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Study of some Physical and Chemical Characterization of Treated Waste Water on Khartoum Refinery

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Abstract: Khartoum Refinery (KR) is located north of Khartoum State.Water samples were collected in clean containers after treatment. Physical and chemical properties of treated water in the area were investigated. The pH and electric conductivity (EC) were measured using a pH meter and a conductivity meter, respectively. Percentage amount of oil and grease was measured using oil and extraction method with Soxlet apparatus. The concentrations of metal elements of the water, samples were measured using an atomic spectrophotometer.

Results showed that the treated waste water at Khartoum Refinery was strongly alkaline (pH 9.7) electric conductivity (4.7 dS/m) and oil and grease of 1.6 mg/L. The chemical analysis of treated water revealed the presence in meq/l of Mg (26.1), Ca (18), Na (222.6), K (4.98), Fe (0.017), Cu (0.0063), Zn (0.024), Mn (0.0146) and Co while Cd and Cr were trace to nill.

Introduction

Municipal waste water is mainly comprised of water (99.9%) together with relatively small concentrations of suspended and dissolved organic and inorganic solids. Among the organic substances present in sewage are carbohydrates, lignin, fats, soaps, synthetic detergents, proteins and their decomposition products, as well as various natural and synthetic organic chemicals from the process industries.

In arid and semi-arid countries, water use is often fairly low and sewage tends to be very strong, Municipal wastewater also contains a variety of inorganic. Substances from domestic and industrial sources including a number of potentially toxic elements such as arsenic, cadmium, chromium, copper, lead, mercury, zinc, etc. Even if toxic materials are not present in concentrations likely to affect humans, they might well be at phytotoxic levels, which would limit their agricultural use. A very important consideration in agricultural use of wastewater, the contaminants of greatest concern are the pathogenic micro- and macro-organisms. Pathogenic viruses, bacteria, protozoa wastewater at much lower levels than the coliform group of bacteria, which are much easier to identify and enumerate (as total coliforms/100ml). *Escherichia coli* are the most widely adopted indicator of faecal pollution and they can also be isolated and identified fairly simply, with their numbers usually being given in the form of faecal coliforms (FC)/100 ml of wastewater (FAO,1992).

Materials and Methods

Study area

Khartoum refinery:

The study area landscape is located in the semi desert zone north of Khartoum State, at latitude16.4023N,16.1157N. longitude 32.4609E ,32.2086E.According to Andrews (1949), Harrison and Jackson (1948a) the area is the semi desert grassland on sand in places with a thin scatter of *Acacia raddiana* ,*A. mellifera* and *Commiphora* spp . The rainy season begins in July the end of September. The dry season begins in December and last June. The rainfall, is about 164 mm per year. The annual minimum temp, average 29.6ºC and maximum 38ºC.

Map of the study area

Khartoum refinery treated waste water system:

Physical oil removal: this concerns all mechanical processes which do not use any reagent. Physical-chemical oil removal is done by adding chemical reagents and biological treatment (alge and fungi) finally the treated water is fed into large forest area.

Measurement of Biophysical Parameters

Water

Sample collection waste water:

Waste water was collected from Khartoum refinery in Khartoum state from forest area. The samples were kept after collection in brown glass bottles closed tightly for further analysis while the pH and EC were measured immediately. Each sample was replicated three times.

Waste water analysis:

Determination of pH:

The pH was determined using pH meter with glass electrode (Tandon, 1993). Three replicated samples of 50 ml of water were each taken in 100 ml clean beaker and the pH glass electrode was immersed, and the reading was recorded.

Determination of electrical conductivity (EC):

The electrical conductivity (EC) was determined using Electrical Resistance Bridge model (CM 35) according to the method of Tandon (1993). Three replicated samples of 50 ml of water were taken in 100 ml clean beakers and the conductivity cell was rinsed with distilled water and then with the sample. The reading was recorded.

Determination of elements:

The determination of elements was done by atomic absorption spectrophotometer (Perkin, 1994).Three samples each of 50 ml were filtered through a 0.45 micron micro-pore membrane to avoid clogging of the burner capillary. The determination of each sample was directly determined. The concentration of each element by atomic absorption spectroscopy (Perkin, 1994) was recorded.

Determination of oil & greases:

This measurement was done in the Central Petroleum Laboratories (CPL). Soxlet extraction method by hexane solvent on samples of produced and waste water was used. (Examination of Water and Waste Water, 1998).

The sample was acidified by 1 ml conc. Hcl and extracted in a soxhlet apparatus at a rate of 20 cycle /h for 4 h .

Oil and grease were calculated using the following equation:

Oil and grease % of dry solids:

$$= \frac{\text{gain in weight of flask, g} \times 100}{\text{Weight of wet solids, g} \times \text{dry solid fraction}}$$

Results

pH ,EC and oil and greases means of the treated Waste water:

The results showed that pH , EC and oil and greases means of the treated Khartoum Refinery waste water was greater than 9 i.e. alkaline and the EC≥ 3 (table 4.1).According to Ministry of Petroleum Standard (2014) the pH and oil & greases are within the standard limits.

2 Elements concentrations in treated waste water:

The results showed that elements concentrations in treated waste water in Khartoum Refinery was high in Na ,Ca, K and low in Pb ,Zn, Mn , Co, Cu while Cr and Cd were not detected (table 2).

Tables:

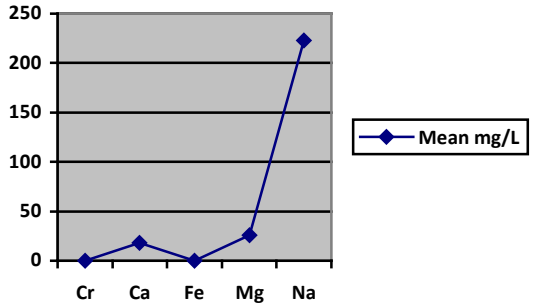
Table (1) pH , EC and oil and greases means in treated waste water from Khartoum Refinery

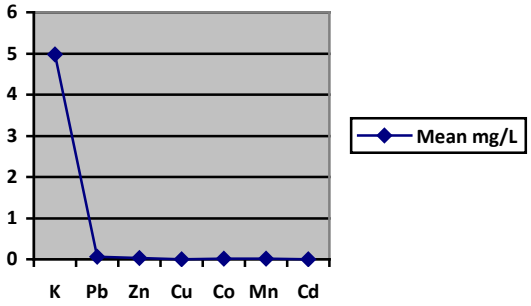
Waste water	pH	EC (dS/m)	Oil and Greases mg/L
Mean	9.48	4.69	1.6
Standard	6-9	-	10

Table (2). Element concentrations in treated waste water from Khartoum Refinery

Elements	K	Pb	Zn	Cu	Co	Mn	Cd	Cr	Ca	Fe	Mg	Na
Mean mg/L	4.98	0.060	0.024	0.0063	0.0106	0.0146	0	0	18.2	0.017	26.1	222.6

Figures:





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