the beginning of the entire water treatment plant and ensures a steady supply of water to keep the treatment process running. They accept water from various sources, such as reservoirs, lakes, or canals, and then transport it to the treatment plant.

Aerator:

Aerators introduce air into the water flow, which may come as a surprise. The goal of air induction is to oxidase iron and reduce the dissolved gases in the intake well's water. Although the dissolved gases cannot be completely reduced, partial reduction causes iron and manganese to be converted from the ferrous to the ferric state before the water is introduced into the filtration process.

Sand Filter:

The procedure eliminates sinkable, floating, and suspended particles from the water. When water is collected from its source, it is forced through a fine bed of sand or gravel, where particles are removed through absorption or physical encapsulation. Sand filters are used as a final polishing stage in any type of water purifier plant. They are capable of capturing both suspended material and bacteria floating in the water. The filtered water slowly sinks through the sand bed, leaving the residual matter above or within the stand.

Chlorination by the chlorine dosing system:

Chlorination is a widely accepted method for treating microorganisms in water. The most common application of chlorine is in swimming pools. It is a disinfectant in which a hypochlorite solution is injected into the water. Even after filtering the water through the sand bed, there are bacteria present that can harm human health.

SCADA and instrumental System:

The SCADA system is a sophisticated technological process that monitors and controls other physical processes in an industrial setting. For instance, traffic lights, water distribution, gas transportation, electricity transmission, oil pipelines, and other processes are used. The SCADA system's primary function is to control equipment involved in the production, manufacturing, fabrication, and development of raw materials.

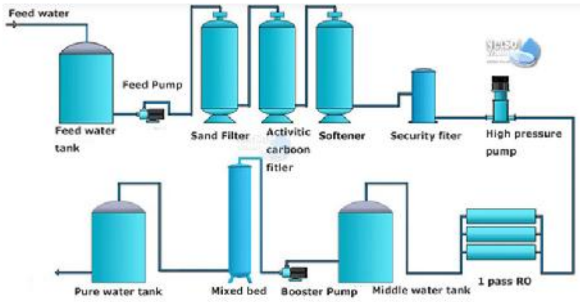


Fig:2 components of water treatment plant

Latur Water Supply

Latur district was separated from Osman Abad district on 15th August 1982. The Latur district lies to the south-east of Maharashtra State, on the border of Karnataka and Maharashtra States. The district lies in between Latitude 17’52” to 18’50” North and Longitude 76 ’2” to 77 ‘18” East. The district lies on Balaghat plateau with altitude range of 540 to 638 m. msl. L. Average annual rainfall for the district is 734 mm. The district has an area of 7,157 sq.kms. The total population of district is 2.454 million persons as per 2011 census, with 74% are rural. Total Municipal Councils in the district are five, namely Latur, Ahmadpur, Udgir, Nilanga, Ausa. The total villages in the district are 943. This district lies in upper watershed of Manjara River, which is a tributary of East flowing Godavari River basin. It is totally lies in Deccan trap basal region with black cotton soils. Average annual rainfall for the district is 769.7 mm with 82% of the rainfall contributed from South West monsoon. The district has an average of 42 rainy days per year. During last decade the rainfall deficit was reported in three years. Last two years were consecutive drought years. Being situated in the upper catchment of Manjara River (a tributary of Godavari River), only about 10% of the district is irrigated by surface water sources. Even before entering this district the water resources are tapped by dams upstream reducing the reliability of water availability during drought years

Latur is a Class a Municipal Council with a population of about 3,50,000 people. The region is prone to scarce water supply. The water supply to the city during the non-summer months is about 75 LPCD with water being available for only one hour twice a week. During summer, the city faces extreme water shortage resulting in water supply decreasing to about 40 LPCD. During summer water is supplied by about 30-40 tankers in most parts of the city as an emergency service. During other seasons, about two tankers are required to supply water in the city. In terms of coverage, about 70% of the population is covered by piped water supply. A groundwater level fall was recorded of more than 3 meters as compared to 5 year averages. This is significantly higher than the previous year. In Latur, Jalkot Taluk shows the deepest level fall in all Marathwada at 7.7 meters deeper than 5 year averages. As is true across the country, groundwater is the real water lifeline of Latur. Reports state that there are over 90,000 borewells in the district alone. Even today, most of the 600 odd tankers that ply on Latur's streets use groundwater. Latur residents survived on groundwater when water was supplied once in 15 days and then once in a month. But most of the bores in the city too are going dry. Unlike the neighboring Solapur where a massive groundwater recharge and protection movement took shape leading to remarkably better groundwater condition throughout the district, no such thing happened in Latur, despite the acute drought. Latur City, with a population of more than 400,000 receives water mainly from the Manjara Dam, or Dhanegon Dam about 60 kms from the city. The 25 meters high dam was built in 1982 and has a Live Storage of 177 MCM according to Maharashtra Govt. (However, according to Water Resources Information System of Central Government, its live storage is 154 MCM. Its submergence area is approximately 4300 hectares. Manjara River on which Manjara Dam is built is by no means small. It is a 724 kms long tributary of Godavari arising from the Balaghat ranges of Maharashtra and meets Godavari in Andhra Pradesh.

II. LITERATURE REVIEW

Vincent Thomas et.al.(2020) In this study, we investigated the presence of FLA and amoebae-resisting bacteria (ARB) at various stages of a drinking water plant fed with river water. We isolated various amoeba's species from the river and from several points within the plant, mostly at early steps of water treatment. Some FLA isolates were recovered immediately after the zonation step, thus suggesting resistance of these microorganisms to this disinfection procedure. A bacterial isolate related to Mycobacterium mucogenicum was recovered from an Echinamoeba-related amoeba isolated from ozone treated water. As amoebae mainly multiply in sand and GAC filters, optimization of filter backwash procedures probably offers a possibility to better control these protests and the risk associated with their intracellular hosts.

Fikrat M. Hassan, Ansam R. Mahmood (2018) Three sites for each plant were selected which represent the sedimentation basin, filtration basin and final stages after chlorination. The results showed variation in drinking water quality parameter values in both treatment plants. The drinking water produced from the AL - Rasheed plant have contained more contaminants than AL-Wihda plant in which the stages of water treatment were characterized by the old condition compared to the first project AL-Wihda. The results of heavy metals show that the Lead, Cadmium and Ni were exceeded the allowed limits in all sites of the study, where they were not removed completely during the treatment stages for both plants.

Stefan J. Hoegera et.al.(2019) Many of these surface waters are used as drinking water resources. However, only traces (,1.0 mg/l) of these toxins were detected in final water (final product of the drinking water treatment plant) and tap water (household sample). Despite the low concentrations of toxins detected in drinking water, a further reduction of cyanobacterial toxins is recommended to guarantee public safety. Thus, variations in cyanobacterial densities and toxin production (amount and kind of toxin) during the year show.

M.J. Lujan-Facundo et.al.(2019) In this study, adsorption was conducted to assess the removal of ibuprofen, caffeine, diazepam and acetaminophen, both as separated processes as in combination with a biological process in sequencing batch reactors. Regarding adsorption tests as separated process, ibuprofen was the pharmaceutical active compounds with the lowest removal percentage (around 50% for the granular activated carbon) and diazepam (around 80% for the granular activated carbon) was the compound with the maximum removal efficiency for the tested concentrations (between 0.5 and 3 mg/L).

III. METHODOLOGY

Fig.2 Methodology Flow Chart

3.2 SITE DETAILS

Fig.3 Satellite view of WTP Latur

Site details

Location: - 18.402468,76.497343

Address: - Additional Latur MIDC, Harangul Bk., Maharashtra 413531

Description: - The raw water for the WTP is from the Dhamigaon which is 60 km from water treatment plant
Capacity of water treatment plant is 80 mld
Everyday supply is equal to 50.55 mld to Latur city
Pump House motor is 750 HP
10 filtration bed four layers of gravel 5th layer is of sand
Chlorine gas cylinder is equal to 900 kg

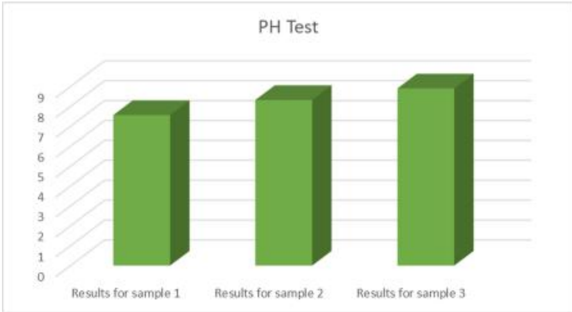
Site Visit: - The Wtp latur site visit images are as following:

IV. RESULT

4.1 PH Test

Table.1 PH Test

Test Parameters	Results for sample 1	Results for sample 2	Results for sample 3
pH	7.56	8.32	8.9



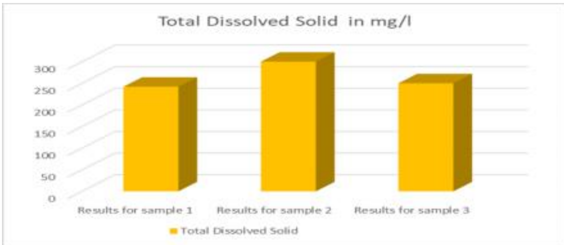
Graph.1 PH Test

The about test parameter is for pH of the samples collected from the water treatment plant Latur. Results for sample one pH is 7.56. for sample to the pH value is 8.32. and for sample 3 the pH value recorded is 8.9 which is the highest among the three samples.

4.2 Total Dissolved Solid

Table.2 Total Dissolved Solid

Test Parameters	Results for sample 1	Results for sample 2	Results for sample 3
Total Dissolved Solid	242	300	250



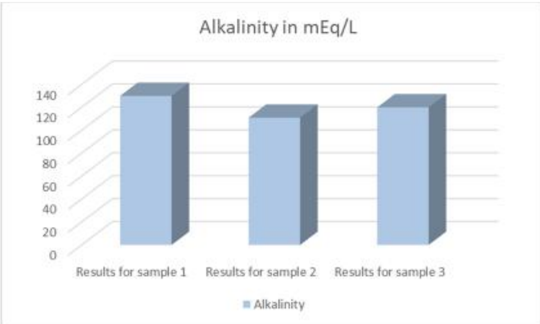
Graph.2 Total Dissolved Solid

The about test parameter is for Total Dissolved Solid of the samples collected from the water treatment plant Latur. Results for sample one Total Dissolved Solid is 242. for sample to the Total Dissolved Solid value is 300. and for sample 2 the Total Dissolved Solid value recorded is 250 which is the highest among the three samples.

4.3 Alkalinity

Table.3 Alkalinity

Test Parameters	Results for sample 1	Results for sample 2	Results for sample 3
Alkalinity	130	111	120



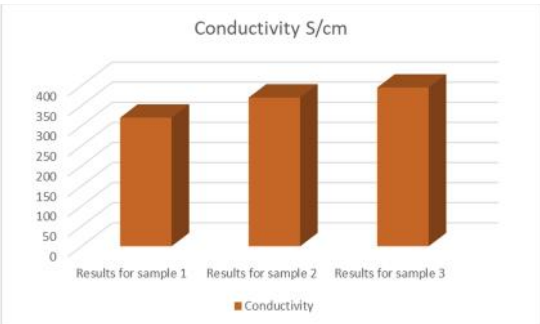
Graph.3 Alkalinity

The about test parameter is for Alkalinity of the samples collected from the water treatment plant Latur. Results for sample one pH is 130 which is the highest among the three samples. for sample to the Alkalinity value is 111. and for sample 3 the Alkalinity value recorded is 120.

4.4 Conductivity

Table.4 Conductivity

Test Parameters	Results for sample 1	Results for sample 2	Results for sample 3
Conductivity	320	370	395



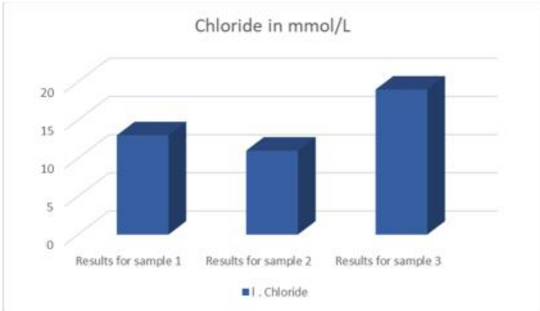
Graph.4 Conductivity

The about test parameter is for Conductivity of the samples collected from the water treatment plant Latur. Results for sample one Conductivity is 320. for sample to the Conductivity value is 370. and for sample 3 the Conductivity value recorded is 395 which is the highest among the three samples.

4.5 Chloride

Table.5 Chloride

Test Parameters	Results for sample 1	Results for sample 2	Results for sample 3
Chloride	13	11	19



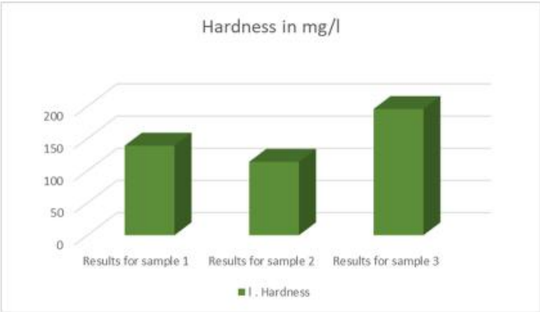
Graph.5 Chloride

The about test parameter is for Chloride of the samples collected from the water treatment plant Latur. Results for sample one Conductivity is 13. for sample to the Chloride value is 11. and for sample 3 the Chloride value recorded is 19 which is the highest among the three samples.

4.6 Hardness

Table.6 Hardness

Test Parameters	Results for sample 1	Results for sample 2	Results for sample 3
Hardness	139	114	196



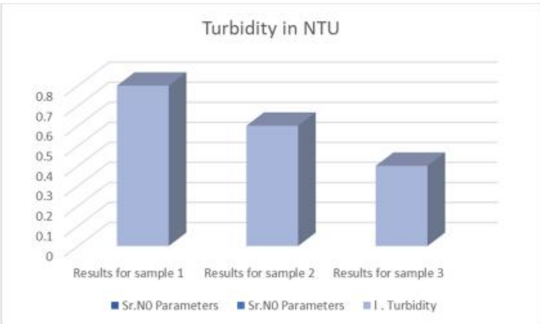
Graph.6 Hardness

The about test parameter is for Hardness of the samples collected from the water treatment plant Latur. Results for sample one Hardness is 139. for sample to the Hardness value is 114. and for sample 3 the Hardness value recorded is 196 which is the highest among the three samples.

4.7 Turbidity

Table.7 Turbidity

Test Parameters	Results for sample 1	Results for sample 2	Results for sample 3
Turbidity	0.8	0.6	0.4



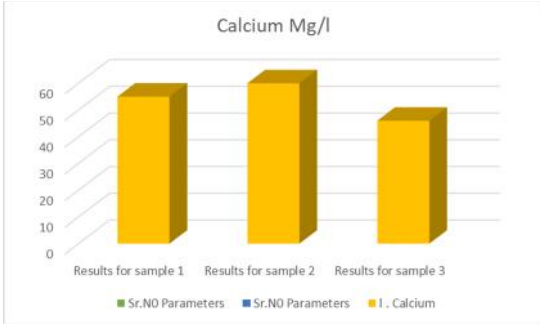
Graph.7 Turbidity

The about test parameter is for Turbidity of the samples collected from the water treatment plant Latur. Results for sample one Turbidity is 0.8 which is the highest among the three samples. for sample to the Turbidity value is 0.6. and for sample 3 the Turbidity value recorded is 0.4.

4.8 Calcium

Test Parameters	Results for sample 1	Results for sample 2	Results for sample 3
Calcium	55	60	46

Table.8 Calcium



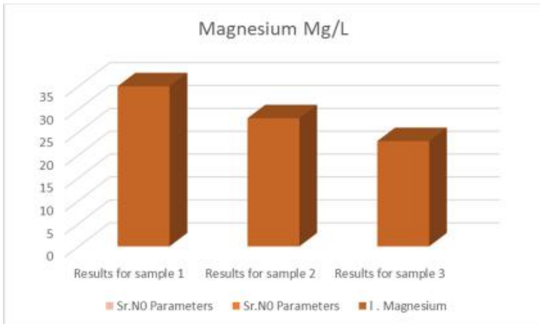
Graph.8 Calcium

The about test parameter is for Calcium of the samples collected from the water treatment plant Latur. Results for sample one Calcium is 55 for sample to the Calcium value is 60.which is the highest among the three samples. and for sample 3 the Calciumvalue recorded is 46.

4.9 Magnesium

Table.9 Magnesium

Test Parameters	Results for sample 1	Results for sample 2	Results for sample 3
Magnesium	35	28	23



Graph.9 Magnesium

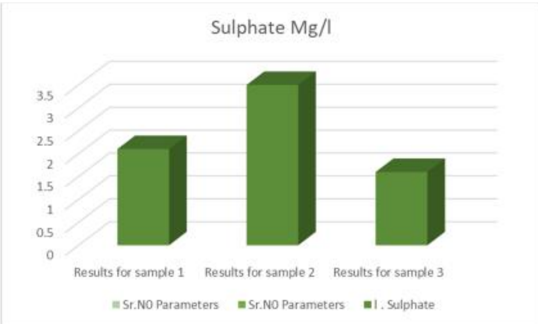
The about test parameter is for Magnesium of the samples collected from the water treatment plant Latur. Results for sample one Magnesium is 35 which is the highest among the three samples. for sample to the

Magnesium value is 28. and for sample 3 the Magnesium value recorded is 23.

4.10 Sulphate

Table.10 Sulphate

Test Parameters	Results for sample 1	Results for sample 2	Results for sample 3
Sulphate	2.1	3.5	1.6



Graph.10 Sulphate

The about test parameter is for Sulphate of the samples collected from the water treatment plant Latur. Results for sample one Sulphateis 2.1 for sample to the Sulphatevalue is 3.5. which is the highest among the three samples. and for sample 3 the Sulphate value recorded is 1.6.

V. CONCLUSION

Results of this study demonstrate the working of Water treatment plant Latur. The occurrence of many of contaminants in day to day using water which is supplied to the houses in Latur were studied. Water is unregulated and this study provides the first documentation of their occurrence in drinking-water supplies. This information can be used in setting research and regulatory priorities and in designing future monitoring programs. Water treatment plant and sampling raw water are treated at the plant. In this study the samples were collected at three different days from the water treatment plant Latur Maharashtra.

The latur WTP is located at Additional Latur MIDC, Harangul Bk., Maharashtra 413531. The 3 samples were collected from the water treatment plant at three different days. The sample were Sample 1, Sample2 and Sample 3 respectively. The collected samples were given to the Ox Food Laboratory Latur. The following test were performed on them and results were obtained:pH,Total Dissolved Solid, Alkalinity, Conductivity, Chloride, Hardness, Colour, Odour, Turbidity, Calcium, Magnesium, Sulphate, RFC, E.C01i, Coliform. The results indicated that the colour and odour was as readable. The rest of thr parameters showed a minimal difference in their readings and all the levels were under the desirable and permissible limits. Results are denoted with their SI units and the IS codes are also mentioned.

REFERENCES

[1] Da Silva, M. F., Tiago, I., Veríssimo, A., Boaventura, R. A., Nunes, O. C., & Manaia, C. M. (2006). Antibiotic resistance of enterococci and related bacteria in an urban wastewater treatment plant. *FEMS Microbiology Ecology*, *55*(2), 322–329. https://doi.org/10.1111/j.1574-6941.2005.00032.x

[2] Amann, R., Lemmer, H., & Wagner, M. (1998). Monitoring the community structure of wastewater treatment plants: A comparison of old and new techniques. *FEMS Microbiology Ecology*, *25*(3), 205–215. https://doi.org/10.1016/S0168-6496(98)00006-3

[3] Gallego, A., Hospido, A., Moreira, M. T., & Feijoo, G. (2008). Environmental performance of wastewater treatment plants for small populations. *Resources, Conservation and Recycling*, *52*(6), 931–940. https://doi.org/10.1016/j.resconrec.2008.02.001

[4] Dyachenko, A., Mitchell, J., & Arsem, N. (2017). Extraction and identification of microplastic particles from secondary wastewater treatment plant (WWTP) effluent. *Analytical Methods*, *9*(9), 1412–1418. https://doi.org/10.1039/c6ay02397e

[5] Buyukkamaci, N., & Koken, E. (2010). Economic evaluation of alternative wastewater treatment plant options for pulp and paper industry. *Science of the Total Environment*, *408*(24), 6070–6078. https://doi.org/10.1016/j.scitotenv.2010.08.045

[6] Tran, T., Bolto, B., Gray, S., Hoang, M., & Ostarcevic, E. (2007). An autopsy study of a fouled reverse osmosis membrane element used in a

brackish water treatment plant. *Water Research*, *41*(17), 3915–3923. https://doi.org/10.1016/j.watres.2007.06.008

[7] Me-Nsope, N., & Larkins, M. (2016). This document is discoverable and free to researchers across the globe due to the work of AgEcon Search. Help ensure our sustainability.*Journal of Gender, Agriculture and Food Security*, *1*(3), 1–22.

[8] Meyer, J., & Bester, K. (2004). Organophosphate flame retardants and plasticizers in wastewater treatment plants. *Journal of Environmental Monitoring*, *6*(7), 599–605. https://doi.org/10.1039/b403206c

[9] Talvitie, J., Mikola, A., Setälä, O., Heinonen, M., & Koistinen, A. (2017). How well is microlitter purified from wastewater? – A detailed study on the stepwise removal of microlitter in a tertiary level wastewater treatment plant. In *Water Research* (Vol. 109). https://doi.org/10.1016/j.watres.2016.11.046

[10] Nasu, M., Goto, M., Kato, H., Oshima, Y., & Tanaka, H. (2001). Study on endocrine disrupting chemicals in wastewater treatment plants. *Water Science and Technology*, *43*(2), 101–108. https://doi.org/10.2166/wst.2001.0078

[11] Stillwell, A. S., Hoppock, D. C., & Webber, M. E. (2010). Energy recovery from wastewater treatment plants in the United States: A case study of the energy-water nexus. *Sustainability*, *2*(4), 945–962. https://doi.org/10.3390/su2040945

[12] Flores-Alsina, X., Corominas, L., Snip, L., & Vanrolleghem, P. A. (2011). Including greenhouse gas emissions during benchmarking of wastewater treatment plant control strategies. *Water Research*, *45*(16), 4700–4710. https://doi.org/10.1016/j.watres.2011.04.040

[13] Siripong, S., & Rittmann, B. E. (2007). Diversity study of nitrifying bacteria in full-scale municipal wastewater treatment plants. *Water Research*, *41*(5), 1110–1120. https://doi.org/10.1016/j.watres.2006.11.050

[14] Power, C., McNabola, A., & Coughlan, P. (2014). Development of an evaluation method for hydropower energy recovery in wastewater treatment plants: Case studies in Ireland and the UK. *Sustainable Energy Technologies and Assessments*, *7*, 166–177. https://doi.org/10.1016/j.seta.2014.06.001

[15] Dargnat, C., Teil, M. J., Chevreuil, M., & Blanchard, M. (2009). Phthalate removal throughout wastewater treatment plant. Case study of Marne Aval station (France). *Science of the Total Environment*, *407*(4), 1235–1244. https://doi.org/10.1016/j.scitotenv.2008.10.027

[16] Mo, W., & Zhang, Q. (2013). Energy-nutrients-water nexus: Integrated resource recovery in municipal wastewater treatment plants. *Journal of Environmental Management*, *127*, 255–267. https://doi.org/10.1016/j.jenvman.2013.05.007

[17] Molinos-Senante, M., Hernández-Sancho, F., & Sala-Garrido, R. (2011). Cost-benefit analysis of water-reuse projects for environmental purposes: A case study for spanish wastewater treatment plants. *Journal of Environmental Management*, *92*(12), 3091–3097. https://doi.org/10.1016/j.jenvman.2011.07.023

[18] Santos, J. L., Aparicio, I., & Alonso, E. (2007). Occurrence and risk assessment of pharmaceutically active compounds in wastewater treatment plants. A case study: Seville city (Spain). *Environment International*, *33*(4), 596–601. https://doi.org/10.1016/j.envint.2006.09.014