

## Assessment of Water Quality Index for GW and SW of Balco Industrial Area of Korba District, (C.G.) India



### Chemistry

**KEYWORDS :** Ground water, Surface Water, Quality rating, Water Quality Index

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### ABSTRACT

The water sources of Balco industrial area are heavily polluted due to industrial and seepage of industrial effluents in surface and ground water sources. To know the applicability of water sources for different purpose, water samples were collected from selected ten sites for three months i.e. from March 2009 to May 2009 and analyzed for parameters such as Temp., pH, EC, Turbidity, TDS, TS, Total Alkalinity and TH along with selected heavy metals viz. Fe, Al, Zn, Mn and As. The mean values of these parameters were compared with ISI, ICMR and WHO standards. All these parameters were considered for the computation of water quality rating and water quality index. The WQI's were found beyond the permissible level from 115.870 to 8023.476 for BS1 and BS5 sampling spots respectively. This clearly indicate that the pollution load increase in water source gradually.

### Introduction:

In nature the basic amenities are air, land and water, which should be pure for surviving and exist of all kinds of biosystems, but the situation is now reverse. Environmental pollution is the result of explosive population, indiscriminate urban industrialization and vast application of chemical fertilizers and pesticides in agriculture, water sources are getting undesirable foreign substances as resulting for unfit for human consumption (Sinha, Saxena & Saxena, 2004).

The concept of WQI was first proposed by Horten (Horten, 1965). Water quality index is a single number like a grade which indicates the overall quality of water. It is defined as a rating reflecting the composite influence of different water quality parameters on the entire quality of water. Water quality index for all the sample is calculated by weighted Arithmetic Index method with using the following formula

$$WQI = \frac{\sum W_i \times Q_i}{\sum W_i}$$

$$W_i \text{ (unit weight)} = \frac{k}{S_i}$$

$k$  = proportionality constant

$S_i$  = Standard desirable value of parameter

$$Q_i \text{ [sub-index]} = \frac{V_i - V_0}{S_i - V_0}$$

Whereas

$V_i$  = Concentration of parameter in the analysed water.

$S_i$  = Standard Desirable Value of parameter.

$V_0$  = Actual value of this parameter in pure water.

On the basis of WQI water sources are categorized in four classes 0 – 25 (excellent), 26 – 50 (Good), 51 – 75 (Poor), 76 – 100 (Very Poor) and > 100 (Unfit for Biosystem).

Different water bodies in India are facing acute water pollution. Pollution was measured in background of WQI by various water scientists, in which some are discussed here. Padmanbha and Belagali (2007) for kabini river in the Kallahally village of Nagaland Taluk. Raman and Geetha (2005) established correlation and WQI for GW. Yeshodha, Meenambal & Rajakumora (2011) calculated WQI for Hosur block of Krishnagiri district. Sinha, et al. (2004) measure WQI of Ram Ganga river at Muradabad. Lipei – Yue, Qian – Hui & Wijian – Hua (2010) assessed GW quality in Pengyangm country Ningxia, North – West China. Padmavathy, Rajendran, Ramchandramoorthy & Priyadarsini (2003) measure the pollution load in lake water on the basis of WQI and NSF Suggestions.

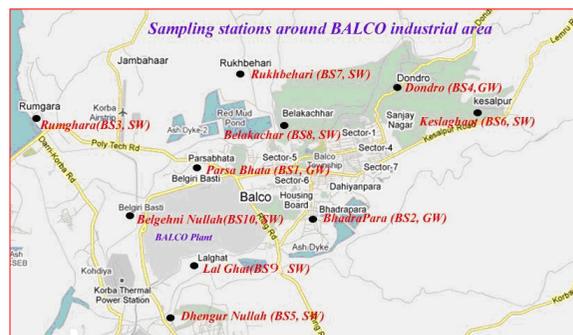
The Balco industrial area is located 8 km away from district

headquarter korba in North – East direction. The study field is spread around 180 Km<sup>2</sup>. The aluminum refining plant established in the year 1971. Bauxite is used as raw material and the annual production of refined aluminum is 3.7 Lakh tones. The haphazardly dumping and loading of raw and waste material, the GW and SW sources are polluted. So we have taken extensively monthly monitoring of water sources by physico – chemical and metallic elements. In the paper we have overemphasized the WQI in the background of selected water properties of different water bodies of Balco industrial area.

### Materials and Methods :

Ten sampling spots were chosen in and around Balco plant and were assigned from BS1 to BS10 (Figure No. 01). Samples were collected in precleaned polythene bottles in the period of March'2009 to May'2009 (Premonsoon). The water samples were analysed according to the methods described by APHA (2005), Trivedy & Goel (1986) and Manivaksam(2002). The observed results were compared with the drinking water standards recommended by the ICMR (1975), WHO(2008) and ISI(2004).

**Figure No. 01**  
**Location of Spots**



### Results and Discussion:

Fifteen water quality parameters were taken for water quality index calculation as described by Harkins (1974), Tiwari, Das & Bose (1986) & Mohanta & Patra (1985). WQI data depicted in Table no. 1 with site wise description. The quality rating of individual parameters and WQI of ten sites of the SW and GW source have been assessed. Water sources become free from pollutants when the value of quality rating is zero. Pollutants are present with the prescribed standard when  $0 < Q_i < 100$  implies pollutants are above the standard when quality rating is greater than 100. In study field the water quality rating is less than 100 for Temp. [BS1, BS2, BS4 and BS7], pH [BS2], EC [BS2], TDS [BS2, BS4, BS7], TSS [BS1 to BS4, BS7 to BS10], TS [BS2], TH [BS4], Mn [BS2, BS3, BS4, BS10], Zn [BS1 to BS10], Fe [BS1, BS2] whereas the quality rating is greater than 100 for Temp. [BS3, BS5, BS6, BS7, BS8 and BS10], pH [BS1 and BS3 to BS10],



**Conclusion:**

On the basis of the above calculated quality rating and WQI of water sources GW and SW of Balco industrial area was shown as min. at the sampling site BS1 and max. at the water sample of BS5. These finding results are indicated the selected water sources of the study fields are highly contaminated by undesirable elements. Some immediate measure is needed to save these water bodies from further damage. We have suggested some indigenous technique for purification of water before using in different fields.

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