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Environmental based assessment of pollutant removal efficiency of the urmia wastewater treatment plant

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Abstract

The Biolac filtration system is based on active multi-stage sludge refineries. This system is a kind of modern biological methods in filtration of sewage waters and sludge's which is so efficient in upgrading of lagoons. This survey aims at the investigation of qualitative sewage polluters and comparison of output results with Environmental Protection Agency (EPA) standards in Iran. First, after studying the details about this system, we focused on analysis of experimental results which was collected during the first six month range of 2010 to 2012 and performance evaluation of system linked to the removal ofBiochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Total Suspended Solids (TSS), N and P polluters. With regard to mentioned investigations and considerations, it can be concluded that the Biolac system was so successful in the removal of polluters such as BOD, COD and TSS. For BOD the average removal rates were more than 96 percent and the output value was less that 20 mg/lit. For COD the removal rates were more than 93 percent and the output value was less that 30 mg/lit. The average removal rate for TSS polluters was about 93 percent's and the output value was less than 13 mg/lit. The corresponding rate for P polluters was about 72 and less than 3 mg/lit, respectively. We consider the EPA Standards in Iran and comparing the mentioned results with these standards, it will be evident that the effluent of such system can be discharged to surface waters.

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Introduction

Wastewater is not just sewage. All the water used in the home that goes down the drains or into the sewage collection system is wastewater. This includes water from baths, showers, sinks, dishwashers, washing machines, and toilets. Small businesses and industries often contribute large amounts of wastewater to sewage collection systems; others operate their own wastewater treatment systems. In combined municipal sewage systems, water from storm drains is also added to the municipal wastewater stream. Wastewater is about 99 percent water by weight and is generally referred to as influent as it enters the wastewater treatment facility. "Domestic wastewater" is wastewater that comes primarily from individuals, and does not generally include industrial or agricultural wastewater (Tchobanoglous*et al.*,2007). At wastewater treatment plants, this flow is treated before it is allowed to be returned to the environment, lakes, or streams. There are no holidays for wastewater treatment, and most plants operate 24 hours per day every day of the week. Wastewater treatment plants operate at a critical point of the water cycle, helping nature defend water from excessive pollution. Most treatment plants have primary treatment (physical removal of floatable and settle able solids) and secondary treatment (Mackenzie, 2010). Municipal wastewater is characterized by its physical attributes as well as its organic and inorganic contaminants. Physical attributes include colour, odour, and turbidity caused by dissolved or suspended solids. Organic contaminants include dissolved or undissolved VOCs which include phenols, chlorobenzene, hydrocarbons and dissolved or undissolved non-volatile organic compounds designated as biological oxygen demand (BOD), chemical oxygen demand (COD), and total organic carbon (TOC) such as carbohydrates, fats, starches etc., Inorganic pollutants may include compounds of trace minerals, sulphides, chlorides, nitrogen and phosphorous(Stenzel, 1993).

Wastewater refers to water used by human due to lose its quality and unusable, which include waste liquid of domestic resources, industrial, agricultural and commercial. Wastewater treatment systems are composed of unit operations in consideration of the wastewater properties, effluent quality level, cost performance, on-site environmental conditions, and the environment policy of the business. The conceptual relation between the treatment technologies and the treatment requirements in food processing factories are Wastewater treatment technologies either remove suspended particles and dissolved substances from water, or convert them into harmless and stabilized materials (Ekhaise and Omavwoya, 2008).Prakash (2008) studied the chemical and biological treatment of chrome liquor. Based on the study, he concluded that the proper balance of alkalinity and BOD can increase the treatment efficiency. The maximum BOD reduction was obtained at an organic load of 0.80 kg BOD/m3/day. Arumugam (1976) has reported on the recovery of chromium from spent chrome tan liquor by chemical precipitation using lime. Pathe (2005) has studied the properties of chromium sludge from chrome tan liquor and related the sludge volume, sludge settling rate, surface loading rate. Majlesinasr (2008) showed that measured BOD5, CODand TSS in the effluent were113, 188 and 99 mg/L respectively.Mesdaghinia*et al.*(2009) showed thatEfficiency of the wastewater treatment plants was not appropriate Results of this study were confirmed by mentioned studies. Sarafraz (2006) showed that measured BOD5, CODand TSS in the effluent were 12.53, 51.7 and 19.68 mg/L, respectively, when the wastewater treatment plant was worked properly.

Mir Bagheri and *et al.* (2009) presented an article called "Evaluation of Biolac Method in Municipal Wastewater Treatment". With regard to the analysis, the efficiency of the system in HRT, cell and different concentration of the mixture of the aeration pool in the removal of BOD and COD were evaluated. Kinetic coefficients (ks, Y, Kd, and k) for concentration of 3500 and 4500 during the evaluation of the Biolac process were resulted.

Naemi and *et al.* (2011) presented an article named "Evaluation of Refinery System based on Biolac Method and Presentation of Utilization Olan on Basis of ATV Standard". Ammonia was among the parameters whose value and removal efficiency was higher and lower than the standard and determined amount, respectively. The average amount of removal rate for this pollutant was equal to %96 and the amount of this parameter in November reached to 7 mg/lit.

The primary balance system has been launched since 1993 along with 6 research projects. Its initial prototype included only several hundred staff then by later progresses its capacity of 900.000 was also designed and constructed. It encompasses about 700 sewage refineries of the world. Biolac is defined as a biological refinery system (secondary refinery) which designed for treatment of municipal and industrial wastewater; it is based on ground pool and activated sludge method along with reservoir for preservation of extra sludge.

The Biolac sewage refinery system operates on the basis of polyphase activated sludge refineries. Sedimentation and aeration process within a pool is done by divider baffles. The sludge amount of the system since of the long period of aeration is so less and does not require stabilization. The other specification of the system is the use of rotating cylindrical garbage collection system for controlling of hydraulic problems which are due to the load input peaks and whitewater. Among the factors which make the system more economical and efficient, we can refer to its structural construction, a special type of aeration and utilization.

The main feature of the system is floating chained aeration along with pendulum oscillator chains. Since its mechanical aspect induced oscillatory motions and tiny bubbles release, so we notice its high capability of synthesis and efficiency. With regard to the timer control of the chains (development of oxic and anoxic zones) and its pool form structure, the process can be directed toward the removal of nutrient elements (phosphorus and nitrogen).

In this research, we attempt to describe the structure, process, advantages and drawbacks of the Biolac method and study the method in terms of pollutants removal rate, its efficiency and influence of different factors on decreasing of the quality index of the sewage pollution, then the pollutants removal output results with regard to the Iran Environmental Organization Standards for bringing the sewage to the surface water will be analysed.

Materials and methods

The purification works at Manger provide both primary and secondary treatment processes. Primary treatment removes most of the solids from the effluent, but doesn't remove or degrade the dissolved organic matter. Secondary treatment uses microorganisms to convert these organics to simple compounds, and uses the energy of the sun to destroy pathogens2. The effluent is then safe to be discharged into the ManukauHarbour. The entire process is shown diagrammatically in (Fig. 1). The works have been designed to take advantage of the natural features of the site. Oxidation ponds provide very economical secondary treatment and these were chosen because a suitable area of harbor mudflats could be formed into ponds and because Auckland has the sunny climate necessary for the efficient working of the ponds. Conditions in the ponds promote the growth of unicellular algae: minute plants which, like any other plants, absorb carbon dioxide in daylight and give off oxygen by photosynthesis. This oxygen oxidase's the organics, thus purifying the sewage by reducing its oxygen demand.

Thetypical processes and removal methods are shown in Table 1 while the screened residues, Separated oil, sludge, etc. generated during wastewater treatment are partly used for livestock Feed, fertilizer, and other purposes, and they are primarily reduced in volume by dewatering, drying, or incineration for disposal as industrial waste (Eckkenfelder*et al.* 1965).

Table 1. Typical wastewater treatment processes and removal method.

Treatment methods	Removal mechanisms	Typical processes
Physical Treatment	Screening, Filtering, Difference of gravity, Thermo-energy, Electric energy, Reverse osmosis	Screen, Filtration, Settling, flotation, Evaporation, drying, Electrolysis, Reverse osmosis membrane
Chemical treatment	Oxidation reaction, Reduction reaction, Double decomposition	Oxidation, Reduction, Neutralization, coagulation
Physical chemical treatment	Phase boundary potential, Adsorption, Ion exchange, Electrochemical reaction, Super critical phase	Coagulation-settling, Coagulation-flotation, Activated carbon adsorption, Ion exchange resin and membrane, Electric Dialysis, Electrolysis, Super critical water oxidation
Biological treatment	Aerobic decomposition, Anaerobic decomposition, Anaerobic-aerobic reaction	Activated sludge process, Denitrification, Phosphorous removal, Anaerobic digestion process, Denitrification, Biological phosphorous removal

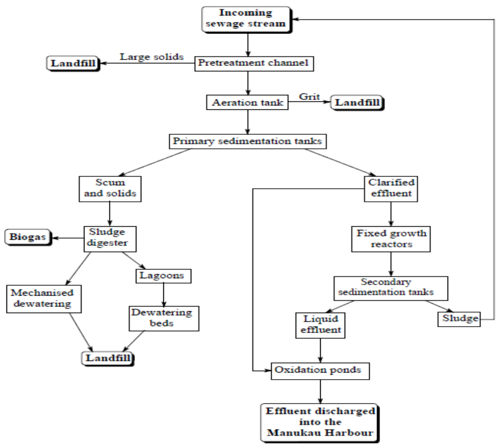

Fig. 1. Sewage treatment flow diagram.

The conceptual relation between the treatment technologies and the treatment requirements in food processing factories areschematically shown in Fig. 1. As shown clearly in the Fig., the major process used for treating wastewater is biological. In the pre-treatment stage, a screen is often used to remove floating materials such as labels and plastic sheets. A gravity oil separator is provided for oil containing wastewater generated by edible oil production. After the pre-treatment stage, normal level BOD is decomposed by an aerobic biological treatment, while high level BOD of several thousands to tens of thousands is diluted prior to treatment. In recent years this high level BOD wastewater tends to be treated, without dilution, by an anaerobic biological process in the pre-treatment stage, and then re-treated by an aerobic biological process. Introducing an anaerobic biological process benefits by reducing the load for the later stage aerobic biological process, converting organic materials in wastewater into fuel gas, downsizing the settling tank because of not using diluting water, and preventing sludge bulking. The BOD removal rate in the anaerobic biological process is normally between 80 and 90%. Then, the remaining BOD is removed by the aerobic biological process, which has a removal rate in the 95 to 99% range. When a factory is located in a sewer-serviced area, an aerobically pre-treated wastewater can be discharged directly to the sewer. When the factory's location is in a non-serviced area and the effluent quality is regulated strictly, then a tertiary treatment is required to reduce BOD, COD, and SS. In such cases, sand filtration, and coagulation-flocculation-sedimentation and activated carbon absorption are, singly or in combination, added for the tertiary treatment (Bryant and Wiseman, 2003).

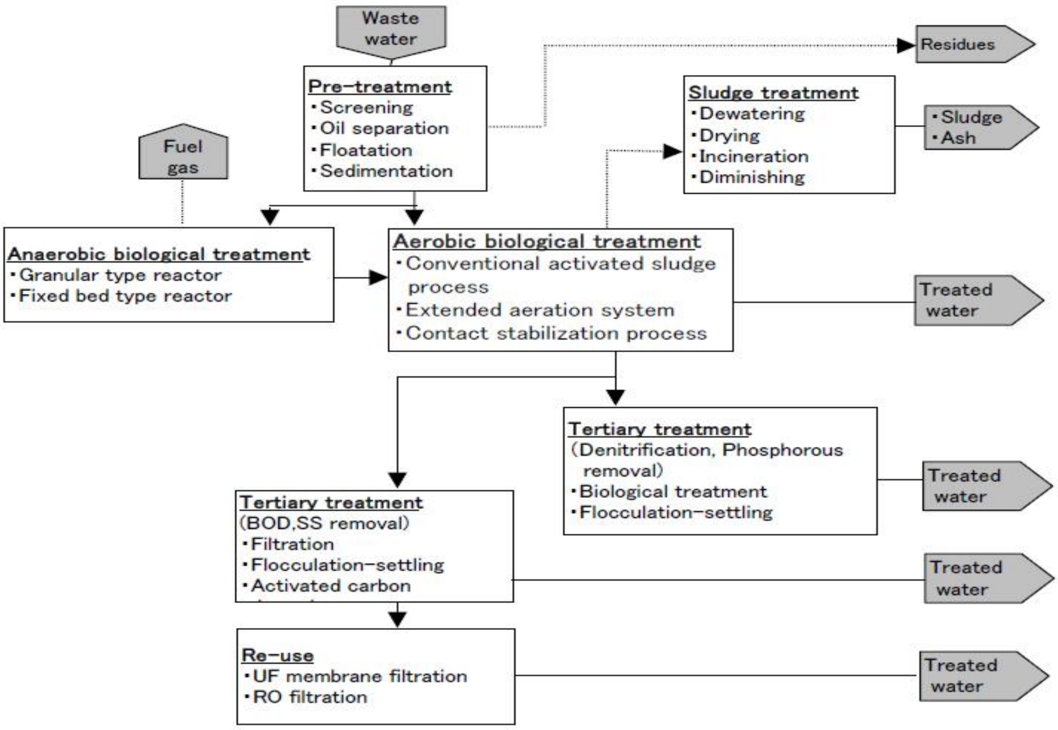

Fig. 2. Typical wastewater treatment system.

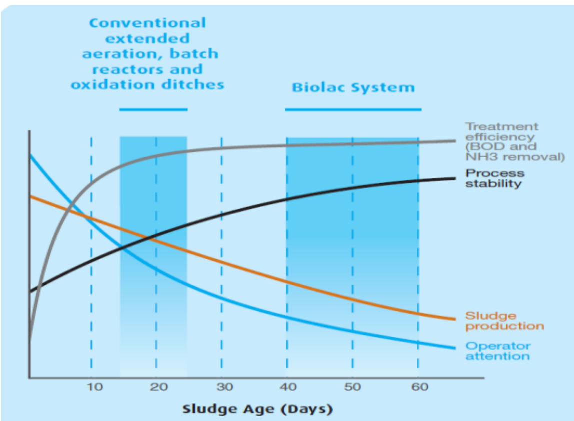

Fig. 3. Sludge Age.

The Biolac system is an innovative activated sludge process using extended retention of biological solids to create an extremely stable easily operated system. The capabilities of this unique technology far exceed ordinary extended aeration treatment. The Biolac process maximizes the Stability of the operating environment and provides high efficiency treatment. The design ensures the lowest cost construction and guarantees operational simplicity. The Biolac system utilizes a longer sludge age than other aerobic systems. Sludge age also known as Solids Retention Time (SRT) or Mean Cell Residence Time (MCRT), defines the operating characteristics of any aerobic biological treatment system. A longer sludge age dramatically lowers effluent BOD and ammonia levels especially on colder climates. The Biolac long sludge age process produces BOD levels of less than10 mg/L andcomplete nitrification (less than 1 mg/L ammonia). Minor modifications to the system will extend its capabilities to Denitrification and–biological Phosphorus removal. While most extended aeration systems reach their maximum mixing capability at sludge ages of approximately 15-25 days, the Biolac system efficiently and uniformly mixes the aeration volumes associated with a 30-70 day sludge age. The large quantity of biomass treats widely fluctuating loads with very few operational changes. Extreme sludge stability allows sludge wasting to non-aerated sludge ponds or basins and long Storage times.

Simple Process Control and Operation The control and operation of the Biolac process are similar to that of conventional extended aeration. Additional controls required for Denitrification, phosphorus removal, dissolved oxygen control and SCADA communications are also easily implemented. Aeration System Components The ability to mix large basin volumes using minimal energy is a function of the unique BioFlex moving aeration chains and the attached BioFuser fine bubble diffuser assemblies. The gentle, controlled, back and forth motion of the chains and diffusers distributes the oxygen transfer and mixing energy evenly throughout the basin area. No additional airflow is required to maintain mixing. Stationary fine bubble aeration systems require 8-10 cubic feet per minute (CFM) of air per 1000 cu. ft. of aeration basin volume. The Biolac system maintains the required mixing of the activated sludge and suspension of the solids at only 4 CFM per 1000 cu.ft. Of aeration basin volume. Mixing of a Biolac basin typically requires 35-50 percent of the energy of the design oxygen requirement. Therefore, air delivery to the basin can be reduced during periods of low loading while maintaining effective food to biomass contact and without the risk of solids settling out of the wastewater.

System Construction

A major advantage of the Biolac system is its low installed cost. Most systems require costly in-ground concrete basins for the activated sludge portion of the process. A Biolac system can be installed in earthen basins, either lined or unlined. The–BioFuser fine bubble diffusers require no mounting to basin floors or associated anchors and leveling. These diffusers are suspended from the BioFlex floating aeration chains; The only concrete structural work required is for the simple internal clarifier(s) and blower/control buildings. Biological Nutrient Removal Simple control of the air distribution to the BioFlex chains creates moving waves of oxic and anoxic zones within the basin. This repeated cycling of environments nitrifies and denitrifies the wastewater without recycled pumping of mixed liquor or additional external basins. This mode of Biolac operation is known as the Wave Oxidation process. No additional in-basin equipment is required and simple timer-operated actuator valves regulate manipulation of the air distribution. Biological phosphorus removal can also be accomplished by incorporating an anaerobic zone. Biological phosphorus removal can also be accomplished by incorporating an anaerobic zone or Bio-P zone. With the Bio-P zone, phosphorus levels of <2 mg/L are standard. The Biolac Wastewater Treatment System is an activated sludge process utilizing a longer sludge age that reduces BOD to <10 mg/L and produces complete nitrification. The system is extremely stable and able to treat widely fluctuating loads with few operating changes. Fine bubble diffuser assemblies are suspended above the basin floor by the BioFlex moving aeration chains. The motion of the chains and diffusers distributes the oxygen transfer and mixing energy evenly throughout the basin. Depending on customer preference and budget considerations, Biolac systems can be installed in concrete basins or lined earthen basins.

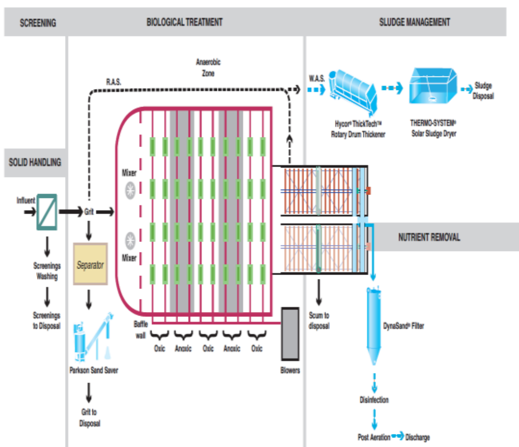

Fig. 4. Biolac System Operating in Wave Oxidation Mode.

Wastewater treatment plant of Urmia is constructed vicinity to Reyhan Abad village in the approximate altitude (1330 m) from sea level. The average annual rainfall height in the city of Urmia is (370 mm), minimum temperature (-22° C) and the absolute maximum (38.4°C), minimum monthly average (-3.6° C), the maximum monthly average (31.31 ° C) and the average daily minimum (-2° C) and maximum (24°

C). Its Area is (135 ha). Wastewater treatment plant is in five equal modules, each with a capacity of two hundred thousand people (200,000 people) and the population covered by the plant for the horizon year (1400) has predicted one million people. The amount of daily waste with acceleration is (0.575 square feet safely), the average daily wastewater without acceleration is equal to (4000 m) and a maximum of moment wastewater is 83,160 cubic meters and about 0.962 meters per second. BOD the effluent slop of this system is below 10 mg per liter, while in the other processes, BOD output is between 50 to 30 milligrams per liter. The length of sewage transmission lines is 51.5 km. Inlet pipe diameter is 1200 mm, length of input channels sewer is 5 m, sewer inlet channel width 2.5 m, there are two integrated Biolac poolin two modules with the same conditions, the length of the Bio Locke pool for each module is 120 mm, the width of Bio Locke pool for each module is 50 meters, the height (depth) of Bio Locke pool for each module is 4 m, the number of Fine screens is 6 with similar performance, the maximum capacity of fine screen is 170 liters per second, the number of pond sludge drying is 14, length of sludge drying pond is 140 meters, sludge drying ponds width is 22 m, height (depth) of sludge drying pond is 4 meters.

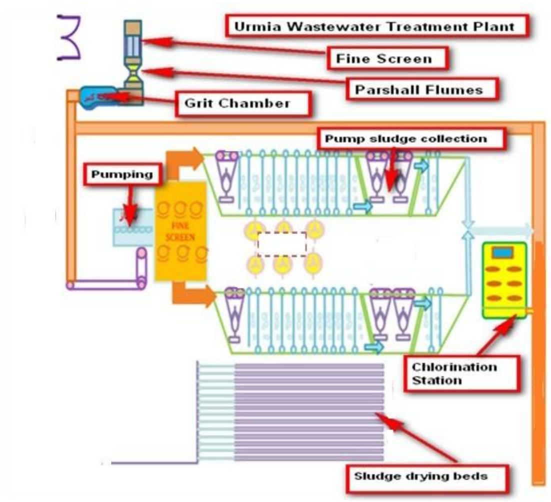

Fig.5. Schematic picture of wastewater treatment of Urmia city.

Results

The statistics of estimating the prospective population of Urmia in 2031 is equal to 1000.000 and about %5 of this population is considered for non-covered conditions of sewage refineries. For every person, the amount of output sewage is equal to 198 Lit per a second in 2006 according to the PBO (parliamentary Budget Officer) standards. Since of consuming increase, from 1 percent upon the output sewage amount is added for coming years , but with regard to the designation condition of the 2031 about %1.05 extra amount (for non-water leakage condition) is considered. The amount of leakage per a cubic meter of the length of the network is equal to 23 cubic meters per a day for every cubic meter. By summing up of these values, the total average value of the generated sewage in 2016 will be equal to 0.883 cubic meters per a second and in 2031 it is estimated to be equal to 2.529 cubic meters per a second.

Table 2 illustrates the amount of current population and perspective population. To predict the future of city's population comprehensive and detailed plans are used. Numerous items such as population growth trend in previous years, civil and industrial programs considered for future, immigration possibility (receive or repel) and current population and its change, has effects.Also, Table 2 shows the amount of leakage, average sewage and total average sewage. The average daily total usage during a year for a person of city's population is called average usage per capita.Screening equipment is located in the start of physical treatment (mechanical). Type, combination and the amount of rubbish is related to incoming sewage's combination, network pipes' steep, the vastness of covered zone and special conditions of the area. Based on internal standard of Iran, the speed between rods in mechanical cleaners is 0.6 to 1 m/s, rod's width is 8-10 mm, depth of rods is 50-75 mm, the open space between rods 10-50 mm, steep of rods to horizon 75-85 degree, and allowed height drop is 150 mm.

Table 2. Technical specifications of a wastewater refinery of Urmia city (Mohammadi 2013).

Year	2006	2016	2021	2031
Population of city (people)	580000	707,000	780,000	1,000,000
Population covered (people)	350,000	650,000	650,000	950,000
Sewage with no leakage water (person liter per days)	198	203	203	210
Leakage water (cubic meters per day)	23	23	23	23
Average wastewater (Lit/day)	218	223	228	256
The average of total produced wastewater (Lit/Sec)	883	1678	1955	2529

Table 3 demonstrates the hydraulic dimensions of screening facility. The results from design, in table 3, shows that the results of design of consistent by Iranian standard.Allowed design depth is between 2-5 meters, length 50-75 meters, width to depth ratio 1:1-1:5, length to width 1:2.5-1:5, surface load 0.6 to 0.8 m/s, stay time at maximum discharge is 2-5 minutes.

Table 3. Hydraulic dimensions of dirt stuck in wastewater treatment Urmia (Ghomi 2013).

Hydraulic dimensions	Executive (m)
Channel width of screen	1.54
Open space between bars in screen channel	0.020
Height (depth) in channel of screen	2.8
Bar installation angle relative to horizon level	75

Table 4 shows the hydraulic dimensions of grit chamber.BIOLAC sewage treatment system acts based on multi-stage active sludge. Sedimentation and aeration process in a pool is done by separating baffles. System's sludge, due to long aeration, is low and needs no stabilization. BIOLAC pool in Urmia sewage treatment facility is built united with polyethylene separators.

Table 4. Hydraulic dimensions of seeds screen channel in wastewater refinery of Urmia.

Hydraulic aspects	Executive (m)
Channel length of grain screen	15
channel width of grain screen	3.2
useful depth with free height	3

Table 5 illustrates the properties of BIOLAC pool."Rotating tubular screening" system is used to control hydraulic difficulties made by influx picks and foam.

Table 5. BIOLAC hydraulic characteristics of wastewater in the pond Executive Branch.

The number of pool BIOLAC	2 integrated pool in two modules with the same condition
Length of BIOLAC pool for each module	120 m
Width of BIOLAC pool for each module	50 m
Height (depth) of BIOLAC pool for each module	4 m

Table 6 shows properties of fine screen.Sludge dryer ponds are consisted of graded gravel and sand in bottom, rubble and then oval sand and on them a layer of pebble gravel, graded from coarse to fine.The sewage is distributed in 30 cm thickness and its water is drained from bottom and is transferred to pumping station and is turned back to entering sewage (dispenser pond) because this water is extremely polluted.

Table 6. Executive specifications of fine screen in wastewater refinery of Urmia city.

The number of fine screen devices	6 devices with similar performance
Maximum capacity of fine screen devices	170 liters per second

Table 7 shows sludge dryer ponds properties.

Table 7. Executive specifications of sludge drying ponds in wastewater refinery of Urmia city.

The number of sludge dryer pond	14 Pond
The length of sludge dryer pond	140 m
The width of sludge dryer pond	22 m
The height (depth) of sludge dryer pond	4 m

Table 8 demonstrates the properties of entrance tubes to sewage treatment.

Table 8. Executive hydraulic characteristics of inlet channel of sewage refinery of Urmia.

Diameter of the inlet pipe	1200 mm, which enters the common manhole
Channel length of sewer entry	5 m
Sewage inlet channel width	2.5 m
The slope drain inlet channel	Two in thousand (2:1000) using reinforced concrete

Table 9 shows experiment and its parameters. Runoff water is permanent or running water, natural or artificial lakes and lagoon. Absorb well is a shaft or hole with absorbability characteristics and its bottom is at least at 3 meter distance of water head. Sewage discharge should be done based on standards which are expressed in terms of pollution density and meeting these standards under authority of department of environment.Pollution density measuring and sewage flow amount should be done right after treatment unit in treatment facility and before entering to environment. Sludge and other solid materials conceived in sewage treatment facilities should be treated properly and the final disposing of these materials shouldn't be a harm on environment. The color and blurriness of exiting sewage should not affect the hosting waters in the area.

Table 9. Examined parameters and test methods (EPA Standard Methods 2006).

Parameters	Test method	Resources necessary
PH	Device PH Me ter	Device Catalog PH Meter
Temperature (° C)	Thermometer	Standard methods (testing site)
COD (Milligra ms per liter)	OPEN	Standard Method
BOD5 (Milligr ams per liter)	Winkler	Device Catalog
TSS (Milligra ms per liter)	Gravimetric	Standard Method
Nitrite - Nitrate (mg)	Spectrophoto meter - Brvsn	Catalogue of the measuring device
Phosphorus (mg)	Spectrophoto metric	Standard Method

Table 10 shows the standards of exiting sewage to runoff waters.

Table 10. Standard of EPA Iran.

No.	Polluting substances	Discharge to surface waters. (Mg / lit)	Discharge to absorbent wells (Mg / lit)	The Farm (Mg / lit)
1	Total suspended solids (TSS)	40 (minute 60)	-	100
2	Ammonium times (NH_4)	2.5	1	-
3	Nitrite by (NO_2)	10	10	-
4	Nitrate by (NO_3)	50	10	-
5	Phosphate by phosphorus	6	6	-
6	BOD_5	30 (minute 50)	30 (minute 50)	100
7	COD	60 (spot 100)	60 (spot 100)	200

Table 11. Typical concentrations of organics in untreated domestic wastewater (Gary *et al.*2011).

Constituents	Unit	Typical Concentration		
		Low	Medium	High
BOD (biochemical oxygen demand)	mg/L	110	190	350
COD (chemical oxygen demand)	mg/L	250	430	800
TOC (total organic carbon)	mg/L	80	140	260
O&G (oil and grease)	mg/L	50	90	100

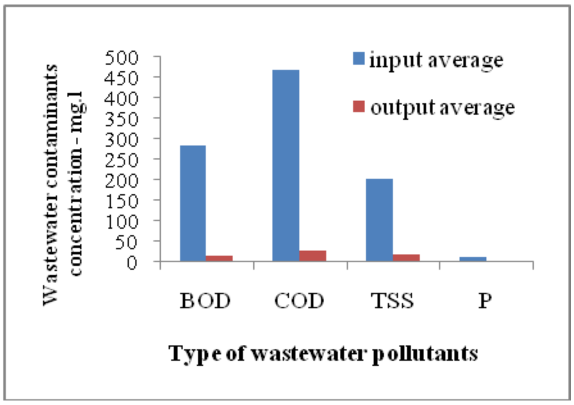

Fig. 6. Average input and output results Wastewater Treatment Plant Urmia 2010.

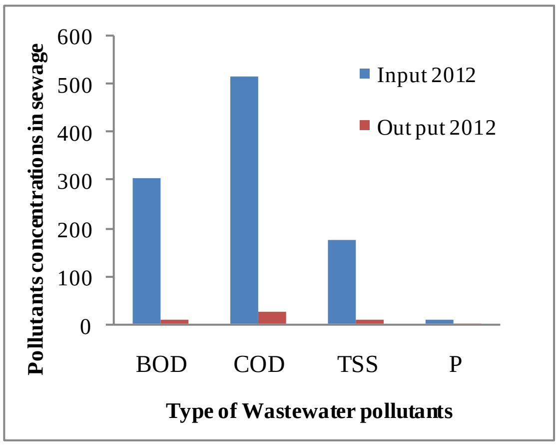

Fig. 7. Average input and output results Wastewater Treatment Plant Urmia 2012.

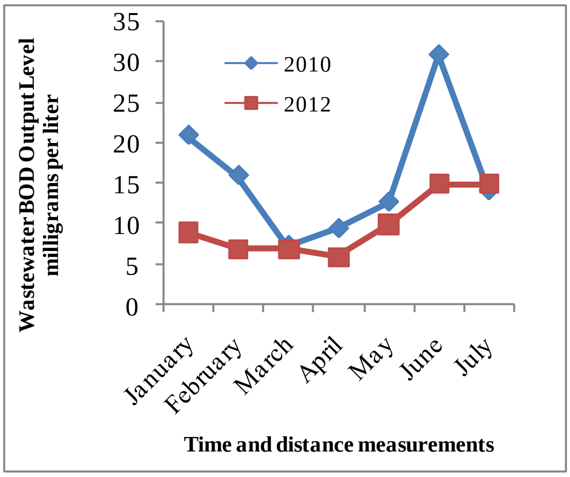

Fig. 8. Performance Evaluation of BOD output in 2010 and 2012 (measured in mg/lit).

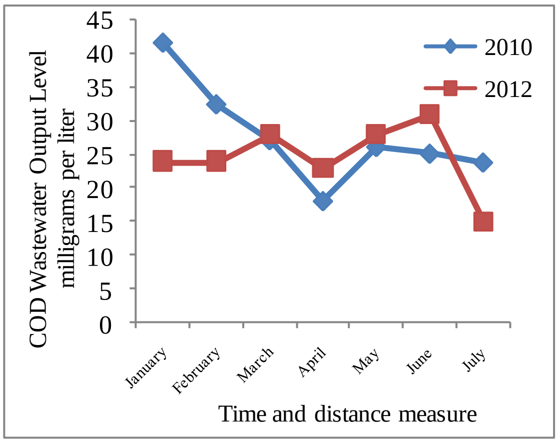

Fig.9. Output COD performance evaluation in 2010 and 2012 (measured in mg/lit).

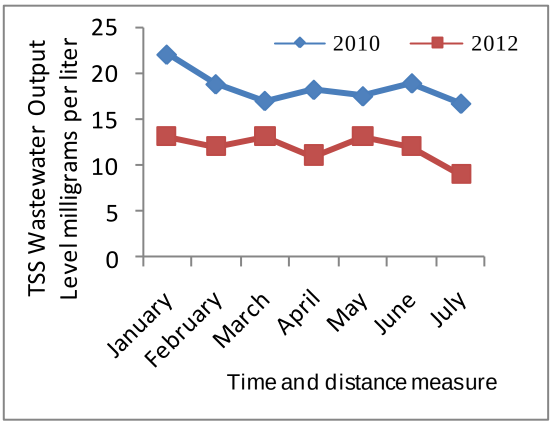

Fig.10. Output TSS performance evaluation in 2010 and 2012 (measured in mg/lit).

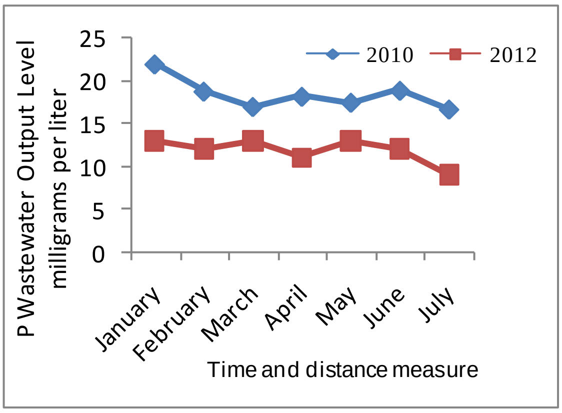

Fig.11. P performance evaluation of output in 2010 and 2012 (measured in mg/lit).

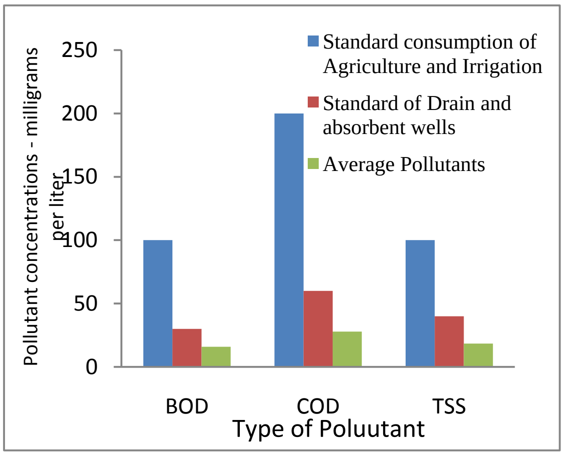

Fig.12. Comparison of pollutant concentrations in the effluent standards of environmental issues in 2010.

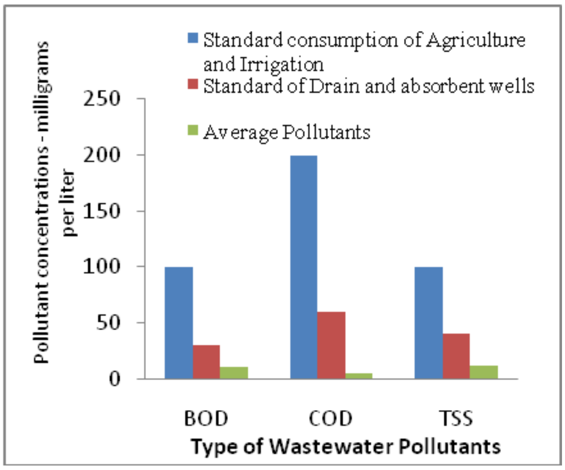

Fig.13. Comparison of pollutant concentrations in the effluent standards of environmental issues.

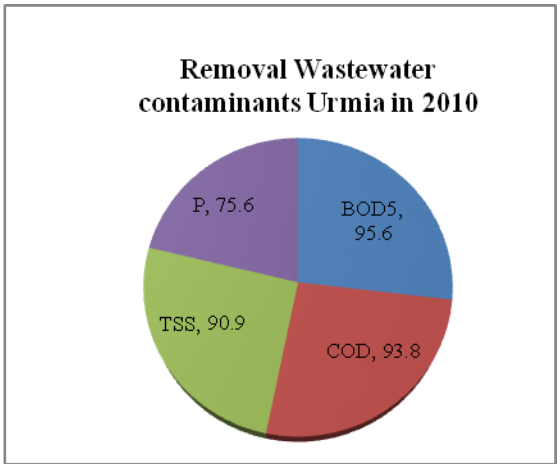

Fig.14. Removal Wastewater contaminants Urmia in 2010.

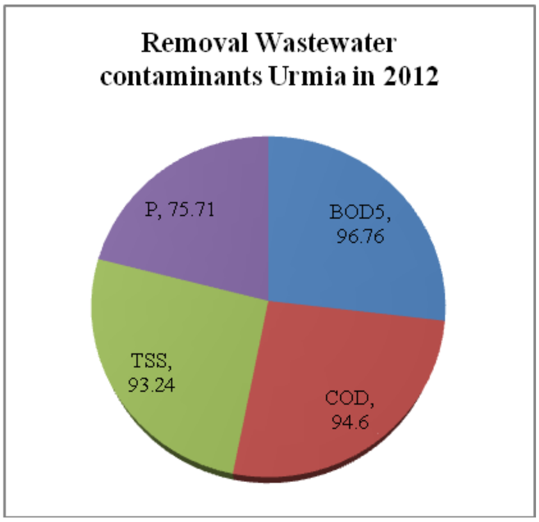

Fig.15. Removal Wastewater contaminants Urmia in 2012.

Discussion

Wastewater treatment systems are designed to remove oxygen-demanding substances (as measured by five-day biochemical oxygen demand, BOD_5, or BOD) and solid particles (measured as total suspended solids, or TSS). Chemical oxygen demand (COD) is a measure of all oxygen-demanding substances, including those not amenable to biological treatment, and these, too, are reduced through wastewater treatment. No reasonably constant relationship exists between COD and BOD values for either untreated or treated kraft (Sulfate) wastewaters (Bryant and Wiseman 2003). Wastewater may also contain toxic and nonconventional pollutants such as chlorinated organic compounds. Industrial and municipal wastewater discharges, as well as storm water runoff associated with urban, industrial, agricultural, contribute oxygen-demanding substances (measured as BOD) to receiving streams and can diminish dissolved oxygen levels. Suspended matter discharges (measured as TSS) may also be implicated in the depletion of DO, as well as other adverse aquatic impacts. Suspended matter, if settle able, can blanket the stream bed, damage invertebrate populations, block gravel spawning beds and, if organic, remove dissolved oxygen from the overlying water column. Suspended matter that does not settle may obstruct transmission of light into the water column, impairing aesthetics, as well as diminishing photosynthetic activity and the abundance of food available to fish and aquatic life.

By analysing the data and drawing comparable charts and graphs of pollution parameters, the factors affecting the performance of the related plant are investigated and proposed solutions to solve the problems and improving the efficiency of removal pollution are provided.Jafarpour and Taherian(2013) examined reliability of BIOLAC system of Urmia sewage treatment system. In that study, investigation and efficiency of the system to vanish BOD, COD, TSS, TP and NH3-N pollutions through some examinations during a one-year period from May, 2010 to January,2011 is done. Later, the reliability of this system by using COR coefficient through presented formulas and effective factors to reduce or induce this coefficient, is discussed. Coefficient of Variation (CV) related to each series of experimental data is conceived and related to the calculated COR. The results show 95% decrease in BOD with a density less than 18 mg/lit, 93% COD with a density less than 32 mg/lit, 92% TSS with a density less than 20 mg/lit, 71% TP with density lesser than 2.8 mg/lit.

Ammoniac is the only parameter which its exiting amount is higher than standard and with 85 % NH3-N the average exiting amount density is estimated around 6.4 mg/lit. In accordance to reliability concept, by increase in CV, lesser amounts are resulted for COR, which expresses a lower density of pollutants in exiting wastewater and meeting the required standards. The results from investigations in sewage treatment system of Urmia showed that the current process with a reliability of 99% has a high efficiency in pollutant reduction.

Naiemi *et al.* (2011), first, by studying about this system, the results of conducted experiments in a 6 month period of summer and fall of 2010 is analysed and the performance of the system on reduction of BOD, COD, TSS, P and N is assessed. For BOD pollutants the average reduction was more than 96%, and the exiting amount was always less than 20 mg/lit. About COD pollutant the reduction amount was always more than 93% and the exiting amount was always less than 30 mg/li. The average reduction for TSS was 93% and the exiting amount was always less than 13 mg/lit. About P parameter the average reduction was 72% and the exiting amount was less than 3 mg/lit. The only parameter which its efficiency was less than the proposed amount and the exiting amount was higher than the standard range was Ammoniac. The average reduction for this pollutant was 86% and the amount in exiting wastewater for October reached 7 mg/lit.(the maximum allowed amount based on Iranian standard and guaranteed by producer company is 2 mg/lit). later on the study, the performance of the system in February, according to the corruption in sludge disposal system, is assessed and the reasons of appearance of problems are presented.

Summery

❖ Filtering pollutants in reciprocating aeration method has better performance than fixed status.

❖ Proper efficiency to remove contaminants and standardization of different parts of the plant hydraulically and full compliance with the standards of Iran.

❖ According to the increasing population and the entrance of the plant, there is no specific matter about population prediction. So the project on the horizon is desirable.

❖ Integrated system design and implementation of an integrated system that will reduce the economic costs. Integrated systems also make it possible for the operator to provide optimal surveillance.

❖ Implementation of the pool and rectangular BIOLAC integrated, operational issues arising from the secondary settling tank reduces circular.

❖ Number of BIOLAC pool was very convenient and efficient connections to other components are assessed together very well.

❖ The result of contaminants in the input and output between the years 2010 to 2012 clearly demonstrates the increasing removal is pollutants. Also according to the environmental standards of waste water discharge into surface water has the ability to output.

❖ Increase the skills and knowledge to optimize the operators of wastewater treatment system is one of the main indicators of the efficiency improvement contaminants have been removed. Also, an accurate and efficient monitoring of the different parts and replacement parts obsolete and outdated, are also the major factors.

❖ The BIOLAC process according to high efficiency and fewer costs in comparison with the other approaches common in activated mud, also improving of airing and optimization of placing the airing diffusers and using the pendulum causes more efficiency in comparison with the other approaches.

❖ BIOLAC process takes up less space than other common methods that employers BIOLAC this makes up the remaining space to easily assign phases other prospects on the horizon.

❖ Wastewater generated by commercial, industrial and institutional facilities is typically referred to as “high-strength” compared to typical household wastewater

Suggestions

❖ All the design elements is use of empirical approaches to other countries and no design value is reassessed in the area. It is proposed to be designed to determine the coefficients in this country compared to other countries, practical design values can be obtained.

❖ Using precision measuring input and output water quality in different types of wastewater treatment systems.

❖ Evaluation of climate and environment, the efficiency of wastewater treatment.

❖ The effect of each of the sewage treatment plants reduces pollutants in wastewater.

❖ Different regionalization of water and wastewater based on quality and offer early treatment (treatment operations) before entering the wastewater treatment plant.

❖ Optimization methods for wastewater treatment in communities large and small, based on the economic value of the Value Engineering Approach

❖ Information and Culture of wastewater treatment techniques in the consumer society.

References

Arumugam V. 1976. Recovery of chromium from spent chrome tan liquor by chemical precipitation. Indian Journal of EnvironmentalHealth.18, 47.

Bryant C, Wiseman C. 2003. Efforts to predict BOD for process control. In Proceedings.Tappi International Environment Conference.

Eckkenfelder W, Acevedo D, Babu S. 1965. Biological wastewater Treatmentplant .translated by Iwai . p 68 Korona.

Ekhaise F, Omavwoya B. 2008. Influence of Hospital Wastewater Discharged from University of Benin Teaching Hospital (UBTH). Benin City on its Receiving Environment. American-Eurasian Journal of Agriculture and Environmental Science. **4(4),** 484-488.

Gary W, VanLoon S, Stephen J, Duffy M. 2012. Environmental Chemistry: A global perspective. Oxford Publisher.University Press. USA.

Ghomi MR. 2013. Environmental Report for Wastewater Treatment.Bazab Consulting Engineers. Urmia. Iran

Jafarpour M, Mehdipour AR, Nasehi A. 2013. reliability analysis of BIOLAC system in sewage treatment facility of Urmia city, third conference on programming and managing environment. Tehran .Iran.

Mackenzie D. 2010. Water and Wastewater Engineering.McGraw-HillPub.

MajlesiNasr M, YazdanbakhshA. 2008. Study waste sludge using hypochlorite and chlorine on wastewater treatment systems in hospitals of Iran. Journal ofEnvirontal Health Science Engineering. **5(3),** 211-2115.

Mesdaghinia A, Khalegi A, Yazdankhah B. 2009. Wastewater Characteristics and Appropriate Method for Wastewater Management in the Hospitals. Iranian Journal ofWater and wastewater engineering .**38 (1),** 34-40.

Mir Bagheri A, Bazar R, Fathi M, Mosavi A. 2009. Evaluation of the Biolac Method in Municipal Wastewater Treatment. 2nd International Symposium of Environmental Engineering .Iran.

Mohammadi R, Rahimzade MH. 2013. Environmental Report for Wastewater Treatment Plant. Shafab Consulting Engineers.Urmia.Iran

Naeimi H, Mehrdadi N, Shahabi M. 2011. Evaluation of Refinery System based on Biolac Method and Presentation of Utilization Olan on Basis of ATV Standard (case study: Urmia Sewage Refinery Facility). 5th International Conference on Environmental Engineering. Tehran.Iran

Pathe P. 2005. Properties of chromium sludge chrome tan wastewater. Indian Journal ofEnvironmentalProtection.**15(2),** 81-87.

Prakash NB. 2008. Bio-chemical treatment of tannery wastewater.Indian Journal of Environmental Protection.***22*,** 486-488

Sarafraz S, Khani MM, Yaghmaeian K. 2007. Quality and quantity survey of hospital wastewatersinHormozgan province. Iranian Journal of Environmental HealthScience Engineering. **4(1),** 43-50.

Standard Methods for the Examination of Water and Wastewater. 2006. Iranian Public Health Association, Tehran,Iran

Stenzel MH. 1993. Removal of Organics by activated carbon adsorption.Chemical Engineering Progress. **89 (4),** 36-43.

Tchobanoglous G, Franklin L, Burton H, Stensel D. 2007. Wastewater Engineering: Treatment and Reuse. McGraw-Hill Science. Engineering. Math - 2002-03-26