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A Study on Quality and Quantity of Wastewater Generated Through Centralized Kitchen Wastewater

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Abstract: ***The fresh water use for different urban activities may lead towards generation of wastewater. The wastewater generated from kitchens is about 60% of total water used in various kitchen activities. The kitchen wastewater is contaminated by high concentration of organic matters which imparts rise in BOD and COD parametric value. Detergents used for washing kitchen appliances may contribute chemicals in wastewater. The lack of awareness about adverse effects may force human beings to dispose kitchen wastewater with high concentration of biodegradable pollutants directly on receiving water body. This may cause degradation of environment and raise issues related to environmental health.***

Keywords: Centralized Kitchen, Wastewater, Quality, Quantity, Receiving water body, Pollutants

1. Introduction

Industrial development is primarily responsible for migration of human groups towards metro cities in search of job. This may cause crowded urban areas with insufficient infrastructural facilities. Food is one of the basic requirements of human beings and to fulfill this Centralized Kitchens, Hotels, Restaurants etc were developed rapidly in urban areas. The wastewater generated from the Centralized Kitchens, Hotels, Restaurants, and Societies contains high concentration of BOD, COD and Oil with varying pH value. Negligence of human beings is towards treatment of kitchen wastewater and intentionally going for disposing off into natural water bodies and on Land. This practice leads towards environmental pollution along with risk to environmental health.

Diaper et al. defined grey water as urban wastewater which includes waste water generated from dishwashers, kitchen sinks, hand basins, baths, showers and washing machines and excluding wastewater generated from toilets. Brandes developed and adopted two separate septic tanks to treat grey water from the kitchen and bathroom and black water from the toilet separately for same house. The results of this study shows the quality of the effluent depends on the contents of organic matter in the wastewater [03]. Eriksson et al. discussed the characteristics of grey wastewater and factors affecting on characteristics of gray water. The factors affecting on characteristics of gray water are: (a) the quality of the water supply, (b) the type of distribution net for both drinking water and the grey wastewater and (c) the activities in the household. Ghunmi et al. assessed the concentrates on quantitative and qualitative characteristics of grey water. The grey water generated around 64 to 85% of the total water flow in the rural and urban areas in Jordan. The study suggest about storing of the grey water, which may be reused as per requirements in terms of volume and timing. To improve the quality of grey water, need treatment, in terms of solids, BOD5, COD and pathogens, before storage and reuse. De Baskar et al. (2009) investigated the feasibility study of constructed wetland for treatment of kitchen waste water generated from hostel mess. The wetland Phragmites australis plant species were grown in the constructed wetland. The campus wastewater has a major variation in quantity; the effect of this variation is not looked into in this pilot study. Abubakar et al. studied reuse or recycling of treated kitchen wastewater for different applications. The study shows reduction in quantity of effluent discharges into receiving water body and proposed a reliable option for supply of water in various applications. These applications are such that they do not require high quality water. The aerobic SBR treatment process is used to treatment of kitchen wastewater before depositing into body of water and for reuse for irrigation purposes. Kawale et al. described that the treatment of sewage has a challenge due to varying raw water characteristics & strict effluent regulations. Finding of the study is SBR system has oxygen dissolving capacity higher than ASP and provides Higher Fecal coliform removal efficiencies with less cost and space. The effluent quality through SBR is better than ASP system, which helps in maintaining acceptable quality of water [10]. The research studies reviews the quality and quantity of centralized kitchen wastewater which is having high concentration of biodegradable pollutants.

In this research study an attempt has been made to carryout experimental study to evaluate quality and quantity wastewater generated from centralized kitchens. The objective of this research is to understand quality and quantity of Centralized Kitchen Wastewater.

2. Methodology

Research Approach

The research approach followed in this study has been explained through a flow diagram as shown in Figure 1.

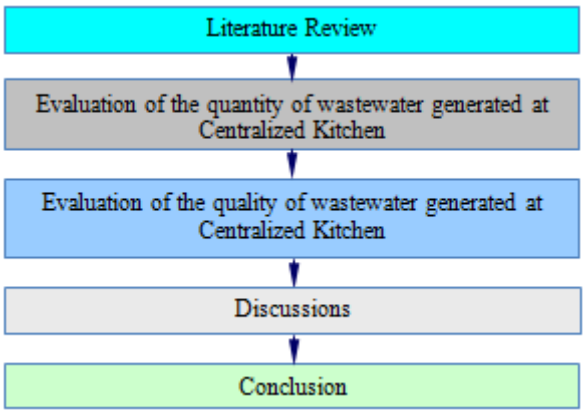

Figure 1: A Flow diagram for Research Approach

3. A Case Study

For this study a Centralized Kitchen selected as located in the campus of ISCON Temple at Akurdi, Pune. The Centralized Kitchen has facility of cooking for 25,000 student's food in two shifts

3.1 The quantity and quality of wastewater generated at Centralized Kitchen

The quantity of waste water generated through kitchen has evaluated during morning and evening session. The quantity has determined with diameter of pipe and depth of flow through the pipe per unit time. The depth of flow through pipe has been checked for 5 mins periodically.

Figure 2: Centralized Kitchen at ISCON Temple

For Example: The diameter of pipe is 150 mm. and observed average depth of flow through pipe was 80mm. And time period of flow through pipe was 2 hours.

The Observed average velocity of flow through pipe is 30.25 m/hr

Cross-sectional area of flow through Pipe is 5030 mm^2
Discharge through pipe is = A x V x 2 x 60 x 60
=.50x 3.25 x 6
= 9.75 m^3/day = 10 m^3/day
= 10000 lit. /day

Figure 2: Activities in Centralized Kitchen at ISCON Temple

Figure 4: Evaluation of depth of wastewater flow

Average water requirement for various activities in kitchen per day as per survey were 12000 lit/day and during the process they are producing wastewater of 10KL per day. Also while field survey of various centralized kitchens, restaurants and hotels found that approx. all these food serving units are generating 5 KL to 10 KL effluent by their individual unit.

3.2 The quality of wastewater generated at Centralized Kitchen

Experimental Work

Collection of Kitchen wastewater samples
Over the entire period of research work composite samples of Kitchen Waster Waste were collected. The kitchen wastewater samples were brought for SBR treatment process on daily basis. The kitchen wastewater samples were vigorously mixed once again before putting into the SBR to avoid settling of pollutants in can.

Composite samples are collected from morning 8.00 AM to 12.30 PM from the waste pipe in proportion to the kitchen wastewater flow as per wastewater sampling procedure by USEPA (United States Environmental Protection Agency).

Laboratory analysis of Kitchen Wastewater Sample
The characteristic of wastewater sample is shown in Table No. 1.

Table 1: Characteristics of Kitchen wastewater sample

No.	*Parameters*	*Value*
1	pH	7.06
2	Chlorides	874.5 mg/litre
3	Oil and Grease	262 mg/litre
4	COD	1840 mg/litre
5	BOD	850 mg/litre
6	Total Kjeldahl Nitrogen	1.05 mg/litre
7	Total Phosphate	1.10 mg/litre

The nature of effluent from kitchen were mainly contains oil, raw cut vegetables, about 70% organic wastes and 10% in-organic wastes. The parametric vales of BOD3@ 270C observed 800 mg/l and parametric value of COD was observed up to 1250 mg/l which was too higher than domestic wastewater. The kitchen wastewater sample contains high value of Chlorides. The use of detergents for washing dishes and pots may contribute sulphates in wastewater. All these food serving units are disposing off their kitchen wastewater into natural streams or on Land or in some cases using for small scale Agriculture fields, or infiltration in sub-soil by taking bores. The non engineered disposal methods adopted by all these units are responsible for environmental pollution causing risk to Environmental Health.

4. Conclusions

The focus of work under this research was determination of quality and quantity wastewater generated through kitchen wastewater.

The conclusions of this study are

- The parametric values of quality of wastewater generated from centralized kitchen are on highest side for COD, BOD and pH.
- The present practices of disposing untreated kitchen wastewater on land or inland water body adversely affecting on environmental health of locality.

References

[1] Abubakar, S., Latiff, A. A., Lawal, I. M. and Jagaba, A. H., "Aerobic treatment of kitchen wastewater using sequence batch reactor (SBR) and reuse for irrigation landscape purposes." American Journal of Engineering Research (AJER), Vol. 5, Issue 5, pp. 23-31, 2016.

[2] Baskar, G., Deeptha, V. T., & Rahman, A. A., "Treatment of wastewater from kitchen in an institution hostel mess using constructed wetland." International journal of recent trends in engineering, Vol. 1, No. 6, pp. 54-58, 2009.

[3] Brandes, M., "Characteristics of effluents from gray and black water septic tanks." Journal of (Water Pollution Control Federation), pp. 2547-2559, 1978.

[4] Diaper, C., Jefferson, B., Parsons, S. A., & Judd, S. J., "Water Recycling Technologies in the UK." Water and Environment Journal, Vol. 15, No. 4, pp. 282-286, 2001.

[5] Eriksson, E., Auffarth, K., Henze, M., & Ledin, A., "Characteristics of grey wastewater." Urban water, Vol. 4, No.1, pp. 85-104, 2002.

[6] Ghunmi, L. A., Zeeman, G., Van Lier, J., & Fayyed, M., "Quantitative and qualitative characteristics of grey water for reuse requirements and treatment alternatives: the case of Jordan." Water science and technology, Vol. 58, No. 7, pp. 1385-1396, 2008.

[7] Kawale, E. M., Dohare, E. D., & Tupe, E. P. "Performance evaluation of existing ASP & SBR (30 MLD capacity) STP's at PCMC, Pune (MH)–A case study." American Journal of Engineering Research (AJER), Volume-4, Issue-8, pp-125-139.

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