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EFFICIENCY OF AL-RUSTAMITYAH SEWAGE PLANT AND THEIR CONSEQUENCES ON THE POLLUTION OF DIYALA RIVER

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ABSTRACT

The present work initiated to eaIuate the efficiency of Al-Rustamivah sewage treatment plant as reflected by the quality of final effluent that is thrown to Di ala river. Weekly samples of wastewater and final effluent were collected between November 1994 and end of January 1995 and analyzed for different chemical and biological features. Results ha e inidicated that Al-Rustamiyah sewage treatment plant could not be able efficiently to purify the raw sewage. The mean values of suspended solids. BOD. COD Dichromate and Oil & grease effluents were felt to pass standard limits (98.4. 92.8. 125.2 and 39.1 ppm. respectiel). The atherse possible effects of pollution on Diuala equatic life hae been also discussed in respect to final effluent quality.

INTRODUCTION

It is well known that the major pollution problems caused by treatment plants are those of water pollution. However, the effluents from these plants present a high pollution load if not treated efficiently before disposal. it would cause death of lix ing organisms in river water. The treated wastewater quality is function of the treatment provided the rating stratgy emplo ed and the characteristics of raw wastewater. Subsequentlx. treated wastewater exhibits wide variation in quality (Bolton and Keine. 1961). One major of pollution is the organic load of final sewage effluents. A significant proportion of organic contaminates carried by sewers derives from urban run—off consisting of story writer from roads. motor ways and paxed areas. in addition to industrial effluents when discharged to sewers (Eganhouse et a!. 1981). The greatest impact of this load in the ens ironment is the reduced diversity of invertebrates (Borowitzed. 1979: Fitzgerald. 1978).

The purpose of the present study is to elucidate the performance ofAl-Rustarniyah sewage treatment plant and the qualit of final effluents discharge to Di ala river in respect to water pollution.

MATERIELS AND NETHODS

The first isit to Al-Rustarniyah sewage plant in Baghdad was made on 8h ofNoxmber 1994 and obser ation were recorded. Samples of w astew ater and final effluents weekly collected till 29t5 on January of 1995 sampling on storm and overflows were avoided. Duplicate samples were analysed for PH. BOD1. COD Dichromate. suspended solids, total dissolved solids. CL. SO4. P04. NO1. NH1. Oil & grease. iron (Fe). copper (Cu). cadmium (Cd). Chrome (Cr). zinc (Zn). nikle(Ni). and lead(Pb) according to the standard methods for examination of ater and \aste\\ater (American public health association. 1980).

RESU LTS

Observations Recorded

The foul-smelling sulphnetted hydrogen (H2S) was recognized in all time sampling before 3 Km from plant (or more on nd direction). It is well known that HS is produced b fermentation of organic sulphur compound or by bacterial reduction of sulphate. The amount of this gas depends upon strength. age. temperature and sulphate content of the se age. Methane was also produced in large quantities during aerobic action. Methane gas has high calorific alue and collected in gas chamber and used for power production inside the plant. The se age treatment plant consists different units orking together to cons cit the raw se age to sludge. which can he disported in land. Effluent s ith acceptable qualit\ here diaposte to water course, and gases to the atmosphere. Fherefore an dis order in one or more of thee units will reduce the efflcienc of the plant. In such cirrcurnstances the sewage plant converts to a source of pollution. Therefore, the efficiency of each unit in Al-Rustamivh seage treatment plant as considered. It was obvious that the economic blockade imposed agnist Iraq and shortage of spare parts hae affocted the sewage treatment plant in all cities of Iraq and Al-Rustamivh plant is one of them. Therefore. gas chamber. detertins and chlorine house unit had been totalk disqualified in this plant.

Analysis of Samples

Table (I) summarized the mean alues of all samples. Die qualifications ofwasteater and final et'fluents as l'ollow:

1-Ph

l'he PH alue 'as nearl neutral (7.2 and 7.4 for seage ater and in the acceptable limits respectively). Hoever. these PH values canbe considered with in the acceptable limits of the Iraqi standards (6-9.5).

2-BOD and COD Dichromate

The ROD and COD the wastewater sere 253.5 and 271.6 ppm. respectively. After puritication they reduced to 92.8 and 125.8 ppm respecti el. hlo%e\ er. the were aboe the standards (40 and 100 ppm for BOD and COD respectively).

3-Suspended and Total Dissolved Solids

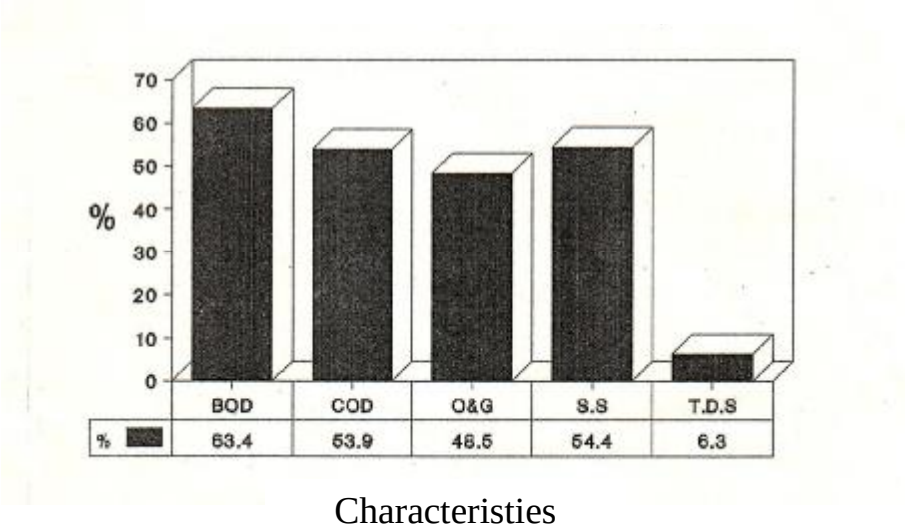
The alue of suspended solids is one of the most important of all the for seage and treated effluents (Bolton and Klein. 1961). In this study the suspended solids was 216 ppm for the \asteater and 98.4 ppm for the final et'fluent. I he removal of suspended solids from raw sev.age is indeed one of the indication of the efficienc. The carefully operated well designed treatment should remove about 50-90 percent. Although, the removal percent in Al-Rustamivah plant as 54.400 (Fig. I). but the suspended solids was oer the standard (60 ppm). The true solution of' the astewater did not much been affected b treatment as might be expected h\ treatment as might he expected. Fhe content of total dissolved solids reduced from 2009.3 to 1881.9 ppm after purification. while purification percent v as 6.3° 0 (Fig. I).

4-Cl and S04

Soluable Cl and SO4 ere high in both 'astesater and final effluents. Ihe chloride content sas 464 and 381.7 ppm for astewater and final effluent. respectiek. The sulphate contents crc 851.4 and 792.1 pmm for wastewater and final effluent. respectively. These to alues of CI. and SO4 can he accepted according to the standard (1200 ppm).

5-NO. NO2 and NH

(Fig.1) Percent of Purification achieved
by treatment of wastewater



Characteristies

Table (1) Analx ses of Wastewater and Final Effluents

Characteristies	Wastewater	Final Effluent
PH rng 1	7.2	7.41
BODS	253.5	92.8
COD Dichromate	271.6	125.2
Suspended Solids (S.S)	216	98.4
Total Dissolved Solids (T.D.S)	2009.3	1881.9
Chloride (CL)	464	381.7
Sulphate (SO4)	851.4	792.1
Nitrate (NO1)	12.5	28.8
Nitrite (NO2)	2.86	3.64
Nrnmonia (NH5)	25.3	25.2
Phosphate (P04)	3.59	4.34
Oil & grease	75.9	39.1
Iron (Fe)	2.59	1.97
Znic (Zn)	0.243	0.029
Cadmium (Cd)	0.025	0.002
Lead (Ph)	0.080	0.049
Chorme (Cr)	0.009	0.005
Nickle (Ni)	0.120	0.050
Copper (Cu)	0.243	0.029

The concentration ofNO3 and NO2 were increased the purification process. NO3 increased from 12.47 ppm in wastewater to 23.8 ppm in final effluent, and NO2 from 2.86 to 3.64 ppm. The ammonia (NH3) also anexpectedk did not decreased diring treatment as a result of bacterial oxidation of ammonia to nitrates

$NH_3 + 3O \longrightarrow HNO2 + H2O$

$HNO_2 + O \longrightarrow HNO_3$

The NH3 contents were 25.3 and 25.2 ppm for wastewater and final effluent respectiek. 6-P04 The phosphate concentrewater was 3.59 ppm and to 4.34 ppm in the final effluent. So it was over the exceptable limit (3). The reactions place in the aerobic of organic matter could increased phosphorus as below:

Organic-phosphorus. P $\longrightarrow$ H3P04 (neutraed by base present).

7-Oil & grease

the wastewater samples content appreciable ammounts of oil & grease (75.9 ppm). The oil & grease should he remoed as much as possible in the earN stages of treatment. However, the concentration decreased to 39.1 ppm in final effluent but it was still much higher than allowable limit (4 ppm).

8-I1ea Metals (Fe. Zn. Cd. Ph. Cr. Ni. and Cu)

The major sources of heavy metals in sewage come from trade wastes. If heavy metals reach the ner in appreciable content, they will damage the equatic life. The concentration of these metals were not high in wastewater (0.3 ppm) except for which was reatiely higher than other (Table I). Howeer. the concentration of all metals were reduced considerably after purification including Fe (1.47 ppm). The concentration of hea\ metaks in final effluents were less than the standards.

DISCUSSION

The main removal mechanisms for pollutants acrose wastewater treatment plant are solatili,ation. biological oxidation and accumulation in the sludge. While the water conten (99.9°o or more) disposed as effluent to water course. Although the present study concentrated on water pollution. the air poolution by H2S and methane has been clearly observed in the surrounded area as a result of dismantle of ges chamber in the sewage treatment plant. l'he emission of H25. methane and CO2 would cause ad erse affects on local en ironment and global climte. The detritus unit which is for remo\ing the grits during the primary sidenmentation. The destructive detritus unit could not able to purify the final effluent from suspended solids. Therefore, the percent as purification of suspended soils was 54.4°o (Fig. I). and the final effluent felt to pase the standard the high content of suspended solids could cause damage to pumps and other mechanical equipment in sewage plant. It would also causes damage to fishes in the river after discharge to the river.

The sewage treatment achieed by Al-Rustamiyah plant could not be able to reduce the organic content (BOD3 and COD) to standard alues (40 and 100 ppm for BOD5 and COD respectiel). In spite of the purification percentage were high for ROD5 and COD (Fig. I). Ehe enrichment of river water by organic matter would cause decreased the dissoked oxygen. Reducing the clissol ed oxy gen in ri er water w ould lead to putrefaction and foul odours due to INS formation.

Ehe high le el of oil & grease in wastewater in wastewater samples were o er the ability of treatments prox ided by Al-Rustamiy ah sewage treatment plant. Therefore. the purification percent was only 48.5°c. the biological degradation of oil & grease (hydrocarbons) in river water would be \erv slow compard with other organic compound. Hence, the bad effwcts of oil & grease will continue for long time and extend to long distance from out let point. The ability of oil & grease to from oils layer over the water surface and would present the gas exchange between water and air. Chemicals coagulants can be used to settle out the oil &

grease during the primar sedimentation. The other components studies of final effluent were the standard except for the phosphate.

CONCLUSIONS

The main conclusions which can he derised from this study would clearl refer to pollution of Diyala river which come from Al-Rustainiyah sewage treatment plant. Suspended may be in the from of non-polar and hence have a er low water solubilit such compound therefore, to adsorb strongl on suspended particulate matter (Herhes. 1977). This suggests that mechsincal processes by sedimentation not a chive substantia remosal of these materials from effluent as a result of stopping deteritus unit from working. Many synthetic organic compounds. because of their non-polar and hvdrophic natur not onE adsorb onto suspended solids, but also partition into non—polar fate and lipid material present in raw sewage. This components of the raw sewage including mineral oils. grease. waxes and surfactants. some ofwhich in varying degrees are resistant to degradation. could potebntiallv represent an important mechanisms for the concentration and transport of these material to the riser water.

[‘he principal concern in disposing of final effluents contaminated with organic pollutant. this would exposure the equate environment to adverse ef0cts. In addition to exposure of the population to these substances either directly from the consumption of water or indirectly through the food chain, where biomanification may accrue.

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Inheritance of dark head

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كفاءة محطة تصفية المياه النقيلة في الرستمية وتأثيرها على تلوث مياه نهر ديالى

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الخلاصة

هدفت الدراسة إلى تقييم كفاءة محطة الرستمية لتصفية المياه النقيلة كما عكست خلال نوعية المياه الناتجة من التصفية التي ترمي إلى نهر ديالى.

عينات أسبوعية جمعت لكل من المياه الخارجة التصفية النهائية للفترة من تشرين الثاني ١٩٩٤ ولغاية نهاية كانون الثاني ١٩٩٥ وحللت النماذج كيمياويا" وبايولوجيا" لصفات مختلفة.

أشارت النتائج إلى إن عملية التصفية لم تكن بالكفاءة المطلوبة لتصفية هذا النوع من المياه النقيلة وكان متوسط قيم كل من المواد العالقة الكلية وكمية الأوكسجين المطلوبة بايولوجيا وكمية الأوكسجين المطلوبة كيمياويا" وتركيز المواد المذيبة في المياه الخارجة من المحطة الى النهر كما يلي:-

(٣٩،١٠،١٢٥،٩٣،٨،٩٨،٤) جزء بالمليون وعلى التوالي).

وحيث إن هذه التراكيز قد كانت أعلى من القيم المسموحة بها حسب المواصفات العراقية لمياه النقيلة وكذلك فان الآثار الضارة لهذا التلوث على الأحياء المائية في نهر ديالى قد أحدث في الاعتبار من جانب نوعية المياه الناتجة...