



## ASSESSMENT AND SCREENING ON WATER QUALITY OF AIR COMPRESSOR INDUSTRY EFFULENT

### Agricultural Science

**J.Johny caroline** Assistant Professor, Nirmala College for Women (Autonomous), Coimbatore

**Pinki Mahur\*** III B.sc chemistry2 Nirmala College for Women (Autonomous), Coimbatore.  
\*Corresponding Author

### ABSTRACT

Water is a basic necessity, needed to maintain a healthy body, a clear mind, and a good balance within your tissues. Ascertain the quality of effluent sample for two different sample from Air compressor manufacturing units named "1/2HP and 2HP" for research and viewed them on basis of different parameter like: Colour, Odour oil and grease, pH @25°C, Total Suspended Solids, Total Dissolved Solids, Bio-chemical Oxygen Demand for 3days @27°C, Chemical Oxygen Demand, Electro Conductivity, Ammonical nitrogen. The effluent water was filter by three different method namely sand filter, Nitrifying bacteria, and reverse osmosis and result were compared. Colour, Odour, Oil and grease, BOD, COD, TSS and TDS of effluent from two different manufacturing obtained were reduced by using sand filters that drain dirt, solids, oil, grease, and chemicals, resulting in lowering of the parameter values. Nitrifying bacteria greatly helped in oxidizing the ammonia and nitrogen content present in the effluents. Another method reverse osmosis was used to reduce the Electrical Conductivity of the effluents.

### KEYWORDS

Effluent water, Nitrifying bacteria, osmosis, filter, oxidizing.

### INTRODUCTION

"Water is the transparent, tasteless, odorless, and nearly colourless chemical substance that is the main constituent of Earth's streams, lakes, and oceans, and the fluids of most living organisms".

It is vital for all known forms of life, even though it provides no calories or organic nutrients. Its chemical formula is H<sub>2</sub>O, meaning that each of its molecules contains one oxygen and two hydrogen atoms connected by covalent bonds. Water is the name of the liquid state of H<sub>2</sub>O at standard ambient temperature and pressure. (1) It forms precipitation in the form of rain and aerosols in the form of fog. Clouds are formed from suspended droplets of water and ice, its solid state. When finely divided, crystalline ice may precipitate in the form of snow. The gaseous state of water is steam or water vapour. Water moves continually through the water cycle of evaporation, transpiration (evapotranspiration), condensation, precipitation, and runoff, usually reaching the sea. (2)

Water being an important source of livelihood for all living organism on earth, we considered taking "ASSESSMENT AND TREATMENT ON WATER QUALITY OF AIR COMPRESSOR INDUSTRY" as our research topic. Here, we took effluent from two different Air compressor manufacturing units named "1/2HP and 2HP" as our main effluent samples for research and viewed them on basis of different parameter like: Colour, odour oil and grease, pH @250C, Total Suspended Solids, Total Dissolved Solids, Bio-chemical Oxygen Demand for 3days @270C, Chemical Oxygen Demand, Electro Conductivity, Ammonical nitrogen.

The result of the test and the methods undertaken for the test as discussed below.

### MATERIAL AND METHODS

#### COLOUR

Principle: Colour is measured by visual comparison of the sample with platinum cobalt standard. One unit of colour is that produced by 1 mg of platinum per litre in the form of chloroplatinate ion.

Calculation: Colour units = 50 A/V

A = estimated colour of dilute sample, V = volume in ml of sample taken for dilution.

#### OIL & GREASE

##### Principle:

Dissolved or emulsified oil and grease is extracted from water by trichlorotrifluoroethane and estimation is made gravimetrically.

##### Calculation:

Oil and grease, mg/l = M/V x 1000, Where M = mass, in mg, of the residue; V = volume in ml of the sample taken.

### pH VALUE

#### Principle:

The pH value is determined by measurement of the electromotive force of a cell consisting of an indicator electrode (an electrode responsive to hydrogen ions such as a glass electrode) Immersed in the test solution and a reference electrode (usually mercury/calomel electrode). Contact between the test solution and the reference electrode is usually achieved by means of a liquid junction, which forms part of the reference electrode. The electromotive force is measured with a pH meter, that is, a high impeded voltmeter calibrated in terms of pH.

### FILTERABLE RESIDUE (TOTAL DISSOLVED SOLIDS)

#### Principle:

The sample is filtered and the filtrate evaporated in a tarred dish on steam-bath. The residue after evaporation is dried to constant mass at 103°C-105°C or 179°C-181°C.

#### Calculation:

Calculate the filterable residue from the following equation:

Filterable residue, mg/l = 1000 M/V

where, M = mass in mg of filterable residue, and V - volume in ml of the sample

### ELECTRO CONDUCTIVITY

#### Procedure:

The water sample is directly measured by conductivity cell and reading are noted.

### NON-FILTERABLE RESIDUE (TOTAL SUSPENDED SOLIDS)

#### Principle:

Non-filterable residue is determined by passing the sample through a weighed filter and drying the filter at 103°C-105°C or 179°C-181°C. Non-filterable residue is calculated from the increase in mass of the filter.

#### Calculation:

Calculate the non-filterable residue from the following equation:

Non-filterable residue, mg/l = 1000M/V where, M = mass in mg of non-filterable residue, and

V = volume in ml of the sample.

### BIOCHEMICAL OXYGEN DEMAND (BOD)

#### Principle:

The biochemical oxygen demand (BOD) test is based on mainly bio-assay procedure which measures the dissolved oxygen consumed by micro-organisms while assimilating and oxidizing the organic matter under aerobic conditions. The standard test condition includes incubating the sample in an air tight bottle, in dark at a specified temperature for specific time.

#### Dilution of Sample and Incubation:

Neutralization- Neutralize the sample to pH around 7.0 using alkali or acid of such strength that the quantity of reagent does not dilute the sample by more than 0.5 percent.

### CHEMICAL OXYGEN DEMAND (COD)

#### Principle:

Most of the organic matters are destroyed when boiled with a mixture of potassium dichromate and sulphuric acid producing carbon dioxide and water. A sample is refluxed with a known amount of potassium dichromate in sulphuric acid medium and the excess of dichromate is titrated against ferrous ammonium sulphate. The amount of dichromate consumed is proportional to the oxygen required to oxidize the oxidizable organic matter.

#### Calculation:

$$\text{COD, mg/l} = (V1-V2)N \times 8000 / V.$$

where,

V1 = volume of FAS required for titration against the blank in ml

V2 = volume of FAS required for titration against the sample in ml

N = Normality of FAS

VO = volume of sample taken for testing in ml.

### AMMONIACAL NITROGEN (NH<sub>3</sub>-N)

#### Principle:

These test methods cover the determination of ammoniacal nitrogen, exclusive of organic nitrogen, in water(3)

Calculation: Calculate the ammonia concentration in mg/L of nitrogen in the original sample, Ammonia nitrogen, mg/L = [A X 1000/ S]

where: A = ammonia nitrogen observed, mg, and S = sample, ml

Calculate the ammonia concentration in mg/L of ammonia in the original

$$\text{Ammonia, mg/L} = E \times 1.22$$

where: E = ammonia nitrogen, mg/L.

### RESULT AND DISCUSSION

Water is a component of 2 molecules of hydrogen and one molecule of oxygen. It is liquid at room temperature. Water is got from many sources in nature and are used for many purpose by human, plants and animals. sources like rain, river, lakes, ponds, sea and earth surface. Each type of water is of different odour, taste and composition. Depending on which they are used for different purpose. Normal water after miscellaneous treatment are used for chemical reaction, industrial purpose, and so on. Two different effluent from AIR COMPRESSOR were taken, let to tested and results were obtained.

S.NO	PARAMETERS	STANDARD VALUE	1/2HP UNIT	2HP UNIT
1.	COLOUR	Colourless	Golden brown	Brown
2.	ODOUR	Odourless	Oily, greasy smell	Oily, greasy smell
3.	OIL AND GREASE	20 mg/l	33 mg/l	30 mg/l
4.	pH	6.5-9.0	6.41	6.38
5.	TOTAL SOLIDS SUSPENDED	20 mg/l	15 mg/l	15.9 mg/l
6.	BIO-CHEMICAL OXYGEN DEMAND	10 mg/l	10 mg/l	13 mg/l
7.	CHEMICAL OXYGEN DEMAND	50 mg/l	40 mg/l	38 mg/l
8.	ELECTRICAL CONDUCTIVITY	5 mS/m	5.3 mS/m	5.1 mS/m
9.	AMMOINICAL NITROGEN	5 mg/l	5 mg/l	5.2 mg/l
10.	TOTAL DISSOLVED SOLIDS	10 mg/l	32.6 mg/l	33 mg/l

### TREATMENT OF EFFLUENT BY VARIOUS METHODS

Effluent was treated by various methods like sand filter, nitrifying bacteria and reverse osmosis to let the effluent into the environment by reducing the parameter values.

### SAND FILTERS

Sand filters are layers of sand, small stones, bigger stones, mud and rocks. Sand Filters are designed to remove excess Total Suspended

Solids (TSS) and Biological Oxygen Demand (BOD) from sewage and waste water treatment plants(4). Our sand filters meet stringent discharge consent standards above what is normally expected from a biological process or an industry standard clarifier. This low cost and low maintenance sand filter tertiary polishing plant is an ideal addition for new and existing (permanent or temporary) process units. The WPL Sand Filters are ideally configured to be retrofitted where an existing system is failing discharge consent conditions, for both SS and BOD.

### REVERSE OSMOSIS

Reverse osmosis (RO) is a water purification technology that uses a semipermeable membrane to remove ions, molecules and larger particles from drinking water. In the normal osmosis process, the solvent naturally moves from an area of low solute concentration (high water potential), through a membrane, to an area of high solute concentration (low water potential). The driving force for the movement of the solvent is the reduction in the free energy of the system when the difference in solvent concentration on either side of a membrane is reduced, generating osmotic pressure due to the solvent moving into the more concentrated solution(5). Applying an external pressure to reverse the natural flow of pure solvent, thus, is reverse osmosis. Reverse osmosis also involves diffusion, making the process dependent on pressure, flow rate, and other conditions. Reverse osmosis is most commonly known for its use in drinking water purification from seawater, removing the salt and other effluent materials from the water molecules. Reverse Osmosis greatly helps in reduction of electrical conductivity of a liquid.

### NITRIFYING BACTERIA

Nitrifying bacteria are chemolithotrophic organisms that include species of the genera Nitrosomonas, Nitrosococcus, Nitrobacter and Nitrospira. These bacteria get their energy by the oxidation of inorganic nitrogen compounds. Types include ammonia-oxidizing bacteria (AOB) and nitrite-oxidizing bacteria (NOB). Many species of nitrifying bacteria have complex internal membrane systems that are the location for key enzymes in nitrification: ammonia monooxygenase (which oxidizes ammonia to hydroxylamine), hydroxylamine oxidoreductase (which oxidizes hydroxylamine to nitric oxide - which is oxidized to nitrite by a currently unidentified enzyme), and nitrite oxidoreductase (which oxidizes nitrite to nitrate).

S. NO.	Parametrs	Standard Value	1/2HP Unit	2 HP Unit
1.	COLOUR	Colourless	Straw colour	Light Brown
2.	ODOUR	Odourless	Reduced smell	Reduced smell
3.	OIL AND GREASE	20 mg/l	1.6 mg/l	1.1 mg/l
4.	pH	6.5-9.0	6.89	6.91
5.	TOTAL SOLIDS SUSPENDED	20 mg/l	1.3 mg/l	1.41 mg/l
6.	BIO-CHEMICAL OXYGEN DEMAND	10 mg/l	8.1 mg/l	8.3 mg/l
7.	CHEMICAL OXYGEN DEMAND	50 mg/l	30.2 mg/l	32 mg/l
8.	TOTAL DISSOLVED SOLIDS	10 mg/l	9.6 mg/l	10 mg/l

### CONCLUSION

On basis of various test result were given and conclusion were brought about.

The effluent obtained from the Air Compressor industry was almost up to the standard value needed for the waste water to be let into the environment. But still, the water was treated by three major treatment methods were undertaken to reduced the value to even better.

Colour, Odor, Oil and grease, BOD, COD, TSS and TDS of effluent from two different manufacturing obtained were reduced by using sand filters that drain dirt, solids, oil, grease and chemicals, resulting in lowering of the parameter values.

- Nitrifying bacteria greatly helped in oxidizing the ammonia and nitrogen content present in the effluents.
- Another method reverse osmosis was used to reduce the Electrical Conductivity of the effluents.

Thus, the finally obtained liquid was found to be good enough to be let into the environment or disposed in land. Since effluents are normally of high chemical content and destruction causing agents to the environment, it is much better and advisable to treat them with the atleast the least possible ways so as to purify them as much as possible and then let them into environment or any disposal ways so that they never cause ill to both human and nature. Being humans it is our major duty to safeguard the resources and nature given to us. Treatment of industrial effluent is one of the major step towards protecting nature.

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