*Journal of Advances in Science and Technology*
*Vol. 17, Issue No. 1, March-2020, ISSN 2230-9659*

# An Analysis the Industrial Waste Water Treatment Tested for Heavy Metal Toxicity

**Madhubala Sarojny[1]*, Dr. Rajesh Kumar Kushwaha[2]**

[1] Research Scholar, Shri Krishna University, Chhatarpur M.P.

[2] Associate Professor, Shri Krishna University, Chhatarpur M.P.

***Abstract - Today availability of fresh water is one of the major concerns for any country due to poor management of wastewater, ecological degradation and industrial effluent which are directly polluted to the natural resource. Estimation of heavy metals in potable water and in industrial effluents is very important because, some metals are essential and some are may affect adversely water consumers, waste water treatment systems or the biological systems of water bodies. Rourkela Steel Plant's effluent water was tested for heavy metal toxicity & water quality, as well as its effect on the groundwater quality in the surrounding 10 km2 area, as part of an investigation into the waste water treatment process. The Rourkela District's primary industrial sector has a high concentration of heavy metals, making water quality one of the most pressing concerns for all living things. Pb, Fe, Cr, & Zn are four heavy metals that we are looking for in the water at various points in the core industrial area as part of our research.***

***Keywords - Wastewater, Treatment Systems, Heavy Metals, Industrial Effluent***

---------------------------------x---------------------------------

## INTRODUCTION

The steel industry is one of today's and future's most significant and critical industries. It's a nation's asset. A vast volume of water is used for waste transfer, refrigeration, and dust management by steel plants. The steel plants include sintering factories, coke mills, blast furnaces, chemicals, and chemical systems, water cooling rolls, pumps, extraction testing, sludge, and slurries transmission lines. Both these plants use a huge volume of water to cool their goods and to remove the impurities from the stock done. In steel factories, wastewater is generated in huge quantities. In the drainage, there are also absorbed, unknown contaminants. The steel industry generates a large amount of waste water and sludge over the course of numerous manufacturing procedures. Advanced waste water management technologies have emerged from the steel sector with astonishing speed. Wastewater treatment in the steel industry, particularly industrial effluent treatment systems, has seen very little research despite a slew of publications on wastewater pollution control. Another benefit of this research is that it could help with recycling, water recovery, and steel industry sludge. Industrial waste water treatment systems can be divided into four subcategories based on how they use chemistry, physics, biology, and arithmetic. Methods like ion exchange, adsorption and adsorption/sedimentation/floatation used in physical therapy remove dissolved and hidden chemicals without altering their chemical structure. These mathematical concepts are extremely useful and practical for building a cost-effective municipal waste water treatment system that performs well.

One of the most important and vital industries now and in the future is steel. An important national asset. Steel plants utilize a large amount of water for waste transfer, refrigeration, & dust control. Water-chilled rolls and extrusion trials are among the equipment found in the steel plants. Sintering factories as well as coke plants are also found in the steel plants. It takes enormous amounts of water to chill and purify the finished goods at each of these facilities. The amount of waste water produced in steel manufacturers is enormous. There are also undiscovered pollutants that have been absorbed into the drainage. The steel industry generates waste water and sludge during a variety of production processes.

Advanced waste water management technologies have emerged from the steel sector with astonishing speed. Despite a considerable number of studies on wastewater pollution control, there are few studies on the design of industrial effluent treatment plants for the steel industry (ETP). This research could potentially help with water & steel sludge recycling and reuse.

Chemically, physically, biologically, & mathematically, all industrial waste water treatment systems can be divided into four classes. Physical therapy procedures include processes such as filtration, flotation, stripping, ion exchange, adsorption, and others that remove dissolved and hidden chemicals without altering their chemical structure.

## OBJECTIVES

1. To study the waste water treatment process.
2. To review heavy metal toxicity.

## METHODOLOGY

In this research study, the relevant material will be performed in the research priorities and the time framework consideration. Different texts, esteemed reviews, theses, and written materials will have been thoroughly scanned for the correct approaches. For the study of chemicals, groundwater and effluent water would be used. These tests would have been correctly collected to achieve the right outcome. To obtain knowledge about the issues, we will examine the analysis priorities, which will also be visited in the chosen study field. Upon completion of the report, various areas of research for water quality will be classified.

The processing of water samples shall be done from the normal water supply. The spring will be drained for some time before taking a water sample. The sample will be obtained for a hand pump after the water will have been rinsed out for 3 to 5 minutes so the soil and other artifacts will be removed from the water. The sample will be collected from the center and middle of the wells in the case of wells. Samples will be taken from starting points in the event of lakes or ponds. Before taking a sample, care will be taken to clear the water with floating and suspended impurities.

Samples will be screened on-site using the filter paper to eliminate suspended impurities from the wash. New/fresh filter papers will have been used for any instance of filtration. The sample for physical and chemical examination will have been collected with a clean and transparent 250 ml bottle of polythene.

## SURVEY OF STUDY AREA

Proper selection of site for collecting the sample to meet the research objectives requires proper survey of an appropriate study area. Considering the objectives of the research the selected study area were visited number of times for getting the information about the problems. Once the survey work is finished, different study area were classified for water pollution.

### Sampling

Water sample collection was carried out from the water source which is used in regular fashion. Before taking a water sample, the source was flushed for some time. In case of hand pump, the sample was collected after flushing out the water for 3 to 5 minutes in order to remove the dirt and other artifacts from the water. In case of wells, a care was taken to take the sample from middle and at mid depth from the wells. In case of lakes or pond, samples were collected from take-off points. Care was taken to remove the floating and suspended impurities from the water before taking a sample. In order to remove the suspended impurities from the water, samples were filtered with the filter paper on site. For every instances of filtration, new/fresh filter papers were used. Clean and clear 250 ml polythene bottle was used for collecting the sample for physico-chemical analysis. The bottle was washed two to three times with the sample water before collecting the water samples. Acid rinsed (0.1 N HCl) bottle was used for collecting the sample for heavy metal analysis. A unique ID number is written on each sample bottle.

## RESULTS AND ANALYSIS

In the present study 33 samples were gathered from these area including effluent water (n =3), surface water(n= 1), recycle stored water Maroda –I (n= 1) & ground water (n=28) in year 2016. A GPS receiver was used to pinpoint the exact position of the study area. The water sampling details along with latitude and longitude given on Table – 1 (a).

**Table-1(a): The water sampling location along with latitude and longitude**

| Sampling area | Source of water | Latitude | Longitude |
|---|---|---|---|
| PURENA | Hand Pump | N – 21 12"00.02" | E – 81˚23"41. 19" |
| SOMNI | Hand pump | N – 21 11" 02.36" | E – 81˚26" 04.70" |
| KHUSIPAR | Hand Pump | N – 21˚12" 25.02" | E – 81˚23" 50.48 " |
| UTAI | Hand pump | N – 21˚07" 13.19" | E – 81˚22" 51.67" |
| MORID | Hand pump | N – 21˚09" 44.58" | E – 81˚25" 17.03" |
| SUPELA | Tube well | N – 21 12"30.44" | E – 81˚20" 51.95" |
| MAHKA KHURD | Hand pump | N – 21˚08" 48.11" | E – 81˚25" 27.29" |
| MAHKA KALAN | Hand pump | N – 21 08" 03.24" | E – 81˚25" 22.05" |
| DUNDERA | Hand pump | N – 21˚09" 09.00" | E – 81˚23" 58.97" |



Madhubala Sarojny[1]*, Dr. Rajesh Kumar Kushwaha[2]

| | | | |
|---|---|---|---|
| GANIYARI | Hand pump | N – 21˚09" 51.08" | E – 81˚26" 35.64" |
| JUNWANI | Hand pump | N – 21˚13" 14.79" | E – 81˚19" 08.28" |
| UMARPOTI | Hand pump | N – 21 07" 37.35" | E – 81˚20" 42.82" |
| KHOPLI | Hand pump | N – 21˚05" 49.70" | E – 81˚22" 35.40" |
| PATORA | Hand pump | N – 21˚06" 38.11" | E – 81˚23" 56.75" |
| JORATARAI | Hand pump | N – 21˚09" 45.87" | E – 81˚23" 40.74" |
| PAREWADIH | Hand pump | N – 21˚08" 20.11" | E – 81˚24" 43.23" |
| BORIYA NALA | Outlet Sample | N – 21˚12" 22.14" | E – 81˚23" 19.48" |
| KOSA NALA | Surface Water | N- 21˚12" 16.65" | E – 81˚20" 15.65" |
| KOHKA | Hand pump | N – 21 13" 29.92" | E – 81˚20" 24.95" |
| KOTRABHATA | Hand pump | N - 21˚14' 18.73" | E - 81˚19' 10.22" |
| KATULBOD | Tube well | N - 21˚12' 17.65" | E - 81˚18' 44.12" |
| BORSI | Hand pump | N - 21˚09' 55.44" | E - 81˚18' 35.80" |
| HANODA | Hand pump | N - 21˚08' 14.06" | E - 81˚18' 08.48" |
| DHANAURA | Hand pump | N - 21˚08' 31.92" | E - 81˚19' 24.23" |
| KHAMHARIA | Hand pump | N - 21 07' 44.36" | E - 81˚19' 42.39" |
| PURAI | Hand pump | N - 21˚07' 09.39" | E - 81˚20' 45.39" |
| RISALI | Hand pump | N - 21˚09' 15.15" | E - 81 20' 17.49" |
| MARODA TALAB | Surface water | N - 21 ˚09' 45.96" N - 21 09' 45.78" | E - 81 ˚ 21' 50.84" E - 81˚21' 51.25" |
| NEWAI | Hand pump | N - 21˚09' 05.90" | E - 81˚21' 45.28" |
| DUMARDIH | Tube well | N - 21˚07' 16.58" | E - 81˚23' 46.18" |
| MUDPAR | Hand pump | N - 21˚07' 12.54" | E - 81˚25' 31.49" |
| PURENA NALA | Outlet Sample | N - 21˚11' 30.84" | E - 81˚25' 19.40" |
| SOMNI NALA | Outlet Sample | N - 21 11' 17.91" | E - 81˚26' 04.94" |

The obtained result analyzed with the help of APHA standard method and the obtained result compared with prescribed limit of WHO and BIS for drinking purpose. The standard range of WHO and BIS limit given on Table 2 (b).

**Table -2(b): Standard range of WHO and BIS for drinking water.**

| S. No | Parameters | WHO | BIS |
|---|---|---|---|
| 1 | pH | 6.5-8.5 | 6.5-8.5 |
| 2 | EC,µS/cm | 500 | 500 |
| 3 | Hardness, mg/1 | 100-300 | 200 |
| 4 | Alkalinity ,mg/1 | 300 | 200 |
| 5 | TDS,mg/1 | 600 | 500 |
| 6 | $Ca^{++}$, mg/1 | 75 | 75 |
| 7 | F-, mg/1 | 1.5 | 1 |
| 8 | Cl-, mg/1 | 250 | 200 |
| 9 | SO42-,mg/1 | 200 | 200 |
| 10 | Pb, mg/1 | 0.01 | 0.01 |
| 11 | Fe, mg/1 | 0.3 | 0.3 |
| 12 | Cr, mg/1 | 0.05 | 0.05 |
| 13 | Zn, mg/1 | 3 | 5 |

## PHYSICO-CHEMICAL PARAMETERS

### pH

The chemical state of ground water is usually defined in terms of pH, Oxidation- reduction [O.Hart 2017]. pH has been categorized under secondary drinking water standard as it does not pose a health risk. pH is the negative log of hydrogen ion concentration. The Water's Acidity or Alkalinity is a Factor in This. If the pH of a sample falls below 7.0, it is called acidic. As for the pH, it is Alkaline when it is above 7.0.

### EC

The electrical conductivity is also one of the important physical properties of the ground water. Electrical conductivity tell us about the ionic strength and degree of ionic mineralization i,e. heavy metal concentration [Nasrullah 2017].

### Total Alkalinity

The Alkalinity of the Water is basically caused by the hydroxidebicarbonate and carbonate ions. The main cause of these ions is the dissolution of minerals in atmosphere. The alkalinity nature of water is due to the presence of OH**-** and CO3**—**ions. Alkalinity represents the acid neutralizing ability of the sample.

### Total Dissolved Solid

In the field, the concentration of TDS is generally is approximated by calculating the specific conductance of water sample. The standard value of

TDS in fresh water is less than 1000 mg/l [Khurshid 1997]. TDS is an important factor which tells us about the quality of the drinking water. The total dissolved solids (TDS) is the sum of all the inorganic & organic stuff in water, measured as a solution. Everything in water that isn't Pure Water molecules is in it. Water with a high TDS content is almost always considered hard water.

## Total Hardness

The presence of divalent metallic cations such as Mg, Ca,Fe, anamneses ions are attributed to the hardness of water. Metal like calcium, magnesium gets mixed into natural water when water comes in contact with the soil rocks containing large amount of mineral deposits [S. Buchanan 2017]. Groundwater hardness is mostly owing to the presence of bicarbonates, carbonates, sulphates, & chlorides of calcium and magnesium in its composition..

## CHLORIDE [Cl-]

Chloride is already present in natural water and it is one of the constituent of natural water but its concentration is very low in natural water. Domestic sewage, industrial wastes are the main source of chlorides in water. It also mixed in water soil from rocks due to weathering (WHO,[APHA.2017] ).

## SULFATE [$SO4^{2-}$]

The major source of higher concentration of sulfate is point sources like sewage treatment plants and industrial discharges into water bodies. As a safety measure, water with a sulfate level exceeding 400 mg/l should not be used

## FLUORIDE [F-]

Excess intake of fluoride through drinking water causes fluorosis on human being.

## CALCIUM [Ca++]

Calcium is the third the most abundant material found in earth's crust. Its atomic number is 20.The reactivity of calcium is less than the alkaline metal as well as the alkaline earth metal. Calcium is generally deposited in pipes and boilers and mixed in water making it hard i.e., water with calcium and magnesium. Water softeners are generally used for making the water soft. Osteoporosis is a bone disease which makes the bones very porous leading to the occurrences of frequent fractures. Osteoporosis is basically caused because of lack of calcium.

Physiochemical parameters -The physicochemical parameters namely pH ,EC ,TDS, Alkalinity, Hardness,F,Cl,SO4,Ca,Pb and, Cr,Fe, Zn for surface water of study area are presented in 3(c) in the year 2016

**Table 3(c): Physiochemical parameter values for Surface water in year 2016.**

| S.No. | Parameters | MarodaTalab | Boriya Nala | Purena Nala | Somni Nala | Kosa Nala |
|---|---|---|---|---|---|---|
| 1 | Ph | 7.91 | 7.22 | 7.21 | 7.08 | 6.76 |
| 2 | EC µS/cm | 680 | 528 | 650 | 670 | 600 |
| 3 | Hardness mg/l | 370 | 220 | 90 | 390 | 280 |
| 4 | Alkalinity mg/l | 210 | 300 | 310 | 350 | 190 |
| 5 | TDS mg/l | 820 | 760 | 624 | 744 | 633 |
| 6 | Ca mg/l | 220 | 320 | 300 | 100 | 105 |
| 7 | $SO_4^{2-}$mg/l | 160.21 | 100.43 | 158.45 | 83.32 | 26.34 |
| 8 | F- mg/l | 1.84 | 1.32 | 1.63 | 1.78 | 1.32 |
| 9 | Cl- mg/ | 109 | 50 | 100 | 80 | 60 |
| 10 | Pb mg/l | 0.02 | 0.01 | 0.02 | 0.01 | 0.03 |
| 11 | Fe mg/l | 0.31 | 0.57 | 0.33 | 0.67 | 0.49 |
| 12 | Cr mg/l | 0.05 | 0.03 | 0.05 | 0.04 | 0.03 |
| 13 | Zn mg/l | 0.08 | 0.01 | 2.17 | 1.45 | 0.09 |

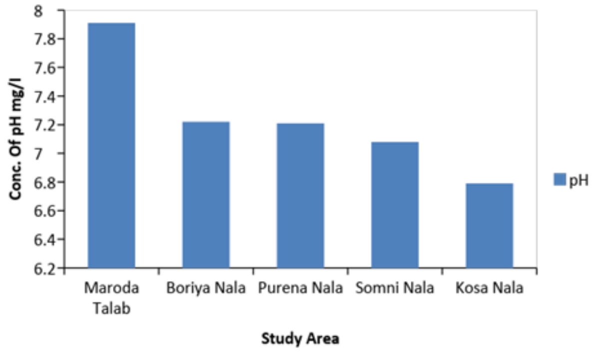


**Fig -1: Represent the pH among the different sampling location of surface water of StudyArea.**

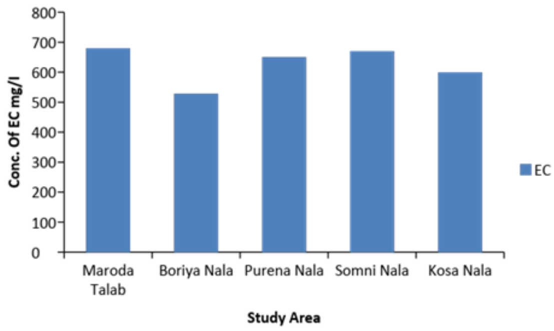


**Fig- 2: Represent the EC among the different sampling location of surface water of StudyArea.**

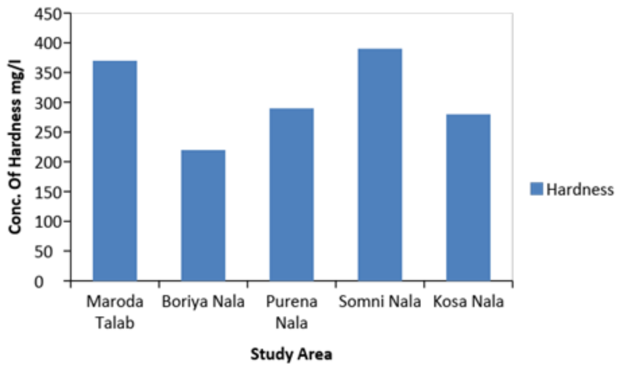

**Fig -3: Represent the Hardness among the different sampling locationof surface water of StudyArea.**

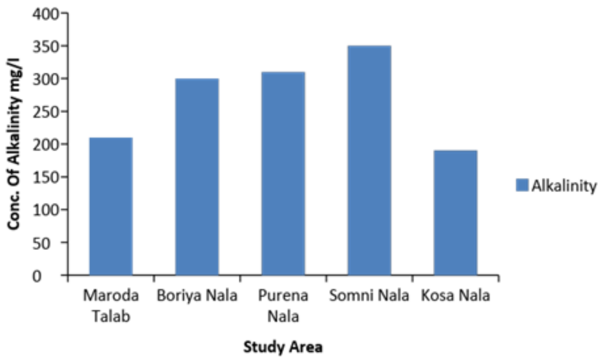


**Fig -4: Represent the Alkalinity among the different sampling location of surface water of StudyArea.**

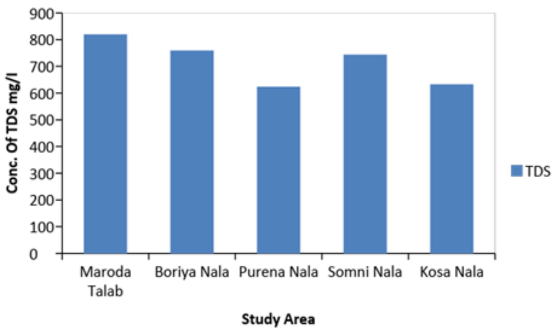


**Fig -5: Represent the TDS among the different sampling location of surface water of Study Area.**

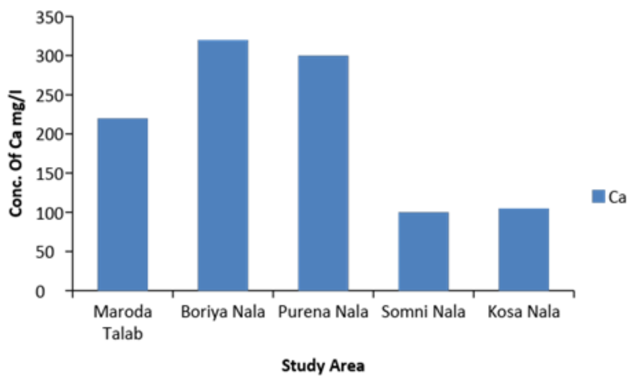


**Fig -6: Represent the Ca among the different sampling location of surface water of Study Area.**

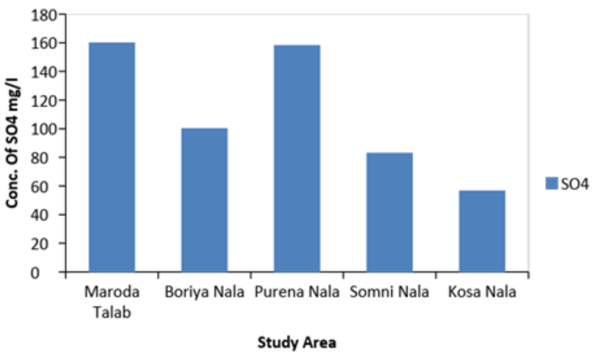


**Fig -7: Represent the $SO_4$among the different sampling location ofsurface water of StudyArea.**

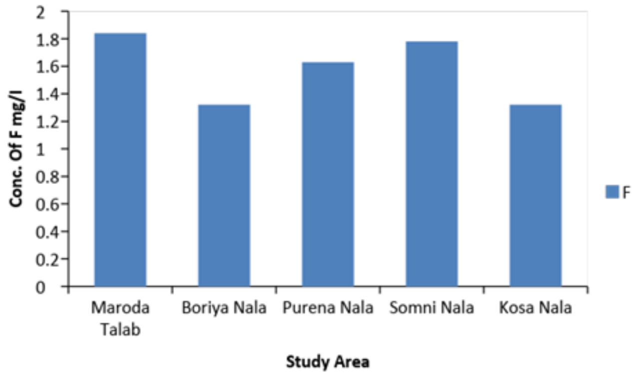


**Fig -8: Represent the F among the different sampling location ofsurface water of StudyArea.**

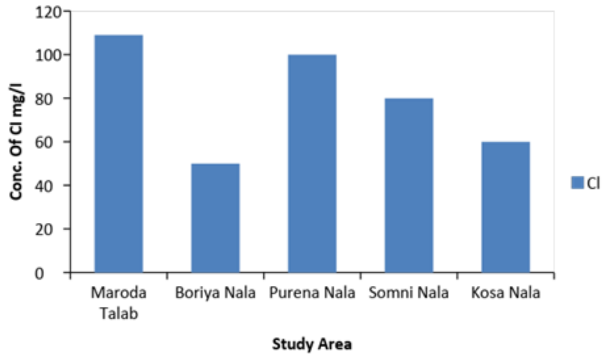


**Fig -9: Represent the Cl among the different sampling location of surface water of StudyArea.**

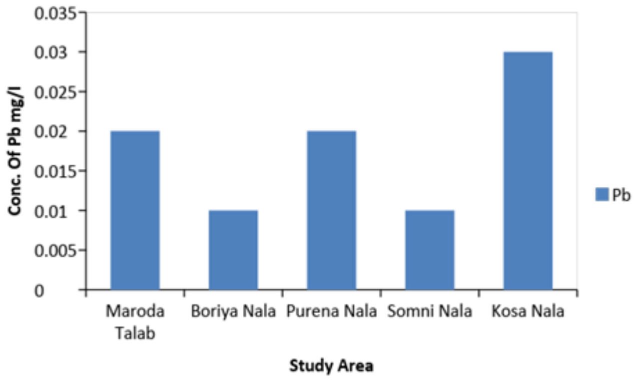


**Fig -10: Represent the Pb among the different sampling location of surface water of StudyArea.**

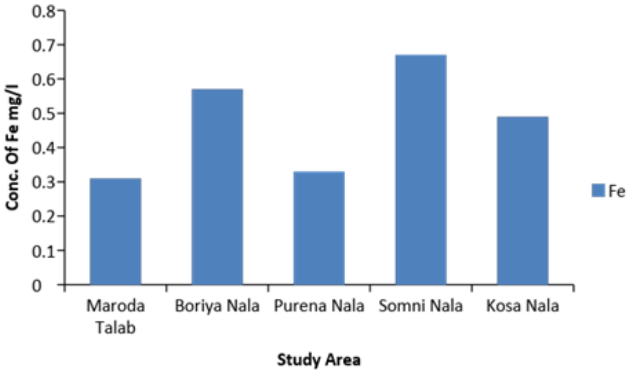


**Fig -11: Represent the Fe among the different sampling location of surface water of StudyArea.**

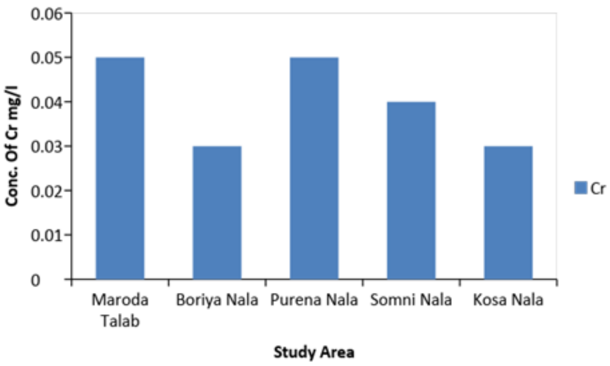


**Fig -12: Represent the Cr among the different sampling location of surface water of StudyArea.**

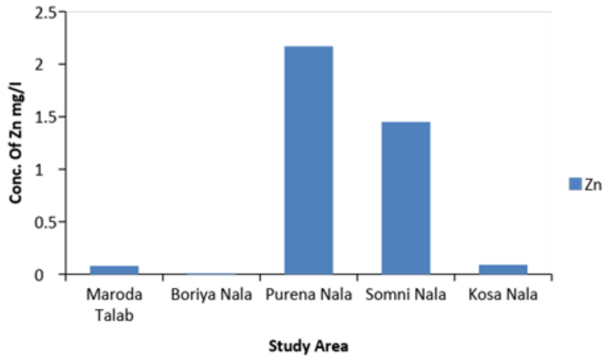


**Fig -13: Represent the Zn among the different sampling location of surface water of Study Area.**

**pH-** The concentration of pH for surface water was 6.7 To 7.9 with Mean value 7.2 along with SD 0.44,which indicate that pH value was within prescribed limit of WHO and BIS.

**EC-** The concentration of EC for surface water was 528 μS/cm To 680μS/cm with Mean value 625μS/cm along with SD 62.66μS/cm, which indicate that EC value was within prescribed limit of WHO and BIS for industrial effluent . Earlier research for industrial waste water of Rourkela indicated 1433-3425 μS/cm (Ankita et al 2016) which indicated higher concentration of EC .The study reviled that outlets water of BSP is treated water before discharge which make concentration within range of industrial standard.

**Hardness-** The concentration of Hardness for surface water 290-390 mg/l with mean value 306 along with SD 64.67 mg/l. The concentration ofHardness for surface water was within range of industrial waste water. Earlier research for Industrial waste water of Rourkela, concluded 370 – 490 mg/l (Ankita et al 2016) indicated higher range of Hardness comparatively BSP waste water.

**Alkalinity-** The concentration of Alkalinity 190- 350 mg/l for surface water mg/l with mean value 272mg/l along with 68.67 mg/l. The concentration of Alkalinity for surface water was within range of industrial waste water.

**TDS** -The concentration of TDS for surface water 624-820mg/l with mean value 716.2 mg/l along with SD 132.22 mg/l. The concentration of Hardness for surface water was within range of industrial waste water. Earlier research for Industrial waste water of Rourkela, concluded 4903 mg/l – 5308 mg/l indicated higher range of TDS comparatively BSP wastewater.

**Ca-** The concentration of Calcium for surface water 89- 500 mg/l with mean value 207 mg/l along with SD 81.67. The concentration of Calcium for surface water was within range of industrial waste water.

**$SO_4$-**The concentration of SO4 for surface water was 26- 160 mg/l with Mean value 105 mg/l along with SD 94.6, mg/l which indicate that SO4 value was within prescribed limit of WHO and BIS.

**F-**The concentration of F for surface water was 1.32-1.82 mg/l with Mean value 1.54 mg/l along with SD 0.3 mg/l, which indicate that F value was within prescribed limit of WHO and BIS for industrial wastewater.

**Cl-** The concentration of Cl for surface water was 50- 109 mg/l with Mean value 81 mg/l along with SD 75 mg/l, which indicate that Cl value was within prescribed limit of WHO and BIS for industrial waste water.

**Pb-**The concentration of Pb for surface water was 0.01- 0.03 with Mean value 0.01mg/l along with SD 0.008, which indicate that Pb value was within the prescribed limit industrial waste water.

**Fe-** The concentration of F for surface water was 0.31- 0.67 mg/l with Mean value 0.47 mg/l along with SD 0.15 mg/l, which indicate that Fe value, was within prescribed limit of industrial waste water.

**Cr-**The concentration of Cr for surface water was 0.03- 0.05 mg/l with Mean value 0.04mg/l along with SD 0.01 mg/l, which indicate that Cr value was within prescribed limit of WHO and BIS for industrial waste water.

**Zn-** The concentration of F for surface water was 0.082- 2.17 mg/l with Mean value 0.74mg/l along with SD 0.08 mg/l, which indicate that Zn value, was within prescribed limit of industrial waste water. The physicochemical parameters namely pH, EC ,TDS, Alkalinity, Hardness,F,Cl,SO4,Ca,Pb,Cr,Fe and Zn for ground water of study area are presented in 4(d) in the year 2016

**Table 4(d): Physiochemical parameter values for ground water in Year 2016.**

| Sample Id | STUDY AREA | pH | EC µS/cm | HARDNESS mg/l | ALKALINITY mg/l |
|---|---|---|---|---|---|
| S1 | PURENA | 6.78 | 490 | 290 | 200 |
| S2 | SOMNI | 6.96 | 650 | 260 | 190 |
| S3 | KURSIPAR | 6.55 | 460 | 170 | 270 |
| S4 | UTTAI | 6.81 | 530 | 220 | 240 |
| S5 | MORID | 6.98 | 700 | 100 | 210 |
| S6 | SUPELA | 6.53 | 410 | 290 | 300 |
| S7 | MAHAK KURUD | 7.08 | 640 | 350 | 100 |
| S8 | MAHAKA KALA | 7.0 | 650 | 160 | 100 |
| S9 | DUNDERA | 7.05 | 690 | 170 | 280 |
| S10 | GANIYARI | 7.24 | 660 | 200 | 310 |
| S11 | JUNWANI | 6.48 | 300 | 210 | 250 |
| S12 | UMARPOTI | 6.84 | 420 | 250 | 200 |
| S13 | KHOPLI | 7.03 | 550 | 300 | 220 |
| S14 | PATORA | 6.98 | 600 | 200 | 250 |
| S15 | JORATARAI | 7.05 | 670 | 230 | 200 |
| S16 | PAREWADIH | 7.98 | 650 | 260 | 300 |
| S19 | KOHAKA | 7.01 | 400 | 260 | 160 |
| S20 | KOTRABHATA | 6.51 | 390 | 290 | 350 |
| S21 | KATULBOD | 6.85 | 340 | 240 | 130 |
| S22 | BORSI | 7.45 | 320 | 200 | 250 |
| S23 | HANODA | 7.06 | 330 | 310 | 320 |
| S24 | DHANAURA | 6.91 | 450 | 380 | 190 |
| S25 | KHAMHARIA | 6.95 | 410 | 400 | 280 |
| S26 | PURAI | 6.95 | 430 | 170 | 310 |
| S27 | RISHALI | 7.21 | 515 | 320 | 170 |
| S29 | NEWAI | 6.83 | 700 | 340 | 240 |
| S30 | DUMARDIH | 7.02 | 710 | 220 | 180 |
| S31 | MUDPAR | 6.98 | 670 | 180 | 290 |

**The physicochemical parameters namely pH ,EC ,TDS, Alkalinity, Hardness, $F^-$, $Cl^-$, $SO_4^{2-}$ ,$Ca^{++}$,Pb,Cr,Fe and Zn for ground water of study area are presented in 5(e) in the year 2016.**

**Table 5(e): Physiochemical parameter values for all sampling sites in Year 2016.**

| Sample area | TDS mg/l | $SO_4^{2-}$ mg/l |
|---|---|---|
| S1 | 720 | 41.75 |
| S2 | 600 | 55.32 |
| S3 | 540 | 80.98 |
| S4 | 740 | 147.42 |
| S5 | 600 | 31.51 |
| S6 | 672 | 68.95 |
| S7 | 924 | 68.95 |
| S8 | 700 | 41.87 |
| S9 | 573 | 61.34 |
| S10 | 660 | 31.51 |
| S11 | 520 | 90.21 |
| S12 | 546 | 94.61 |
| S13 | 592 | 34.66 |
| S14 | 546 | 50.54 |

| | | |
|---|---|---|
| S15 | 526 | 96.67 |
| S16 | 680 | 100.12 |
| S19 | 629 | 69.23 |
| S20 | 700 | 51.87 |
| S21 | 500 | 51.12 |
| S22 | 612 | 90.95 |
| S23 | 804 | 62.29 |
| S24 | 744 | 67.78 |
| S25 | 984 | 45.64 |
| S26 | 720 | 84.37 |
| S27 | 648 | 127.36 |
| S29 | 744 | 80.06 |
| S30 | 540 | 39.12 |
| S31 | 624 | 28.53 |

The physicochemical parameters namely pH ,EC ,TDS, Alkalinity, Hardness,F,CL,SO4,Ca,Pb,Cr,Fe and Zn for ground water of study area are presented in 6(d) in the year 2016

**Table 6(f): Physiochemical parameter values for all sampling sites in Year 2016.**

| Sample area | $F^-$ mg/l | $Cl^-$ mg/l | $Ca^{++}$ mg/l |
|---|---|---|---|
| S1 | 0.04 | 80 | 94 |
| S2 | 0.02 | 50 | 161 |
| S3 | 0.46 | 20 | 171 |
| S4 | 0.31 | 100 | 202 |
| S5 | 0.14 | 150 | 107 |
| S6 | 0.08 | 190 | 174 |
| S7 | 0.38 | 50 | 106 |
| S8 | 0.26 | 100 | 205 |
| S9 | 0.02 | 20 | 131 |
| S10 | 0.17 | 80 | 162 |
| S11 | 0.50 | 50 | 300 |
| S12 | 0.36 | 80 | 200 |
| S13 | 0.07 | 60 | 205 |
| S14 | 0.26 | 80 | 236 |
| S15 | 0.55 | 80 | 105 |
| S16 | 0.06 | 100 | 100 |
| S19 | 0.46 | 100 | 163 |
| S20 | 0.52 | 120 | 125 |

| | | | |
|---|---|---|---|
| S21 | 0.43 | 50 | 85 |
| S22 | 0.53 | 60 | 145 |
| S23 | 0.13 | 40 | 153 |
| S24 | 0.13 | 50 | 74.9 |
| S25 | 0.11 | 140 | 122 |
| S26 | 0.33 | 120 | 168 |
| S27 | 0.30 | 50 | 155 |
| S29 | 0.63 | 40 | 185 |
| S30 | 0.45 | 50 | 251 |
| S31 | 0.03 | 50 | 142 |

## CONCLUSION

Industrial waste constitutes the major sources of various kinds of metal pollution in natural water. The metals of most immediate concern are chromium, manganese, iron, cobalt, nickel, copper, zinc, cadmium, mercury and lead. The aim of wastewater treatment is to eliminate pollution up to a minimum to deter environmental and human health threats. This is achieved by collecting and treating waste water in vast plants until it is allowed again into the atmosphere. All the house water used in drains or in the sewer system is called wastewater.In the current study an attempt has been made to estimate the effectiveness of the treatment method by physico-chemical studies of outlets and recycle stored water Maroda-I of Rourkela Steel Plant.The obtained result analyzed with the help of APHA standard method and the obtained result compared with prescribed limit of WHO and BIS.This investigation is, therefore consorted effort towards the understanding the effectiveness of treatment and evaluate its effluent impact on groundwater quality.

## REFERENCES

1. B.M.R. Faisal., R. K. Majumder., J.U.Mohammed. A.H.Mohammed., "Studies on heavy metals in industrial effluent, river and groundwater of Savar industrial area, Bangladesh by Principal Component Analysis International" . Int. Res. J. Environment Sci, 2017,2[4]:34-38.
2. B.Prashad.,J.M.Bose "Evaluation of the heavy metal pollution index for surface and spring water near a limestone mining area of the lower Himalyas" Environ Geol,2017,41[1]:183-188.
3. Baruah, A., Chaudhary, V., Malik, R., &Tomer, V. K. (2019). Nanotechnology based solutions for wastewater treatment. In Nanotechnology in Water and wastewater treatment (pp. 337-368). Elsevier.
4. Bera, S. P., Godhaniya, M., & Kothari, C. (2018). Emerging and advanced membrane technology for wastewater treatment: A review. Journal of Basic Microbiology, 62(3-4), 245-259.
5. C. L. BEH, T. G. CHUAH (2017) on "Removal of Heavy Metals from Steel Making Waste Water by Using Electric Arc Furnace Slag", CODEN ECJHAO E-Journal of Chemistry, 2557-2564
6. C.E.Renn: Investigating water problems. Educational products division, LaMoltechemical products company, Maryland.
7. C.R.Ramakrishnalih, C.Sadashivalahand,G. Ranganna, G., Assessment of Water Quality Index for the Groundwater in TumkurTaluk, Karnataka State, India, E-Journal of Chemistry,2017, 6: 523-530.
8. Cao, AM, Monnel, JD, Matranga, C, Wu, JM, Coa, LL & Cao, D 2017, 'Nano size copper oxide in removal of Arsenic(III) from wastewater, Journal of Physical Chemistry C, vol. 111, pp.12624-28.
9. ChinazaGodswillAwuchi (2020) on "Industrial Waste Management, Treatment, and Health Issues: Wastewater, Solid, and Electronic Wastes", European academic research vol 3, issue 2
10. CPCB., 2013. General standards for discharge of environmental pollutants part-A: Effluents. Central Pollution Control Board, New Delhi, India.
11. D.K. Pandey.,S.Biswas., R. Sharma.,C.S.Mishram,"Analysis of Water Quality Parameters of Ground and Surface Water inSiltaraIndustrial Area, Raipur, Chhattisgarh, INDIA". IJCSMT,2017,2[1]:8-12.
12. D.K.Pandey.,S.Biswas., R.,Sharma,C.S.Mishram,"Analysis of Water Quality Parameters of Ground and Surface Water inSiltara Industrial Area, Raipur, Chhattisgarh, INDIAIJCSMT,2017,2[1]:8-12.
13. Dai, C., Yang, L., Wang, J., Li, D., Zhang, Y., & Zhou, X. (2018). Enhancing anaerobic digestion of pharmaceutical industries wastewater with the composite addition of zero valent iron (ZVI) and granular activated carbon (GAC). Bioresource Technology, 346, 126566.

14. Das., "Environmental impact due to iron ore mining in Chhattisgarh". Recent Res. Sci. Technol. 2017, 6:27-29.

15. Erika Alcamisi, Ismael Matino (2017) on "Wastewater treatment in iron and steel industry: process integration for water re-use", 1st International Process Integration Forum for the Steel Industry, At: Lulea (Sweden)

16. F.M.Henretig .Lead. In: Golgfrank LR, editor. Goldfrank"sToxicoliogic Emergencies. 8th ed. McGraw Hill Professional; 2017.

17. Fahiminia, M., Ardani, R., Hashemi, S., &Alizadeh, M. (2017). Wastewater treatment of stone cutting industries by coagulation process.

18. Farghaly, M. G., Attia, H., Saleh, H. A., Ramadan, A. M., &Khalek, A. (2019). A combined hydrocyclone-electrocoagulation treatment for different types of industrial wastewater. Physicochemical Problems of Mineral Processing, 57.

19. G. Matta., R., Kumar., A. Kumar .,A. Kumar., "A study on physicochemical Characteristics to assess the pollution status of River Ganga in Uttarakhand", INTERNATIONAL JOURNAL OF GEOMATICS AND GEOSCIENCES,Volume ,2017,5[ 1].

20. G. Singh., D. D. Singh., S.K. Sharma, "Effect of polluted surface water on Groundwater: A case study of BudhaNullah", IOSR Journal of Mechanical and Civil Engineering, 2017. 5[ 5]: 01-08.

**Corresponding Author**

**Madhubala Sarojny***

Research Scholar, Shri Krishna University, Chhatarpur M.P.