6th Conference on Sustainability in Civil Engineering (CSCE'24)
Department of Civil Engineering
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ASSESSMENT OF ABLUTION WASTE WATER QUALITY FOR VARIOUS MOSQUES IN PESHAWAR CITY

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Abstract- Ablution water refers to the water utilized by worshippers for washing (wudhu) before engaging in prayers. Different researchers have described the usage of ablution water for different purposes by channeling it through basic treatment. In this case study, ablution water quality of various mosques for Peshawar city is assessed on the basis of various parameters i.e. biological oxygen demand(BOD), chemical oxygen demand (COD), total dissolved solids(TDS), total suspended solids(TSS), PH and electrical conductivity(E.C) so that it can use in functional purposes without any initial treatment. Water samples were collected from different mosques, and tests were conducted for the mentioned parameters. The results were compared with the National Environmental Quality standards and other international standards for water usage in various applications. The laboratory test comparisons indicated that the ablution water in Peshawar city can be used directly for irrigation after primary treatment to remove suspended particles, industrial use, and concrete mixing without any initial treatment.

Keywords- Ablution water, biological oxygen demand, chemical oxygen demand and wudhu.

1 Introduction

The ablution act, which Muslims perform before their five daily prayers, requires a significant amount of clean water. Muslims use approximately 3.9 to 4.42 liters of water per person a day for performing ablution [1]. This means that the Mosque needs the continuous supply of clean water five times a day, source of which is well. The wells are affected by continuous discharge l1 eading to serious problems in dry seasons. The ablution waste water can be reused by treating it by different methods. One of the researcher [2] suggested the reuse of ablution waste water in ablution activities by treating it by electrocoagulation method. A study conducted in Lahore to find the most acceptable space dimensions of ablution units and design for the user's comfort while performing the ablution activity, so that people would face no difficulty in ablution actions[3]. Another researcher [4] in Saudi Arabia proposed the reuse of ablution waste water from the Mosques by treating them from simple sand and carbonic filters along with sterilization method. Our study is actually about the same concept of reuse of ablution waste water from Mosques in Peshawar city so that it can be used for functional purposes without any basic treatment. The water used for ablution purposes came from the tubewells, that is the freshest water source in Pakistan. Even by treating it by simple methods, it can be used for a lot of purposes. In this study the ablution water in the different Mosques of Peshawar city is assessed, for the direct reuse in essential purposes without any initial treatment. The Primary objective of the study is to Assess the quality of ablution water from various mosques in Peshawar City, compare the water quality parameters with national and international standards and determine the feasibility of reusing ablution water for purposes such as irrigation, industrial use, and concrete mixing without significant treatment. After testing the collected water from different Mosques in Peshawar and comparing them with standards, it was concluded that the ablution water from the Mosques in Peshawar city can be directly used in the Irrigation purposes, mixing water in concrete and industrial use especially for cooling for hot machinery.

2 Research Methodology

2.1 Data collection from different places:

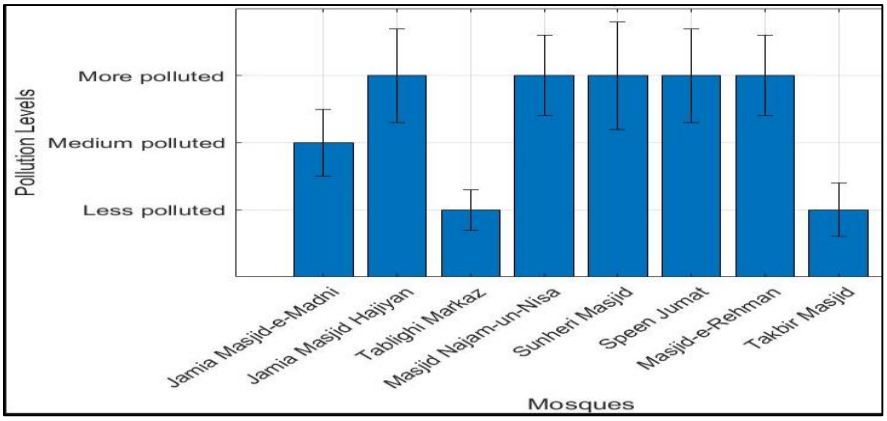

***Figure 1**: Sampling places for ablution water collection along with standard deviation in Peshawar*

Water samples from all main places Mosques in Peshawar city are collected. Sampling places vs pollution level bar graph and their standard deviation are shown in Figure 1. Not any specific method is used to categorize Mosques for sampling purposes on the basis of pollution level rather they are categorized on visual method. Mosques situated in residential areas are classified as less polluted, those in commercial areas as highly polluted, and mosques located between residential and commercial zones are categorized as moderately polluted.

Sampling of waste water samples from various sites are taken as per NEQ standards Pakistan. Table 1 presented the sampling Techniques for various parameters, preservation methods, container type, Technique for analysis procedure, special equipment for analysis purpose and make and model name.

2.2 Summary of Sampling

***Table 1** Sampling Techniques according to NEQS(National Environmental Quality Standards Pakistan)*

S. No.	Parameters	Container	Preservation	Technique	Equipment Name (Make and Model)
1	pH	Plastic/Glass	Analyze immediately	Electrode Method	pH Meter (Hanna HI 2211)
2	TDS	Plastic/Glass	Refrigerate	Gravimetric analysis	TDS Meter (Apera Instruments PC60)
3	B.O.D	Plastic/Glass	Refrigerate	Winkler method	BOD Incubator (Labtech LI-126)
4	C.O.D	Plastic/Glass	Analyze as soon as possible or add H_2SO_4 to pH <2 and refrigerate	Dichromate reflux method	COD Reactor (Hach DRB200)
5	TSS	Plastic/Glass	Refrigerate and analyze within 7 days	Filtration and drying method	Analytical Balance (Mettler Toledo ML204)
6	EC	Plastic/Glass	Refrigerate and avoid freezing.	Conductivity method	Conductivity Meter (Hach HQ440d

2.3 Laboratory Testing

Tests were conducted in the laboratory for required parameters i.e. BOD, COD, TSS, TDS, E.C and pH with proper safety and protocol. Sampling was done according to NEQ standards as shown in Table 1.

2 Results and Discussions:

Table 2 *Laboratory test results of ablution water samples collected in Peshawar city*

Sample ID	BOD(mg/l)	COD(mg/l)	TSS(mg/l)	TDS(mg/l)	E.C(µS/cm)	PH
Jamia Masjid-e-Madni	35	49.42	1333	154	308	7.03
Jamia Masjid Hajiyan	52	98.85	1666	348.5	697	7.18
Tablighi Markaz	38	49.00	1332	457.5	915	7.11
Masjid e Najm-u-Nisa	58	98.80	1998	415.5	831	7.15
Sunehri Masjid Saddar	63	98.90	666	426.5	853	7.05
Speen Jumat	49	49.48	1333	415.5	831	7.15
Masjid-e-Rehman	55	98.90	1200	382	764	7.03
Takbir Masjid	31	49.00	1250	380	760	7.10

In Table 2, laboratory test results for various parameters i.e. BOD, COD, TDS and TSS etc. are shown. These parameter results are then compared with different Water quality standards as shown in Table 3,4,5 and 6.

Table 3 *Comparison with NEQS limits [5]*

S.#	Parameter	NEQS Limit	Data Range	Compliance
1	BOD	80 mg/l	31 - 63 mg/l	Compliant
2	COD	150 mg/l	49.00 - 98.90 mg/l	Compliant
3	TSS	200 mg/l	666 - 1998 mg/l	**Non-Compliant**
4	TDS	3500 mg/l	154-457.5 mg/l	Compliant
5	EC	1200 µS/cm	308 - 915 µS/cm	Compliant
6	PH	6-9	7.03 - 7.18	Compliant

Table 4 *Mixing water quality standards for ready mix concrete ASTM C94[9]and[8]*

S.#	Parameters	Unit	Maximum Limits	PH
1	TSS	Mg/l	2000	7.03
2	TDS	Mg/l	2000	7.18
3	COD	Mg/l	500	7.11
4	pH	N/A	98.90	6-8

Table 5 *Permissible limits of water for Irrigation use [5]*

S.#	Water class	Sodium (Na) %	Electrical Conductivity µS/cm at 25˚C
1	Excellent	<20	<250
2	Good	20-40	250-750
3	Medium	40-60	750-2250
4	Bad	60-80	2250-4000
5	Very bad	>80	>4000

Table 6 *Permissible limits of water for Industrial useBIS (IS: 10500: 1991)*

S.#	Parameters	Prescribed Limits		Probable effects
		Desirable	Permissible	
1	pH	6.5	8.2	pH 7.0 is required for most industries, low pH increases corrosion
2	Total dissolved solids, mg/l	50	3000	Foaming occurs in boilers and solids interfere with clearness, taste or colour of products. Low TDS values are required for most industries.

By comparing the results of Table 2 to various standards, i.e. Irrigation water guidelines for Pakistan [5], Indian standards [6], NEQS Pakistan [7]and ASTM concrete standards[8] and[9], ablution water can be used ablution water in the Peshawar city can be directly used in industrial use, concrete mixing and in the irrigation (after primary treatment to remove Total suspended particles), without any initial treatment.

3 Practical Implementation

Study significantly conserves the fresh water resources, especially in regions facing water scarcity. Reusing ablution water can reduce the demand for treated potable water, leading to cost savings for mosques. This research contributes to all of SDGs but specifically, it contributes to SDG 2, 4, 6, 9, 11, 12, 14, 15 and 16.

4 Conclusion

By comparing the results to different standards in table 3,4,5 and 6, ablution water can be used for;

- For concrete mix preparation, without any basic treatment as compared to ready mix standards ASTM [8]and[9].
- For industrial usage, compared to table 6,ablution water can also be used without any treatment.
- Compared to Pakistan's NEQ standards Table 6, ablution water is suitable for various uses, including irrigation (following primary treatment through sedimentation to remove total suspended solids(TSS), concrete mixing, industrial applications (such as cooling and boiler feed water), recreational purposes (like fountains), and aquaculture (suitable for fish).

For future, Exploration of other sources of greywater, such as domestic wastewater from kitchens etc. should be carried out, to compare their quality and reuse potential with ablution water. Also, investigation on its impact on soil health, plant growth, and industrial processes will be carried out to ensure sustainable practices.

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