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ARTICLE

Analysis of Gray Water Recycling by Reuse of Industrial Waste Water for Agricultural and Irrigation Purposes

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ABSTRACT

Isfahan industrial province with its numerous industrial estates in its area and consequently the amount of wastewater produced by these settlements is very difficult to deal with. Therefore, the need for proper wastewater treatment and efficient management of industrial waste water from the industrial estates of this province should be seriously addressed and followed up by the authorities. The purpose of this study is the feasibility of reuse of wastewater from industrial settlements for agricultural and irrigation purposes. The present study is a descriptive cross-sectional study. In this study, the average values obtained from the sampling and the results of the experiments on waste water from the industrial waste water treatment plant in Isfahan, 2017, have been used. Average values of BOD5, COD, TSS and so on were compared with the standards set by the Environmental Protection Agency and analyzed in Excel software. According to the results, the average values of COD, BOD5, TSS, SO4, pH and catalyst quality parameters were determined from wastewater effluents of 315,162,93,164 (mg / L), 8.3 and 32.5 (NTU) respectively. The results of the study show that the average values of the quality parameters examined from the effluent of the treatment plant other than BOD5 and COD are within the standard range and the limit for agricultural and irrigation purposes, which may lead to undesirable environmental performance of these two parameters.

1. Introduction

Today, with the growth of urban populations, followed by rising levels of public health and awareness, water use has increased. High water consumption will increase the amount of sewage [1,2]. The release of raw sewage in nature is polluting the environment and has a bad impact on the quality of surface and underground flows. Sewage treatment, while preserving the environment, makes use of sewage and extraction and recycling of used water [3,4].

Irresponsible behaviors and the discharge of raw sewage into the environment have many health and environmental hazards. However, despite the adoption of various

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laws on the need for wastewater treatment and then its release into the environment, the use of raw or very refined wastewater in developing countries has a growing trend, which itself is known to have a level the bottom line is the environmental perception of these countries [5,6].

Raw wastewater contains many pathogens, before reuse, it should be used with appropriate filtration technology and used in different sectors. Therefore, for the sake of human health and the environment, when reusing wastewater, standards and guidelines are established by the World Health Organization, the United States Environmental Protection Agency, the Iranian Environmental Protection Agency, the European Union and so on [7,8].

Unfortunately, a favorable view and lack of attention to wastewater quality parameters on release or use of them in various uses without considering and taking into account the harmful consequences of this use

Many problems, such as pollution of water and soil, will lead to the spread of some diseases [9,10].

The wastewater often contains various compounds of rare elements, heavy metals and microorganisms that have limited use of them in different parts. Nevertheless, it can be used in different sectors depending on the type of wastewater and its constituents [11,12]. Consumption as an unconventional source of water for application in the agricultural sector requires special management, while benefiting from it there are no environmental and health hazards [6].

The need for environmental protection is the unquestionable principle that has been universally accepted in the world today, and this necessity has become more important as industrial and technological growth and subsequent emergence of contamination. The uneven growth of the country's industries in recent years and the continuation of the current process affect the ecosystems. Thus, a multidimensional look and prevention of economic activity based on the absolute exploitation of nature, and the directing of industrial activities a type that has the least harm to the environment [13,14]. But control and pollution control policies can be effective if factories and companies implement these policies in their own plans.

Therefore, in this research, it is tried to investigate the possibility of reuse of waste water from Isfahan industrial town for agricultural and irrigation purposes in order to see the least harmful environmental and health effects in order to optimize the use of this abnormal water source. So far, many studies have been conducted in the country for the reuse of wastewater, and some of them are mentioned. Gu et al., 2016 studied the efficiency of an industrial wastewater treatment plant. The results showed that, with the exception of cases where organic or hydraulic load has entered the refinery, most of the existing parameters are moderate in the acceptable range and the waste water can be used for agricultural and green areas [15].

In another study, the performance of the refinery of industrial estate was studied. The results showed that the numbers were from the proposed range of the environmental protection organization for discharge into surface water and absorbent wells, and the only option for wastewater disposal, use in agriculture And irrigation [16].

Alderson and his colleague investigated the qualitative conditions of an Industrial City wastewater treatment plant for reuse of waste water for agricultural and irrigation purposes. Based on the results obtained from this study, a number of parameters were greater than the limit and required more refinement [17].

Reznik and his colleague studied the reuse of Israel industrial city No. 2 waste water. The results of this study showed that the output of this system has a good consistency with environmental standards and standards for entering agricultural land, so they suggested that for irrigating agricultural land around and also irrigation of the green space of the town [18].

2. Materials and Methods

This study is a descriptive cross sectional study in which the possibility of reuse of waste water from Isfahan industrial town has been investigated for agricultural and irrigation purposes according to a number of qualitative index parameters. In this study, the values obtained from sampling results And daily, weekly, monthly and, of course, irregular daily, tests have been used on waste water effluent treatment plant in 2012. Sampling and testing were carried out in accordance with the standard methods presented in the standard book of the Water and Wastewater Testing [11] in order to validate the results. Then, the average values of parameters as descriptive statistics of this research were compared with the standard of wastewater use in agricultural and irrigation sectors and analyzed in Excel software. The experiments were carried out using digital devices and in the laboratory of the industrial city. In this study, the following methods and tools were used to measure the measured parameters such as BOD5, COD and ...

COD measurement of samples with vials using the COD model (AQUA LYTIC).

(1) Measurement of BOD samples was performed using the BOD meter digital meter model (AQUA LYTIC). A device that measures BOD samples with a precision of 0-400 mg / l.

(2) To measure the pH of the samples, an electrometric method was used and the AQUA LYTIC pH meter was used.

(3) Measuring the sulfate of the samples by colorimetric method using the PC MULTI DIRET model, which is used in the range of 5 to 100 mg / l.

(4) Turbidity measurement using nephlemetry or sub-

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traction method. In order to measure the turbidity of the AQUA LYTIC model, a range of applications ranged from 0 to 1000, the results were reported in terms of NTU units.

(5) The TSS has been measured by gravimetric or gravimetric method using filter paper.

3. Results

COD parameter: Based on available data and study on effluent effluent of the treatment plant at the relevant time interval, the mean value of the COD of the effluent was 3612.3 mg / L. In Figure. 1, diagrams and trends

The changes in wastewater COD from the wastewater treatment plant are also characterized by the average amount and standard limit of wastewater consumption in agriculture and irrigation.

Parameter BOD5: The average amount of BOD5 from the wastewater treatment plant was calculated at a rate of 160 mg / l. In Figure. 2, the graphs and trends of BOD5 changes in effluent from the wastewater treatment plant of the settlement are also indicated by the average amount and standard limit of wastewater consumption in the agricultural and irrigation sectors.

PH parameter: In the study on the effluent, the lowest and highest pH values are 7.5 and 8.2. Based on the present study, the average amount of wastewater effluent during the study period was 8.2.

Turbidity Parameter (in terms of NTU): The minimum measured opacity is 14 and the maximum is 80. According to available data, the average output turbidity (NTU) was determined to be 4/31.

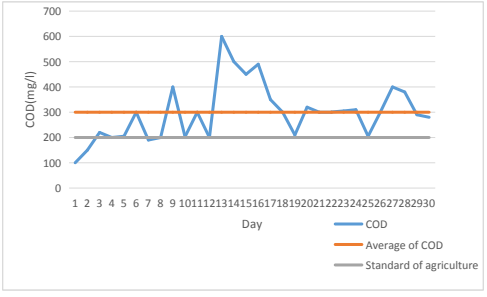

Figure 1. Changing of COD in the study area

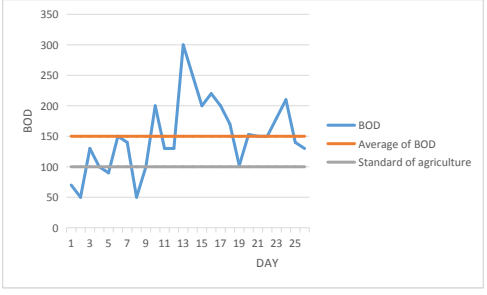

Figure 2. Changing of BOD in the study area

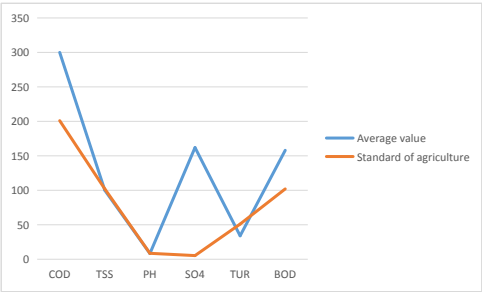

Figure 3. Comparison the parameters from gray water with standard value for agriculture

SO4 parameter: The average amount of data indicates that the effluent sulfate is 162.16 mg / l. The lowest amount of sulfate in the wastewater was measured at 108 and the highest was 215 mg / l.

TSS parameter: The present study showed that the average total amount of suspended solids (TSS) of the effluent at the relevant time interval was 92.25 mg / l. The highest rate for this parameter is 180 and the lowest is 36 mg / l.

4. Discussion and Conclusion

The occurrence of Iran in the dry and semi-arid region, followed by dehydration, the occurrence of successive droughts, and the drop in groundwater and groundwater have caused the issue of reuse of treated wastewater to be seriously raised. This is while the industrial cities of the country are often located in these areas. Industrial province of Isfahan with its numerous industrial estates in its area, followed by the volume of wastewater produced by these settlements, is severely affected by the problem of dehydration. Therefore, the need for proper treatment of sewage and efficient management of industrial effluents of this province should be seriously pursued and pursued.

In order to achieve optimal performance for the removal of various pollutants from industrial effluents, by the company's industrial towns, in order to achieve the objective of preventing the construction of a wastewater treatment plant by any of the industries based in the city, various studies have been carried out. Which eventually led to the construction and commissioning of the central refinery of the town. So the wastewater is directed to the central refinery of the town and is refined.

At present, in 2012, there are about 311 units in the industrial city of Isfahan, including food, textile, cellulosic, chemical, non-metallic, metal, electrical, and electronics and services, and are operating and operating in one of the largest active townships Iran has become.

The city's water supply resources are split from 3 wells within the city limits. On average, the total water con-

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sumption in this town is 2421 cubic meters per day. At the same time, an average of 1332 cubic meters of sewage is produced in the town due to the coefficient of water conversion into sewage.

At present, the city's central treatment plant with a daily capacity of 864 m 3 of sewage in the first phase of operation and the quality of the wastewater entering the wastewater treatment plant is equivalent to urban waste water. In accordance with the quantitative and qualitative characteristics of the city's sewage system, the system designed for the treatment plant is a combination of active agglomeration with sticky growth (IFAS) with an upstream upstream anaerobic reactor (UABR). The industrial waste water treatment system has 2 sections Aerobic and anaerobic. Sewage from the production units enters the system and in the anaerobic section a large part of the treatment works and after becoming a wastewater in the irrigation of the green space of the city is used. However, for the reuse of refined wastewater, it should be noted that the quality characteristics of wastewater comply with the standards of the Iranian environmental organization to prevent the negative environmental and health consequences.

Based on available data and study on effluent effluent of the studied treatment plant at the relevant time interval, the average parameter of wastewater COD was determined to be 36.312 mg / L, which compared to the standard of application and reuse of wastewater for agricultural use and Irrigation, which is defined by Iran's Environmental Protection Organization 200, is not within the scope of the limit.

The average amount of BOD5 is 160 mg / l. According to the standard, this parameter for application in agricultural and irrigation applications should be in the range of 100, which is not the same as COD in the range and scope of the limit.

Based on the research, the average pH of the effluent was 8.2 which is within the standard range for application of effluent in agricultural and irrigation applications (8-8.5).

According to the available data, the average output turbidity (NTU) is 41.4%. According to the standard for turbidity parameters for agricultural and irrigation purposes, which has been set at 50 NTU, it can be stated that the average value of output effluent turbidity is in the limit of the limit.

The average amount of data indicates that the effluent sulfate is 162.17 mg / l, which can be considered as suitable for comparison with the use of wastewater in agriculture and irrigation. It should be noted that the limit for this parameter for agricultural and irrigation purposes is 500 mg / l.

In relation to the TSS parameter, the present study showed that the average total amount of suspended solids (TSS) of the effluent is 25.29 mg / l, which is also comparable to the limit for wastewater use in agricultural and irrigation sector, which is in accordance with the standard 100 Is defined. In Figure. 3, the average values of the parameters studied are compared with the standard of wastewater use in the agricultural and irrigation sector.

The results of this study show that the average values of the quality parameters examined from the effluent wastewater treatment plant of Isfahan industrial town other than BOD5 and COD are within the standard range and the limit for agricultural and irrigation purposes, which may be the adverse environmental performance of these two parameters To follow. In the treatment plant during the week, a part of the refined wastewater is used to irrigate the greenery of the town, while most of the water, without planning and management, is guided to the ground areas around the refinery, which, according to The quality of the wastewater in the present situation and the inappropriate performance of the treatment plant in removing some of the pollutant indicators (BOD5, COD) can lead to water and soil contamination.

According to a similar study carried out at the Salman-Shahr Industrial Park's refinery, as a result of the proper functioning of the wastewater treatment plant, the effluent was detected for discharging to surface water, absorbent well and agricultural use [8]. Also, a study on Ahvaz City 2 refinery showed that the effluent of this system is in good agreement with environmental standards and standards for entering agricultural land [10]. A study on wastewater treatment plant in Shokoieh industrial city of Qom showed that wastewater for discharge to surface waters and wells is not within the limits of the limit and the only option for wastewater disposal is use in agricultural and irrigation activities [9]. Results that are not consistent with the results of the present study.

In another study, the qualitative conditions of the Alborz industrial wastewater treatment plant in Qazvin province were evaluated. The results indicated that some of the quality parameters of this wastewater treatment plant were exceeded and required more refining, which would result in improved purification, diversification of waste water and the negative consequences of its use [6]. The result is similar to that of the present study.

Therefore, in order to promote sustainable development and reuse of wastewater in the agricultural sector and irrigation, efforts should be made to reduce the flow of wastewater from the settlement to the refinery and to prevent the violation of active units and unauthorized discharge of wastewater into the collection network, by reviewing

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The continuous operation of the refinery and the implementation of technical and engineering solutions, as well as observance of the principles of exploitation, will bring the quality of wastewater to the optimum and standard of the Iranian Environmental Protection Agency and at least minimize the environmental and health effects of this use. Of course, the relevant government agency should also have a more tangible supervisory role in relation to the proper functioning of the active units of the city as well as the refinery and proper management of its effluent in terms of environmental requirements in order to pay attention to the value of water in arid and semi-arid regions, We see the optimal use of this unusual water source.

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