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EVALUATION OF PHYSICOCHEMICAL PARAMETERS-(TEMPERATURE, PH AND CONDUCTANCE) OF EFFLUENTS WASTES OF QUID-E-AZAM INDUSTRIAL ESTATE WASTEWATER

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ABSTRACT

The population explosion, the development of technology and industry has brought numerous problems and has been the cause of deterioration of the environment. The serious issue of concern is efficient collection and treatment of non-rural and industrial wastewater in developing countries like Pakistan. This study was designed to evaluate physicochemical parameters like Temperature, P^H and Conductance of wastewater effluent in Quid-e Azam Industrial estate being located in industrial areas. The main drain of industrial estate carries wastewater stretches from 0-550 m ahead. The Quality of waste water varied greatly as collected from various locations. The study focuses on significance of treatment plant prior to disposal of waste water and can prove to be invaluable source of data for its design. Samples were collected and characterized by using different techniques. The P^H varies from 6.69 to 11.65, Conductance from 1076µS/cm. Results were compared with National Environmental Quality Standards (NEQS) and it was concluded that wastewater was highly polluted which will deteriorate all the water bodies.

KEYWORDS: wastewater, Quid-e-Azam industrial estate, drains.

INTRODUCTION

The escalating demand and utmost importance of water has compelled man to consider technology of water reuse more seriously. Irrespective to the source, efficiently treated industrial wastewater presents an adequate alternative source of ecofriendly water. Today, water pollution has been raising concerns among scientists and engineers. (Sohail, 2003).

The efforts for developing water resources has been made globally. Conservation of available water resources has been timely stressed especially the surface water from the wastewater pollution as it is an important player in development of the country. Dumping of waste water into surface water happens to be the cause of serious problems and also impact public health.

The wastewater can be disposed properly in number of ways but the improper management of wastewater discharge in cities leads it to the surface water. Hence, the surface water bodies are affected by the effluent discharge which in turn affect the quality of water resulting in health problem to public. So, the reuse of waste water offers a most obvious and viable solution to the problem in many occasions (Muthukumaran *et al.*, 2004, Maheshwari, 2010). The industrial wastewater contains industrial site drainage contains contaminants like (silt, sand, alkali, oil, chemical residues, heavy metals), Industrial cooling waters (biocides, heat, slimes, silt), Process industrial waters, Organic or bio-degradable waste, including waste from creameries, abattoirs, and ice cream manufacture, Organic or non-biodegradable/difficult-to treat waste (pharmaceutical or pesticide industrial wastes), extreme pH leftover (from acid/alkali manufacturing, metal coating), Toxic waste (metal plating, cyanide and pesticide production, etc.), Solids and Emulsions (paper manufacturing, foodstuffs, lubricating and hydraulic oil production, etc.), agronomic drainage, direct and diffuse (Pollution control act New Dehli-1998). Analytical tests are carried out on wastewater in order to assess the nature, strength and turbidity of wastes, facilitate the design of treatment works, to check the efficiency of treatment work and assessment of quality of final effluents (Hassan, 1997). A number of different treatments and disposal or reuse alternatives are then developed and the best alternative is chosen. The physical, chemical and biological means sreused to remove contaminants in wastewater (APEC, 2005). Physical unit operations involve screening, mixing, flocculation, sedimentation, flotation, filtration and gas transfer. Whereas, precipitation, adsorption and sterilization are the most common chemical methods

used in wastewater treatment and Biological treatment primarily used to remove biodegradable organic substances from wastewater with proper environmental control (Nicoll, 2007).

Wastewater Parameters

Temperature

Temperature below 37°C does not pose any problem if the waste water is meant to be treated biologically. Most industries waste tends to be on the warmer side. Increased temperature, can alter the fish species which can inhabit in the water receiving this temperature. Waste water treatment system can possibly function up to 65 °C in thermophilic condition with their respective microorganisms. Low temperature operation leads to very low temperature which slow down reaction rate of biological and chemical treatment system. Separation of solids from waste water becomes difficult due to increased viscosity and low temperature. The temperature of the process is maintained between 10 °C and 30 °C. Increased temperature speed up the process of degradation, growth and odour production from anaerobic decomposition. The high temperature wastewater can cause a bacterial population shift in the secondary treatment which is responsible for producing floating sludge and reduced BOD (Biological oxygen demand) removal efficiency. This would sequentially endanger the treatment plant's ability to meet its discharge permit limits. When evaluating an industrial waste stream, it is necessary to understand the specific characteristics of the waste and how they may affect each portion of the Industrial Water Treatment Solutions (IWTS) and in turn how the effluent will affect the Publicly owned treatment works (POTW)'s conveyance, treatment, disposal, and reuse facilities. Measurement of temperature is an important parameter required to get an idea for self-purification of rivers, reservoirs, and the control of treatment plant. It is important factor for calculating the solubility of oxygen and carbon dioxide, bicarbonates and carbonates equilibrium. The temperature of drinking water has influence on its taste (Kaull, 2002).

pH

For the most practical purpose the pH of an aqueous solution can be taken as a negative logarithm of hydrogen ion activity (Khan, 2000). The pH of industrial wastes or acids and alkalis discharged to an industrial sewer are normally taken into account during design.

The industrial collection system may be planned to handle strong acids or alkalis, but may not be designed to resist the heat of reaction. For example, when a concentrated solution of sodium (an alkali) is disposed of to the sewer, there might be a huge temperature rise due to the heat of solution. If there is little quantity of stagnant wastewater in the sewer or pump station, the heat of solution may surpass 104 F° (40 C°), the distortion temperature of PVC (I.W.T, 1999). An escape of liquid chlorine can cause a temperature rise that enough to produce steam resulting in a very toxic gas. Mineral acids such as H_2SO_4, HNO_3, HCl, and H_3PO_4 are used extensively to clean base metals in the metal finishing industries. The industries like fertilizer, iron and steel, mining, and petroleum industries also use huge quantities of these strong acids can cause a pH violation and damage to the collection system a pH of 4.0 or less.

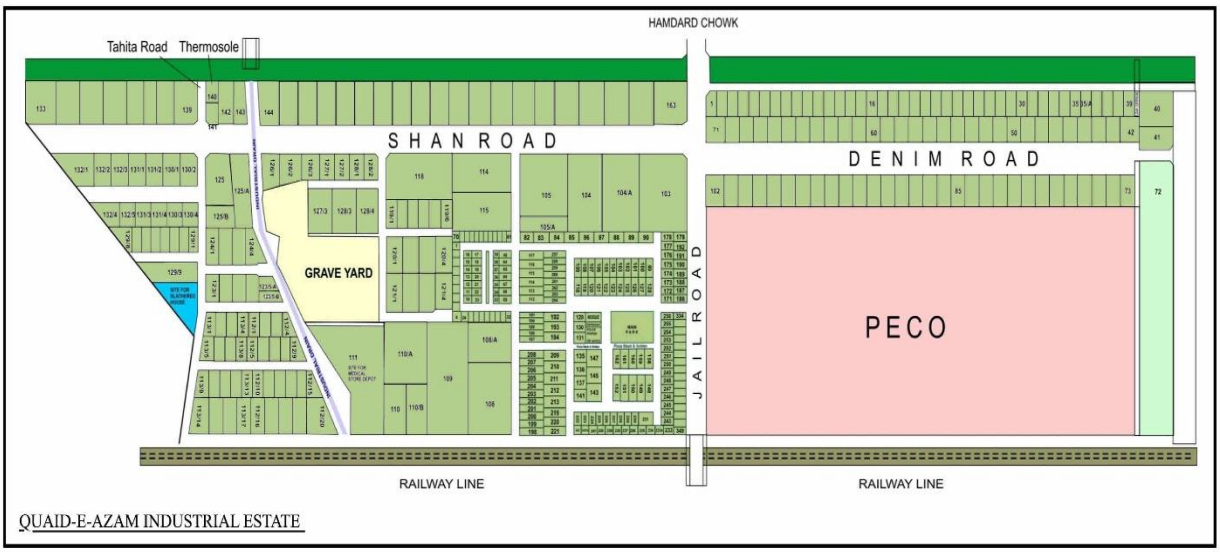
Conductivity

Conductivity is the capacity of water to carry on and electric current and varies both with number and types of ions which solution contains, in turn related to the concentration of ionized substances in the water. Most dissolved inorganic substances in water are in the ionized form and hence responsible for conductance (APEC, 2005).

Experimental Protocol

Study Area

The Quid-e Azam Industrial estate spread over an area of over 565 acre comprising many industrial plants like Pharmaceuticals, Textile, Dyeing & Printing, Food & Beverages, Garments, Plastics, Auto parts, Chemical, Steel. Wastewater quality of various drains were analyzed to assess the contaminated wastewater in that industrial area. The samples of drain were collected from the inlet and discharge points and stored before analyzing the physical and chemical parameter as per standard methods. All the samples were tested for target parameters i.e. pH, Temperature and Conductance. The entire chemicals used in the study are laboratory grade. The water used in the study was distinguished and later, stored securely to avoid contamination. All the analysis was conducted according to standard method. Samples were collected twice from five points and checked by using target parameters.



Quid-e-Azam Industrial Estate Map.

Measurement of Temperature, pH and Conductivity

For measuring temperature, a thermometer having a quick response with 0.1°C division at room temperature (Kaul, 2002). Immersed the thermometer directly in the water body for a period of time sufficient to permit the constant reading. It is not possible to take reading directly, then collect water in a sampling bottle, nearly one liter, and measuring the temperature by dipping the thermometer in the sample.

The pH determination is usually done by electrometric method which is the more accurate method and free of interferences (Kaul, 2002). The pH is determined by measurement of electromotive force of a cell comprising an indicator electrode immersed in the test solution and a reference electrode contact between the test solution reference electrodes is usually achieved by means of a liquid junction. The emf (electromotive force) of this cell is measured with pH meter.

Conductivity measurement is generally affected by nature of various ions-their relative concentration and the ionic strength of water, dissolved CO_2, Turbidity and Temperature (Ajmal, 1985). Conductivity may be expressed in milli Siemens/meter or micro µ Siemens/cm. With reasonable care, conductivity meter needs little maintenance and give accurate results.

RESULTS AND DISCUSSION

Sr. #	Sample Code	Sample description	Sample Industries
1	**A**	Ghosia chawk, Shah gilani road, Green town	Dyes
2	**B**	Initial Point of drain	Foods
3	**C**	Graveyard initiation	Fabrics, Pharmaceuticals
4	**D**	Yummy Pulley	Dyes, Food, Cosmetics
5	**E**	Yummy wastewater	Food, Oil, Pharmaceuticals

Sampling Scheme of the Drain

Samples	Temperature	NEQS	pH	NEQS	Conductivity	NEQS
A	35.3C°	40C°	7.16	6-9	1481 µ/cm	-
B	33.7C°	40C°	7.59	6-9	2310 µ/cm	-
C	34.2C°	40C°	8.24	6-9	2200 µ/cm	-
D	34.2C°	40C°	9.73	6-9	1817 µ/cm	-
E	33.7C°	40C°	7.86	6-9	2580 µ/cm	-

Analysis of results of sample A-E in June

Samples	Temperature	NEQS	pH	NEQS	Conductivity	NEQS
A	30.1C°	40C°	6.69	6-9	1076 µ/cm	-
B	29.5C°	40C°	7.14	6-9	2380 µ/cm	-
C	29.9C°	40C°	8.74	6-9	1780µ/cm	-
D	29.8C°	40C°	11.65	6-9	7820 µ/cm	-
E	29.8C°	40C°	7.04	6-9	2310 µ/cm	-

Analysis of results of sample A-E in September

These results were compared with NEQS-National Environmental Quality Standards which shows that samples are highly basic, high conductance and temperature is also near to the NEQS values in the month of June. These high values of parameters indicates that oil and food industrial effluents are more in samples and there is quite large load of pollution in the wastewater. Whereas, samples collected in the month of September were varies from less basic to highly acidic, too much high conductance and also temperature fluctuations. These results shows that dyes, pharmaceutical and fiber and cosmetics industrial effluents in wastewater. So, it is estimated by analyzing different parameters that Quid-e-Azam industrial estate has excess amount of pollution with no proper disposal or treatment system.

CONCLUSION

The present study reveals the water quality deterioration due to industrial effluents of Quid-e-Azam industrial estate. From the above study, it was proved that high concentration of pH and conductance and temperature fluctuations were not found within permissible limit prescribed by NEQS-National Environmental Quality Standards present in the effluent of wastewater. Instead of discharging the effluent wastes water into the nearby body of water, it is proposed to disposed of through proper treatment using primary and secondary plant treatments which are essential for the improvement of working for reducing most of the pollutants and get better water quality of the effluent to reuse for any other purposes (i.e. industrial, domestic and irrigation). Further research studies are needed and encouraged with an extensive scope and continuous study on the characterization of the industrial effluents and pollutants and monitoring the extent of the environmental influence (Ajibola, 2014, Ajibola *et al.*, 2014 and Egunlae, 2011). More representative samples should be used to go beyond this initial assessment as reported in this study.

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