# **ANALYSIS OF WASTE WATER SAMPLE OF WARD NUMBER 5, 6, 7 OF JAGDALPUR CITY BEFORE DISCHARGING IN INDRAVATI RIVER**

# **INTODUCTION:-**

# In our major project we analyzing the quality of waste water of ward number 5,6 and 7 of Jagdalpur city. Waste water of 5,6 and 7 ward is disposed into the Indrawati river (behind the district jail) without any treatment. The area of which waste water is analyzing is shown in the map by green dotted line. The main drain through which the waste water of whole area is disposed to the Indrawati River is shown on map by red line. The map of the area is attached.

# According to IS standard certain limits are given for different parameters in order to analyze the quality of waste water. If any of the parameter crosses the limit prescribed by the IS standard should not be disposal directly into the river. We have analyzed the quality of waste of the area to know whether it should directly dispose into river or not. We analyze some parameters for the waste water of area, list of which is given below-

# **List of parameters:-**

# Temperature

# PH value

# Solids

# Total solid

# Volatile solid

# Fixed solid

# Suspended solid

# Dissolved oxygen (D.O.)

# Biological oxygen demand (B.O.D)

# Chemical oxygen demand (C.O.D)

# Ammoniac nitrogen.

# **SAMPLING**

# Sampling program and procedure:-

# The collection of representative sample is the main important function of an analyst. The interpretation of result and recommendation for treatment are all based on analysis report scrupulous care in the collection of sample is therefore necessary to ensure that the sample is representative of the body of the water under examination and to avoid accidental contamination of the sample during collection.

# Three types of samples are often collected depending on situation:-

# **Grab sample:-**

# Grab sample are single collected at specific spot at a site over a short period of time (typically seconds or minutes). This they represent a “snap shot” in both space and time of a sampling area. Discrete grab samples are taken at selected location rapid time. Depth in integrated grab sample are collected over a three determined part of the entire depth of water column at a selected location and time in given body of a water.

# A sample can represent only the composition of its source at the time and place of collection. However when a source is known to the relatively constant composition over an extended time or over substantial distances in all directions, then the sample may represent a longer time period and/or a large volume then the specific time and place at which it was collected. In such circumstances, a same may be represented adequately by single grab sample examples are protected ground water supplies, water supplies receiving conventional treatment, some well mixed surface water, but rarely, waste water stream, river, large lakes, shore line, estuaries and ground water plums.

# **ENVIRONMENTAL SIGNIFICANCE**

# 1) TEMPRATURE:-

# The temperature of water is very important parameter because its effect on chemical reaction rates aquatic life and suitability of water for beneficial increase temperature can cause change in the specious of fish that can exist in the receiving water body.

# In addition oxygen is less soluble in warm water than in cold water. The increase in the rate of biochemical reaction that accompanies increase in temperature, combined with the decrease in the quantity of oxygen present in surface water can often cause serious depletion in D.O. concentration in the summer month. It shows also be realize that a sudden change in temperature that can a result in a high rate of mortality of aquatic life more ever abnormally high temperature can faster the growth of undesirable water plant and waste water.

# 2) PH:-

# The hydrogen ion concentration is an important of both neutral water and waste water. The concentration range suitable for existence of most biological life is quite narrows and critical. Wastewater with an adverse concentration of hydrogen ion is difficult to treat by biologically mean, and if the concentration is not alerted before discharge, the waste water effluent may alter the concentration in natural water.

# 

# 3) TOTAL SOLID-

# The term solid refer to the matter either filterable or non filterable that remains as residue upon evaporation and subsequent drying at a defined temperature. Highly mineralized water is unsuitable for many industrial applications. High suspended solid in the water may be aesthetically unsatisfactory for such purpose as bathing. Analysis of total solid is important to decide upon the various unit operations and process in physical and biological wastewater treatment and to assess its performance evaluation .For assessing compliance with regulatory agency.

# 4) SUSPENDED SOLID-

# Suspended solid can lead to the sludge deposit and aerobic condition when untreated water is discharged into aquatic environment.

# 5) DISSOLVED OXYGEN (DO):-

# The dissolved oxygen analysis measure the amount of gases oxygen dissolved in water. This test is used to evaluate the pollution strength of domestic and waste water. The higher value of D.O. is caused corrosion of steel and iron. D.O. in waste water encourages the growth of aerobic bacteria. Aerobic bacteria live when oxygen is available in plenty Aerobic conditions do prevail when sufficient do is available within water end products of aerobic are stable and foul smelling.

# 6) BIOCHEMICAL OXYGEN DEMAND (BOD):-

# The test measures the oxygen utilized the biochemical degradation of organic material and oxidation of inorganic material such as sulphides and ferrous ions during a specified incubation period. It also measures the oxygen used to oxidize reduced forms of nitrogen unless their oxidation is prevented by an inhibitor. Temperature effects are held constant by performing a test at fixed temperature. The methodology of BOD test is to compute a difference between initial and final Do of the sample incubation. DO is estimate by eudiometric titration.

# 7) CHEMICAL OXYGEN DEMAND (COD):-

# The open reflux method is suitable for a wide range of waste with a large sample size.

# The dichromate reflux method is preferred over procedures using other oxidant because of its superior oxidizing ability, applicability to a wide variety of sample and ease of manipulation. Oxidation of most organic compounds is up to 95-100 % of theoretical value. The organic matters get oxidized completely by potassium dichromate (K).

# 8) AMMONIAC NITROGEN:-

# Ammonia is produced by microbiological degradation of organic nitrogenous matter. In sewage and polluted water most of the nitrogen is present is in the form of organic (protein) nitrogen and ammonia. As time progress, organic nitrogen is gradually converted to ammonia Nitrogen on if aerobic conditions are present, oxidation of ammonia to Nitrites occur.

# **PROCEDURE, OBSERVATION AND CALCULATION**

# **TEMPERATURE**

# Apparatus: - Thermometer and beaker.

# Principle:-

# Temperature of waste water is commonly higher than that of water supply because of the addition of warm water from households and industrial activities .As specific heat of water is much greater than that of air the observed waste water temperature are higher than the local air temperature during most of the year and are lower only during the hottest summer months. Depending on geographic location, the mean annual temperature of waste water varies from about 10 to 21.1⁰ C is a representative value. Depending on location and time of year the effluent temperature can either be higher or lower than the corresponding influent values.

# Procedure:-

# Take waste water sample in 100 ml beaker.

# Immerse the thermometer into the beaker.

# Read the value carefully.

# Result: -

# Temperature of waste water sample = 18⁰C

# Temperature of recovery water body = 18⁰C

# Optimum Standard: -

# The temperature of waste water shall not exceed 40⁰C with in 15 meter downstream from effluent outlet.

# **PH**

# Apparatus:- Pocket PH meter.

# Principle:-

# The hydrogen ion concentration in water is closely connected with the extent to which water molecules dissociate water into hydrogen and hydroxyl ion as follows

# H2 O ↔ H+ + OH-

# Applying the law of mass action to this equation yields

# [H+][OH-]/ [H2O] =K

# Where bracket indicate the concentration of constituents in moles/liter because the concentration of water in a dilute aqueous system is essentially constant this concentration can be in corporate into the equilibrium k to give

# [H+][OH-] =Kw

# Kw is known as ionization constant and is approximately equal to

# 1× 10-14 at room temperature 25⁰C

# The usual mean of expressing the hydrogen ion concentration is as PH which is define as the negative log of hydrogen ion concentration

# PH = -

# Procedure: -

# Stand or dice the PH meter by calibrating with needle and by bringing with PH=7.

# Immerse the PH meter in the sample, which is kept in beaker.

# Read the PH value.

# Result: - The PH value of given sample is 6.6 to 6.7.

# Inference: - As per ISI water quality standard the PH value varies from 5.5 to9

# **SOLIDS**

# PRINCIPAL:-

# Residue left after evaporation and subsequent drying in oven at specific temperature 103-105 0C of known volume of sample are total solid. Total solid include “total suspended solid” (TSS) and “total dissolved solid”(TDS). Whereas loss in weight on ignition of the same sample at 500 0C in which organic matter is converted into CO2 volatilisation of inorganic matter as much as consistent with complete oxidation of organic matter, are volatile solids.

# **TOTAL SOLID:-**

# APPRATUS-

# Evaporating dish 200ml capacity of porcelain, Drying oven 104+-10C, Desiccators, Pipette, Measuring cylinder.

# PROCEDURE:-

# Place required quantity of sample (say 50 ml) in a dry constant weight dish or crucible.

# Evaporate to dryness in an oven at 103-105C and dry to constant weight

# Cool the dish in desiccators

# Weight and note the increase in weight.

# FORMULA USED:-

# Total solid mg/l = [(weight of crucible with residue - weight of empty crucible)x1000]/ml of sample

# VOLATILE SOLID-

# PROCEDURE:-

# Ignite the residue of Total solid at 600C in muffle furnace (15 to 20 minutes), cool and weight.

# FORMULA USED:-

# Total volatile solid = (wt. of crucible with residue as obtained in total solid – wt. of empty crucible) -(wt of crucible with residue heated to 600◦C)x 100 /ml of sample

# FIXED SOLID:-

# FORMULA USED:-

# Fixed solid = Total solid - Volatile solid

# **SUSPENDED SOLID:-**

# PROCEDURE:-

# Filter the sample (say 50 ml) through watt-man filter paper No. 44.

# Place the watt-man filter paper no.44 in oven for 103-105 0C.

# Take out from oven and weight the watt-man filter paper no. 44.

# Take tare mass of watt-man filter paper noi.44.

# Formula used:-

# = [(Residue on watt-man filter paper no. 44 drying of 103-105C – Tare mass of watt-man filter paper no. 44)\*1000]/ ml of sample (50 ml)

# = [0.025\*100]\*1000/50

# = 50 mg/l

# **DISSOLVED OXYGEN (DO)**

# Principle:-

# Oxygen present in sample rapidly oxidizes the dispersed divalent manganous hydroxide to its higher valency, which is precipitated as a brown hydrated oxide after the addition of NaOH /KOH and KI. Upon acidification manganese reverts the divalent state and liberates iodine from KI equivalent to the original DO content. The liberated iodine is treated against Na2S2O3 (N/40) using starch as an indicator.

# Procedure:-

# Take 100 ml of distilled water add 1ml of phosphate buffer solution, 1ml of mgSo4 solution, 1ml of Cacl2 solution and 1 ml of Fecl2 solution. Then aerate this mixture for 10-15 minutes.

# Take one BOD bottle of capacity 300 ml.

# Take 3 ml of waste water with 297 ml of dilution water which is prepared in step one.

# In BOD bottle add 1 ml of MnSO4 solution, 1ml Alk KI solution and 2 ml of conc. H2SO4.(If white precipitate is obtained means O2 is absent(oxygen nill). If brown precipitate is obtained means O2 is present.)

# Shake it vigorously till its precipitate dissolve.

# Find the exact capacity of bottle by formula = (200\*exact capacity of bottle)/(exact capacity of bottle-4)=203 ml.

# Take 203 ml of mixture and transfer it in 500 ml conical flask. Add 1-2 drop of starch indicator blue color will appear.

# Titrate it with N/40 NaSO3 solution till color disappear. Note the burette reading.

|  |  |  |  |
| --- | --- | --- | --- |
| Sample | Initial buretteReading | Final buretteReading | Volume ofsodium thiosulphate used(ml) |
| DOs | 0 | 4.3 | 4.3 |

# **BIOCHEMICAL OXYGEN DEMAND (BOD)**

# Chemicals used:-

# Phosphate buffer solution, MgSO4 solution, Cacl2 solution, Fecl3, MnSO4 solution, Alk. KI solution, Conc. H2SO4, Starch indicator , N/40 Na2SO3 solution, Distilled water.

# Principle:-

# The test measures the oxygen utilized the biochemical degradation of organic material and oxidation of inorganic material such as sulphides and ferrous ions during a specified incubation period. It also measures the oxygen used to oxidize reduced forms of nitrogen unless their oxidation is prevented by an inhibitor. Temperature effects are held constant by performing a test at fixed temperature. The methodology of BOD test is to compute a difference between initial and final Do of the sample incubation. DO is estimate by isometric titration

# Procedure:-

# Take 100 ml of distilled water add 1ml of phosphate buffer solution, 1ml of mgSo4 solution, 1ml of Cacl2 solution and 1 ml of Fecl2 solution. Then aerate this mixture for 10-15 minutes.

# Take 3 BOD bottle of capacity 300 ml.

# In the 1st and 2nd bottle take 3 ml of wastewater (sample) with 297 ml of dilution water which is prepared in step 1st.

# In the 3rd BOD bottle take 300 ml of dilution water.

# Keep 1st and 3rd bottle in BOD incubator for 3 days at 27 oc.

# In 2nd BOD bottle add 1 ml of MnSO4 solution, 1ml Alk KI solution and 2 ml of conc. H2SO4.(If white precipitate is obtained means O2 is absent(oxygen nill). If brown precipitate is obtained means O2 is present.)

# Shake it vigorously till its precipitate dissolve.

# Find the exact capacity of bottle by formula = (200\*exact capacity of bottle)/(exact capacity of bottle-4) =203 ml.

# Take 203 ml of mixture and transfer it in 500 ml conical flask. Add 1-2 drop of starch indicator blue color will appear.

# Titrate it with N/40 NaSO3 solution till color disappear. Note the burette reading as DOS.

# After 3 day of incubation. Take out both the BOD bottle from incubator.

# Add 1ml of MnSO4 solution, 1ml of Alk. KI solution and 2 ml of conc. H2SO4 in both the BOD bottle. White or brown precipitate will form. Shake both the bottle till its precipitate dissolves.

# Take 203 ml of mixture from 1stbottle in 500 ml conical flask. Add 1-2 drop of starch indicator.

# Titrate it with N/40 Na2SO3 solution till color disappear. Note the burette reading as DOI.

# Take 203 ml of mixture from 3rdbottle and transfer it into conical flask. Add 1-2 drop of starch indicator.

# Titrate it with N/40 of Na2SO3 solution till color disappear. Note the reading of burette as DOB.

|  |  |  |  |
| --- | --- | --- | --- |
| Sample | Initial buretteReading | Final buretteReading | Volume ofsodium thiosulphate used(ml) |
| DOi | 0 | 3.2 | 3.2 |
| DOb | 0 | 3.6 | 3.6 |
| DOs | 0 | 4.3 | 4.3 |

# DOi = DO of diluted sample after three days of incubation.

# DOb = DO of blank after three days of incubation.

# DOs = initial DO of diluted sample.

# Calculation:-

# Formula used:-

# BOD in mg/l = [(DOb-DOi) x volume of bottle/ volume of sample] –

# (DOb-DOs)

# BOD in mg/l = [ (3.6-3.2) x 300/3] – (3.6-4.3)

# BOD in mg/l = 40.7

# **CHEMICAL OXYGEN DEMAND (COD)**

# Chemical used:-

# K2Cr2O7 solution – N/4, Conc. H2SO4 containing AgSO4, Ferrione indicator, Standard FeSO4.(NH4)2.SO4 –N/4, Distilled water.

# Principle:-

# The open reflux method is suitable for a wide range of waste with a large sample size.

# The dichromate reflux method is preferred over procedures using other oxidant because of its superior oxidizing ability, applicability to a wide variety of sample and ease of manipulation. Oxidation of most organic compounds is up to 95-100 % of theoretical value. The organic matters get oxidized completely by potassium dichromate (K2Cr2O7) with silver sulphate as catalyst in the presence of concentrated H2SO4 to produce CO2 and H2O. The excess potassium dichromate remaining after the reaction is titrated with ferrous ammonium sulphate. The dichromate consumed gives the oxygen required for oxidation of the organic matter.

# Procedure:-

# Take two BOD bottle.

# In 1st bottle take 10ml of waste water and 90 ml of distilled water and mark it as sample.

# In 2nd bottle take 100 ml of distilled water and mark i as blank.

# Add 25conc. ml of K2Cr2O7 solution of N/4 normality in both bottle and mix.

# Add slowly 75 ml of standard H2SO4 containing Ag2SO4 mix it thoroughly.

# Keep both the bottles in autoclave pressure cooker for 30 minutes.

# After 30 minutes the bottle in two different conical flasks and add 150 ml of distilled water.

# Add 1-2 drop of ferine indicator blue-green color will appear.

# Titrate content of conical flask one by one with standard N/4 FeSO4.(NH4)2.SO4 till red color appears.

# Note the reading of burette for blank as A and for sample as B.

# Observations:-

|  |  |  |  |
| --- | --- | --- | --- |
| Sample | Initial burette reading | Final burette reading | Volume of ferrous Amonium sulphate used |
| Sample(B) | 0 |  |  |
| Blank (A) | 0 |  |  |

# Calculation:-

# Formula used:-

# COD in mg/l = [(A-B) x C x 8000/ml of sample]

# A = volume of ferrous ammonium sulphate used for blank.

# B = volume of ferrous ammonium sulphate used for sample.

# C = normality of ferrous ammonium sulphate solution.

# C = (0.25x ml of k2Cr2O7 used)/ ml of ferrous ammonium sulphate used).

# **AMMONICAL NITROGEN**

# Reagent used:-

# 10 percent copper sulphate solution

# 12 N, sodium hydroxide solution

# Standard Ammonium chloride solution

# Nesseler reagent

# **Apparatus:-** Nessler tube tall form (50 mL or 100 mL capacity)

# **Principle:-** Colorimetric method, using Nessler-s reagent is sensitive to 20mg/L of ammonia N and may be used up to 5mg/L of ammonia N. Turbidity, color and substances precipitated by hydroxyl ion interfere with the determination. For ammonical nitrogen test we use nessler method.

# Procedure:-

# Take 100 ml sample in Nesseler tube and 1 ml copper sulphate

# Solution.

# Mix it thoroughly and add 1 ml of sodium hydroxide solution.

# Mix and allow it to settle.

# Take out mean end portion (5 to 25 ml) say 20 ml, in to another

# Nesseler tube and dilute to 100 ml.

# Take six Nesseler tube and place 0.2, 0.4, 0.6, 0.8, 1.0 and 1.2 ml of

# Standard ammonium chloride solution and distilled water 50 ml.

# Add 2 ml Nesseler reagent to samples and to each temporary standard.

# Make the volume 100 ml.

# After 10 minutes, compare the colors and record the standard result of

# Temporary standard.

# Observation table:-

|  |  |  |  |
| --- | --- | --- | --- |
| S. NO. | Volume Distilled | Volume Nesseler standard | Temp. standard match |
| 1. | 50 ml | 2 ml | 0.2 |
| 2. | 50 ml | 2 ml | 0.4 |
| 3. | 50 ml | 2 ml | 0.6 |
| 4. | 50 ml | 2 ml | 0.8 |
| 5. | 50 ml | 2 ml | 1.0 |
| 6. | 50 ml | 2 ml | 1.2 |

# Calculation:-

# Ammonia Nitrogen (mg/l)

# N = (ml of standard NH4Cl solution \* 10)/(ml of sample taken)

# = (0.8\*10)/(100/1000)

# = 80 mg/l

# RESULTS

|  |  |  |
| --- | --- | --- |
| **SR. no.** | **Parameters** | **Results** |
| 1 | Temperature |  |
| (a) | Receiving water (river) | 18 0C |
| (b) | Waste water (sample) | 18 0C |
| 2 | PH | 6.6-6.7 |
| 3 | Solid |  |
| (a) | Total solid | 1.4 mg/lit |
| (b) | Volatile solid | 1.292 mg/lit |
| (c) | Fixed solid | 0.108 mg/lit |
| (d) | Suspended solid | 2.6 mg/lit |
| 4 | Dissolved oxygen | 4.3 mg/lit |
| 5 | Biochemical oxygen demand | 40.7 mg/lit |
| 6 | Ammonical nitrogen | 80 mg/lit |
| 7 | Chemical oxygen demand |  |

# INTERPRETATION:-

# The sample analysis shows the evidence of organic pollution as borne out by high BOD, COD and ammonical nitrogen.

# The value of BOD, COD and ammonical nitrogen are much beyond the permissible limit as prescribed by Indian standard i.e. 30mg/l, 250mg/l and 50mg/l for waste water intended for discharging into inland surface water.

# Waste water can therefore treated to trying within standard limit as laid down by Indian standard before discharging into Indrāvati River.