Organoleptic Properties of Water Reservoir in Phagwara City (Punjab)

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ABSTRACT

Water plays a vital role in human life. It is known to provide significant amount (~7%) of essential nutrients to the human body. Water quality, as in general the quality of any item or phenomenon, is the combination of properties (of water in this case) that are manifested in relation to human, other living creatures, items and substances. The exclusive position of water on our planet as a whole was expressed most objectively by the one of the outstanding Russian scientist of the twentieth century, V.I. Vernadsky: "There is not any natural body that could be compared (with water) by its influence of the course of the fundamental and most colossal geological processes. Not only earth surface, but deeper parts of the planet (in the scale of the biosphere) is determined in the most important of their manifestations by its existence and its properties". Due to the diversity of the natural forms of the existence of water and diversity of forms of water using by humans (biological and technical), the vast multiplicity of water properties was explored (physical, chemical, biological, and technological). Chemical compounds entering the water reservoirs from industry sewage more or less can give a negative effect on organoleptic properties of water and process of natural water self-cleaning. The deterioration of the water aesthetic parameters is the most common cause of population abstinence from water use; it always leads to water use limitation. Organoleptic properties of water are related to odor, taste and color. Transparency of water is relative to coloring materials and turbidity due to suspended and colloidal matter. Certain inorganic as well as organic compounds change the organoleptic properties of water or even make it unfit for human or industrial uses. A report of organoleptic study from 2009 to 2011 of the water samples taken from the region of Phagwara city, Punjab is presented here.

Keywords: Color, Color Index, Odor, Organoleptic Properties, Phagwara City, Punjab, Water Reservoirs.

1. INTRODUCTION

Organoleptic properties of water are related to odor, taste and color. Transparency of water is related to coloring materials and turbidity due to suspended and colloidal matter. Certain inorganic

as well as organic compounds change the organoleptic properties of water or even make it unfit for human or industrial uses.

Odor and Taste: Odor and taste determinations are qualitative and subjective. In addition to chemical and biological effects of foul smelling and coloring constituents, they make the water aesthetically unacceptable. Odor in water is a general sign of pollution by decaying organic matter. Compounds that contribute to odor are generally volatile organic compounds, while chemicals that contribute to taste and odor are ketones, phenols, aldehydes and some other organic and inorganic compounds. It is possible to quantify concentrations of analytes responsible for odor and taste by techniques' such as GC.

Color (Hue): Transparency (visibility) of water is a measure of depth of penetration of light. This parameter depends on the presence of coloring matter and turbidity due to suspended matter. Color of water (hue) can be due to organic or inorganic contaminants. It can also be pH-dependent. Color of water, free from suspended matter, can be estimated semi-quantitatively by comparing samples with standard solutions of potassium chromate of different dilutions.[1]

2. REVIW OF LITERATURE

Gupta *et al.* (2013) studied on Comparative **organoleptic** quality of Indian major carps collected from pond and reservoir**.** An attempt was made to distinguish the possible **organoleptic** differences between the pond reared and wild fish species of reservoirs and correlate these with the physicochemical characteristics of water bodies. The texture was found to firmer in wild varieties of fishes than pond reared fish, with best in Catla catla followed by Labeo rohita and Cirrhinus mrigala. All the cultured fishes had lighter **color** than wild fish species which were darker in appearance. Comparatively, higher dissolved oxygen and transparency levels with low temperature and alkalinity levels were found in reservoirs. Hydrobiologically, the efficient ecosystem of reservoir was responsible for stronger texture and dark **coloration** in wild fish species. The fishes from reservoir exhibit tendency to lead active and agile life, comparatively the fishes from ponds were docile. Reservoirs had the potential of enhanced quality fish production.[2]

Zhukov *et al.* (2012) at Kharkiv National Medical University, Kharkiv, Ukraine worked on Influence of some simple ethers on the water **organoleptic** properties and sanitary regime of water reservoirs. They found that, chemical compounds entering the water reservoirs from industry sewage more or less could gave a negative effect on **organoleptic** properties of water and process of natural water self-cleaning. The deterioration of the water aesthetic parameters was the most common cause of population abstinence from water use; it always leads to water use limitation. Polyoxypropylenpolyols P-5003-AC, P-373-2-20, P-294-2-35 were widely used in many sectors of

the economy as intermediate and final products. In industrial production of those compounds a large amount of sewage was produced (50 m^3/ton of finished product); that water inevitably enters the water reservoirs creating serious difficulties in population supply with good quality water.

The possibility of transformation and the transformation of each individual substance to a certain extent depends on the stability of its forms in an aqueous medium and was defined both by properties of the xenobiotic and by the aquatic environment. The leading and reliable preventive measure limiting the entry of xenobiotics in the environment, and particularly in water sources was their hygienic regulation and substantiation of the forecast of the potential hazard for warm-blooded animals, and water reservoirs.[3]

Bhatt *et al.* (2011) worked on **Organoleptic** and physico-chemical properties of underground and reverse osmosis water used in V.V. Nagar and nearby places of dist. Anand (Gujarat). A report of **organoleptic** and physico-chemical study of the water samples taken from the region nearby Anand district of central Gujarat is presented here. Twenty five water samples were subjected to analysis like **odor,** taste, transparency, pH, TDS, hardness, and conductivity. The calcium, magnesium, potassium and sodium count obtained from the study of these samples had given the information regarding the suitability of the water for drinking purpose. The drop in mineral contents after reverse osmosis treatment was critically examined and the pros and cons were identified. While the pros were appreciated, remedies to cons were also suggested wherever possible.[4]

3. AIM OF THE STUDY

The aim of this research is to examine the effect of organoleptic properties of wastewater of Phagwara, water reservoirs.

4. OBJECTIVES

Ob1. To determine the odor of wastewater of Phagwara.

Ob2. To determine the color of wastewater of Phagwara.

Ob3. **To access them on the basis of Water Quality Index.**

5. SIGNIFICANCE OF THE STUDY

1. Measurement of odor is very essential to find out whether a chemical treatment to eliminate it required.
2. Measurement of color is very essential for an environmental engineer to find out whether a chemical treatment to eliminate it required.

3. It is also used to select the suitable chemicals and their required dosage in chemical treatment.
4. To find the aesthetic quality of the potable water and to check whether the water used for industrial processes is odor and color-free.[5]

6. AREA OF THE STUDY

Phagwara city is main industrial center in the Kapurthala district of Punjab, India, because of its good location on the National Highway No.1. The different types of industries like Guru Nanak Autos (GNA), Wahid Sandhar Sugar Mill, Jagjit Cotton Textile (JCT) Mills, Leather Industry, Dairy Industry, Tech World Computers and Rubber Industry etc. which are located in this city, release numerous industrial effluents & sewages and discharge into a naturally made Ganda Nala. These effluents affects on its premises and surrounding areas and later the river Kali Bein of Kapurthala District.

Fig.1: Map of Dist. Kapurthala Showing Phagwara

Fig.2: Sukhjit Starch & Chemical Ltd. Phagwara

7. WORKING STATIONS

The working stations were established with more or less similar distances. Samples were collected from definite sampling stations in 15 days interval from Jan. 2009 to Dec. 2011 from naturally made Ganda Nala in wide polythene bottles from midstream.

8. SAMPLING

Total seven samples were collected in every month one from each working station basis. After chemical analyses the average value of seven samples are put in Value Tables for further statistical operations.

9. METHODOLOGY

- **General methods of waste water analysis: Organoleptic Properties**

A. To characterize and measure the wastewater odor

The threshold odor of a water or wastewater sample is determined by diluting the sample with odor-free water. The **"threshold odor number" (TON)** corresponds to the greatest dilution of the sample with odor-free water at which an odor is just perceptible. The recommended sample size is 200 mL. The numerical value of the TON is determined as follows:

$$TON = \frac{A+B}{A}$$

where A = mL of sample and B= mL of odor-free water. The odor emanating from the liquid sample is determined with human subjects (often a panel of subjects) as discussed above.[6]

A.i. Data Collection and Interpretation of Wastewater Odor

After collecting the samples they are analyzed and data are arranges & interpreted.

Table No.1: The "Threshold Odor Number" (TON) of Wastewater

SN	Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2009	3	4	5	5	5	6	6	6	6	5	4	4
2	2010	5	5	5	6	6	6	6	6	6	6	5	5
3	2011	6	6	6	6	6	7	7	7	7	6	6	6

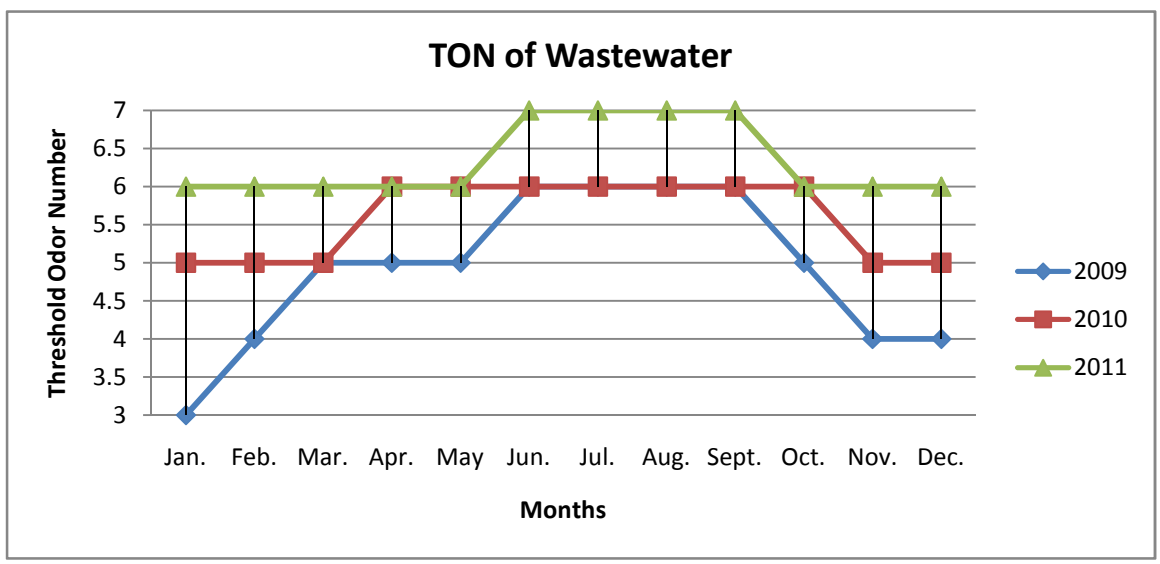

Fig.3: Graphical Representation of Threshold Odor Number (TON) of Wastewater

B. Visual Method of Quantitative Determination of Wastewater Color Index

An older visual method of determination of color index of water is used in fieldwork. Quantitative determination of the water color (called water color index) is carried out by colorimetric analysis, i.e. cobalt solutions (potassium chloroplatinate K_2PtCl_6 mixed with cobalt chloride $CoCl_2.6H_2O$). The primary reference solution is prepared as a mixture of 1.246 g of platinum salt with 1.009 g of crystalline cobalt chloride hexahydrate. These amounts of salts are dissolved in 100 ml of distilled water; 100 ml of hydrochloric acid with specific density 1.19 g cm^{-3} is added to this solution, and its volume is adjusted to 1.0 L with distilled water. The color index of the obtained solution is taken as 500°, because it contains 500 g of pure platinum per 10^6 ml of water. Standard solutions are prepared from various amount of the primary solution:

- No.1 – color index 0° (distilled water);
- No.2 – 10° (4 ml of primary solution are diluted with distilled water to a volume of 200 ml);
- No.3 – 20° (as reference solution No.2, but prepared of 8 ml of primary solution);
- No.4 – 30° (as reference solution No.2, but prepared of 12 ml of primary solution);
- No.5 – 40° (as reference solution No.2, but prepared of 16 ml of primary solution);
- No.6 – 50° (as reference solution No.2, but prepared of 20 ml of primary solution);
- No.7 – 60° (as reference solution No.2, but prepared of 24 ml of primary solution);
- No.8 – 70° (as reference solution No.2, but prepared of 28 ml of primary solution);
- No.9 – 80° (as reference solution No.2, but prepared of 32 ml of primary solution);

The water under investigation is compared with the reference solutions using a set of similar cylinders made of colorless glass, and so its color index is determined. The color index of the natural water depends on the presence of humic acids in the soil, on biological processes (water florescence), and on pollutants of various origin. This latter factor is decisive for wastewater.[7]

Calculation-

Color (Unit) = Estimated color x Dilution factor

B.i. Data Collection and Interpretation of Wastewater Color Index

After collecting the samples they are analyzed and data are arranges & interpreted.

Table No. 2: Measurement of wastewater true color in Platinum Cobalt Unit (PCU)

SN	Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	Avg.
1	2009	160	240	320	400	320	640	640	640	560	320	240	160	387
2	2010	400	400	400	480	480	560	560	560	480	480	400	400	467
3	2011	480	480	480	480	560	560	560	560	640	560	560	400	527
Avg.		347	373	400	453	453	587	587	587	560	453	400	320	460

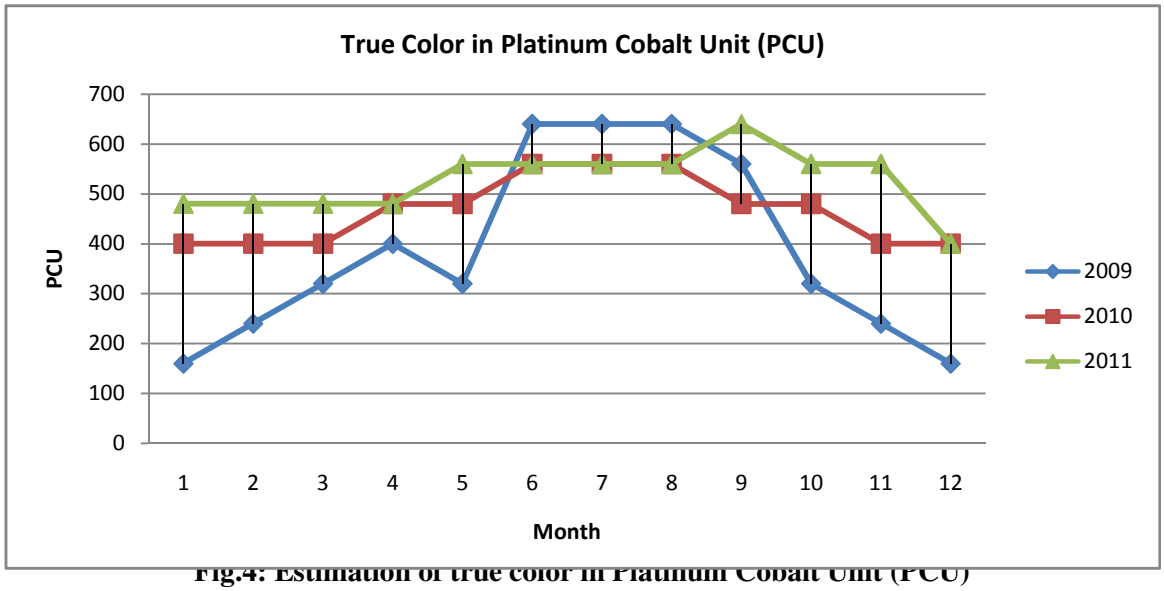

Fig.4: Estimation of true color in Platinum Cobalt Unit (PCU)

10. RESULTS & DISCUSSION

From the above table & graphical representation it is very clear that the threshold odor number is high in the month of June to September. It is also very clear that the value of OD is too high where dilution factor is 80. That indicates the waste water is more turbid. Thus it is necessary to regular monitoring and adopt preventing measures to control the organoleptic properties of wastewater of Phagwara for the sake of public health and to maintain clean & green healthy environment.

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