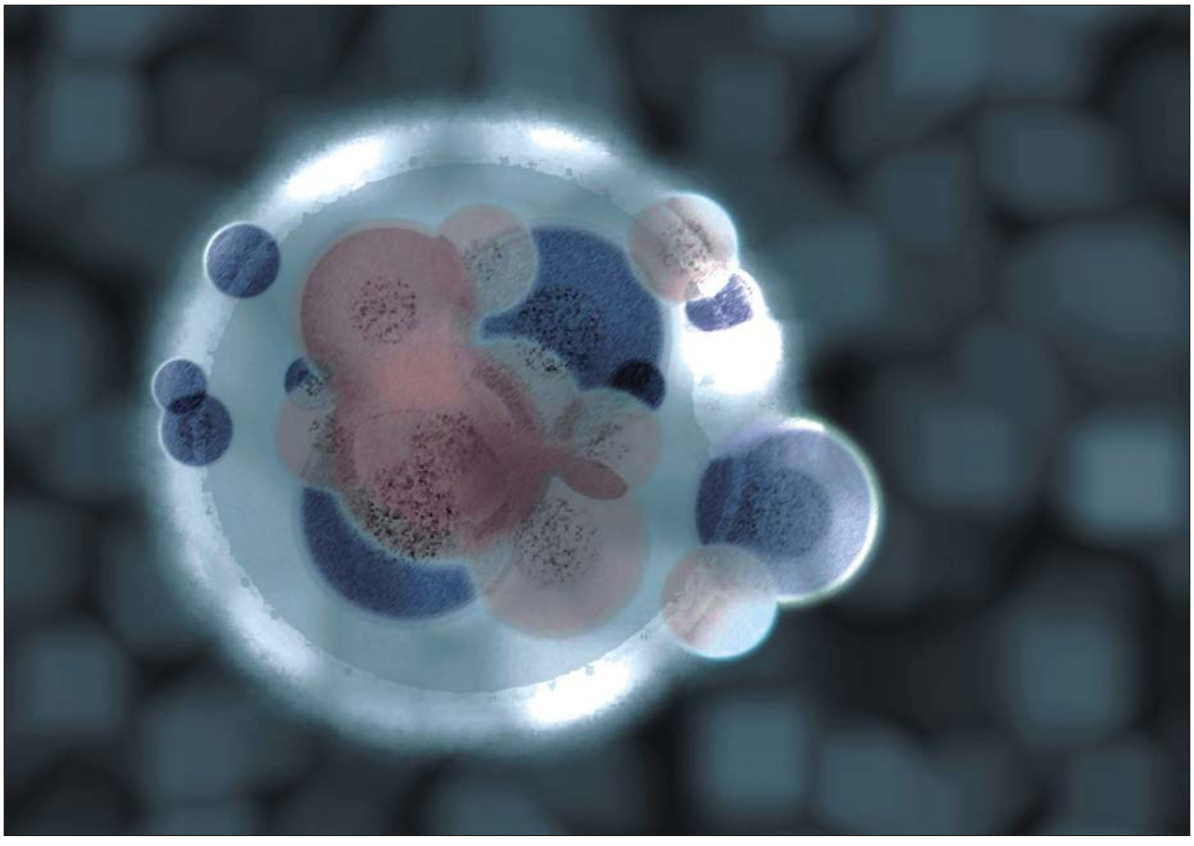

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Establishment of Design Criteria at Shoosh Wastewater Treatment Plant in South of Tehran, Iran

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Abstract: The purpose of this study was to determine the per capita waste generation at Shoosh Wastewater Treatment Plant (SWTP) in Tehran. This study was carried out during the twelve month in the year of 2003. Daily composite samples were taken weekly from the inlet of SWPT and analyzed for major pollutants in the laboratories of Tehran sewage company. The results showed that yearly average of per capita waste generation for individual pollutants as gram per capita per day (g/c-d) is COD=59.5, BOD= 38.7, TSS=34.4, TN=11, Organic-N=3.2, Ammonia-N= 7.8 and total phosphor= 0.87 which were well below Iranian standard excluding nitrogen compounds which is due to local condition and population characteristics. Poor sanitation is major reasons for low load of waste generation in this town.

Key words: Design criteria, treatment plant, wastewater, waste generation, composite sample, pollutants

INTRODUCTION

One of the important fundamental in the implementation of wastewater treatment facilities is the knowledge of the constituents found in wastewater and amounts of these. The constituents that present in raw wastewater can be classified as physical, chemical and biological[1]. Before deciding for selection of suitable process to treat the wastewater, it is necessary to consider the characteristic of the pollutants. Domestic wastewater contain various pollutants so that actual concentration of pollutants vary from a community to another[2]. Moreover, socio-economical status of the community is detrimental factor on wastewater properties[3].

The organic matter contributed per person per day in domestic wastewater approximately 110 g of suspended solid and biochemical oxygen demand in communities where a substantial portion of the house hold kitchen waste is discharged to the sewer system through garbage grinders. In communities that don't use garbage grinders, the organic loads of wastewater is less than other communities[4,5].

In the selection of data for wastewater treatment plant design, the quantity and organic strength of wastewater should be on actual measurement taken throughout the year to account for variations resulting from the seasonal, Climatic change and other factors[4]. The average values during the peak month may be used for design. The quantity and characteristic of wastewater fluctuate with season of year and between weekdays and holidays. Waste strength is highest during the workday where household and industrial activities are contributing a large amount of organic matter and it is reduced during the night when entering flow is less contaminated and slow velocities in pipes permit settling of solid[5].

The suspended solid, biodegradable organic matter, Nutrient and pathogens are most popular pollutants that present in domestic and commercial wastewater[2].

Sludge production in wastewater facilities is depending on concentration of suspended solid in raw wastewater and oxygen requirement depending on organic load of sewage[3].

Discharge of Nutrient (Nitrogen and phosphor) to receiving water resulting to excessive growth of the undesirable aquatic life such as Algae and eutrophication and causes water contamination[6].

In addition, for calculation of pollutants mass loading in the inlet of wastewater treatment plant, it is required that population and per capita per day waste generation must be known[1].

This paper presents the results of one year survey for establishment of design criteria at Shoosh Town Wastewater Treatment Plant (STWTP) in south of Tehran and to establish the design criteria for wastewater treatment plant design in similar condition.

MATERIALS AND METHODS

Shoosh town located at south of Tehran (Capital of Iran) and has 40000 inhabitants through the year. Inhabitants in this town living in poor sanitation

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condition and has low income and water consumption. Shoosh Wastewater Treatment Plant (SWTP) with extended activated sludge process was built to treat the raw domestic and commercial sewage from the mentioned town. SWPT consisted of a bar screen and two aeration tank followed by two secondary sedimentation tank. The raw sewage from the town flowed by pump to the bar screen and thence to the two aeration tank. The final effluent from the treatment plant discharged by gravity to a stream running along side the treatment works.

During the one year (January 2003 to December 2003), influent sewage to treatment plant were sampled and analyzed for several chemical parameters. Samples were 24 h composite samples that taken every 2 h in 1 L plastic bottles. A total of 52 sample (1 per week) analyzed for Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Total Suspended Solid (TSS), Total Nitrogen (TN), organic nitrogen, ammonia nitrogen and Total Phosphor (TP) based on methods described in the book of standard method for the examination of water and wastewater[7].

RESULTS AND DISCUSSION

The monthly average of per capita waste generation for individuals pollutants based on 52 composite samples analysis were given in Table 1. Table 2 also presents the seasonally and yearly average of capita waste generation at Shoosh town during 2003 year. For COD, BOD and TSS yearly average is 59.5, 38.7 and 34.4, g/c-d, respectively in addition, TN=11, ammonia nitrogen =7.8, organic nitrogen =3.2 and total phosphor is 0.87 g/c-d.

By comparing the results obtained (Table 3) at SWTP with Iranian standard, it appears that the per capita waste generation in Shoosh town is significantly less than Iranian standard (excluding nitrogen compounds). This research shows that the average specific load for suspended solids in Shoosh town is less than BOD load which is probably due to settling of suspended solid in sewer. Since Shoosh town is located in a flat area, so that sewer constructed with low slope and velocity that permits suspended solid to settle in sewer[8,9].

Based on another research at Sahebgharanieh town wastewater treatment plant (a town in north of Tehran) the average load of waste generation for BOD, TSS, TN and TP is 43, 45, 6.9 and 3.7 gram per capita per day[10].
By comparing this results with Shoosh town results, it appears that excluding for TN, load of other parameters in Sahebgharanieh town is higher than Shoosh town which

Table 1: Monthly average of per capita pollutants generation at Shoosh town during 2003 year (Values as gram per capita per day)

	Parameters						
Month	COD	BOD	TSS	TN	Ammonia nitrogen	Organic nitrogen	Total phosphorous
January	71.0	45.4	26.4	8.8	6.4	2.4	1.20
February	78.5	47.1	34.0	6.2	4.5	1.7	1.00
March	66.5	41.2	35.7	5.9	4.7	1.2	0.42
April	58.3	37.6	37.5	11.5	8.0	3.5	0.70
May	49.9	32.4	29.2	11.4	9.0	2.4	0.78
June	56.4	33.9	32.5	4.1	9.5	4.6	0.58
July	40.5	23.7	31.5	9.5	6.4	3.1	0.77
August	42.1	32.8	42.7	13.0	8.9	4.1	1.00
September	54.7	35.5	35.5	11.8	8.2	3.6	1.20
October	67.0	44.2	32.5	17.4	12.1	5.3	0.94
November	69.6	45.9	36.6	8.6	6.0	2.6	0.85
December	69.0	45.4	38.4	13.8	9.6	4.2	1.20

Table 2: Seasonally and yearly average of per capita pollutants generation at Shoosh town (Values as gram per capita per day)

	Parameters						
Season	COD	BOD	TSS	TN	Ammonia nitrogen	Organic nitrogen	Total phosphorous
Winter 2003	72.0	44.5	32.0	6.9	5.2	1.80	0.87
Spring 2003	54.8	34.6	33.0	12.3	8.8	3.50	0.69
Summer 2003	45.7	30.7	36.7	11.4	7.8	3.60	0.93
Fall 2003	65.5	45.2	35.7	13.3	9.3	4.03	0.99
Yearly average	59.5	38.7	34.4	11.0	7.8	3.20	0.87

Table 3: Iranian standard for municipal Wastewater treatment plant (Values as gram per capita per day)

	Parameters						
Iranian	COD	BOD	TSS	TN	Ammonia nitrogen	Organic nitrogen	Total phosphorous
Design criteria	---	50	60	10	6	4	2

is due to the characteristic of households living status. The people living in Shoosh town area has poor sanitation and educational condition and water consumption is low. There is limited dairy industrial activity in this area that generate some wastewater containing nitrogenous compound. The high load generation of TN in Shoosh town wastewater is related to mentioned activities[8,9]. On the other hand, according to the information provided by the Tehran sewage company, because of households in this area (Shoosh town) has low income and poor sanitation the uses of detergents for health purposes is less than other area in Tehran, which resulting to lowered phosphorous contents of wastewater[11].

Finally, the results for this study showed that the ratio of BOD to COD in raw wastewater at Shoosh town is 0.65 that compliance with data present in Iranian and non Iranian literature. Normally, in municipal wastewater the ratio of BOD to COD is between. 0.4 to 0.8[4,5].

The results indicate that at this town per capita waste generation is less than Iranian standard. Only nitrogen compounds was observed in high loads which is due to commercial activities in mentioned area. By comparing Iranian standard with foreign literature, it is appear that the waste generation in Iran is less than other countries which is depending to local condition, population characteristic and don't uses of Kitchen garbage grinder. Application of kitchen garbage grinder in house hold resulting to increases the load of pollutants in raw wastewater, by 30 to 100% with respect to other household[5]. In conclusion, the socio-economical status of communities effects the quality of raw wastewater.

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