INTERNATIONAL JOURNAL OF ADVANCE RESEARCH, IDEAS AND INNOVATIONS IN TECHNOLOGY

ISSN: 2454-132X
Impact factor: 4.295
(Volume 4, Issue 3)
Available online at: www.ijariit.com

Removal of ammonical nitrogen from industrial effluent

Prexa Chhasatiya
patelmansi514@gmail.com
Shroff SR Rotary Institute of Chemical Technology, Vataria, Gujarat

Mansi Patel
prexachhasatiya@yahoo.com
Shroff SR Rotary Institute of Chemical Technology, Vataria, Gujarat

Shubhi Sharma
shubhisharma0908@gmail.com
Shroff SR Rotary Institute of Chemical Technology, Vataria, Gujarat

Shailesh Vekariya
shailesh305vekariya@gmail.com
Shroff SR Rotary Institute of Chemical Technology, Vataria, Gujarat

Ajaz Shaikh
ajazshaikh73@gmail.com
Shroff SR Rotary Institute of Chemical Technology, Vataria, Gujarat

Anjali S Nair
anjali.nair@srict.in
Shroff SR Rotary Institute of Chemical Technology, Vataria, Gujarat

ABSTRACT

Ammonia removal from wastewater has become a worldwide emerging concern as ammonia proves to be toxic to aquatic species and also causes eutrophication in a natural water environment. Nitrogen compounds in our effluent have been removed by means of biological approaches (micro-organisms). Based on the microbial nitrogen cycle many biological technologies and processes have been developed and implemented for nitrogen removal from wastewater, such as de-nitrification, nitrification and by the use of biological species. However, with the effluent discharge standards have become more stringent (<10mg total nitrogen/L), conventional processes cannot meet the new requirements.We have removed the amount of nitrogen with the help of bacteria such as Nitrosomonas, Nitrospira. The limit of discharging nitrogen is 50ppm into the rivers. So by using these bacteria, our aim will be fulfilled.

Keywords: *Bacteria, Nitrogen, Effluent.*

1. INTRODUCTION

Industrial pollution continues to be a potential threat affecting the water. The discharge of non-biodegradable heavy metals like copper, zinc, nickel lead, cadmium and chromium into water stream is hazardous because the consumption of polluted water causes various health problems. The dominating process for the removal of nitrogen is chemical precipitation. Typically it is done with aluminum and iron coagulants before the biological treatment but nitrogen can also be precipitated in the biological treatment or as the final step of the treatment process.

There are Two Things Ammonia recovers & ammonia removing

Ammonia recovers are most useful economical because the ammonia product is very useful and costly and eco-friendly.

1) Ammonia recovers from ammonical waste

(a) By Distillation Tower

The ammonia can be recovered with distillation tower the tower height depends upon the quantity of waste and percentage of ammonia. (as shown in the fig)

(b) Successful Ammonia Removal from Wastewater Using Liqui-Cel Membrane.

(c) The membrane bioreactor (MBR) treatment process consists of three main components: 1) anoxic basins, 2) pre-aeration basins, and 3) the MBR basins. Raw wastewater must be screened through a fine screen prior to the anoxic basin. From the anoxic basin, mixed liquor flows into the pre-aeration basins and then into the MBR basins. The membranes are located in the MBR basins where wastewater is passed through the membranes and permeate pumps deliver the effluent to the disinfection process prior to discharge. The membranes remove the need for secondary clarification required in other treatment processes.

(d) The solution is ECP (Electrolytic Catalytic Precipitation). From 1000 ppm to 0 ppm in few hours, without chemicals, without dilution, only with electric power. ECP is a process assigned to Aquatic Technologies. Primary claims all refer to

the addition of catalytic enzymes, but the results cited do not show much improvement over straight anodic oxidations.

2) Ammonia Removing

I. Remove ammonia from the wastewater via biological nitrification.

II. Different from biological treatment, this process physically converts ammonia in wastewater to nitrogen and steam using the stripper and the catalytic converter

III. Anaerobically digest the excess biomass from biological nitrification to release ammonia into the water in the digester. Microorganisms can be used to convert ammonia to nitrate. A facility for doing this would likely be inexpensive to run but would take up a lot of space

IV. When excess digested biomass is dewatered, retain the filtrate from the dewatering process. It should contain > 1000 mg/L of ammonia.

V. You could take anaerobic with USAB follow Fixed Media as the reactor and put it or inoculated with nitrifying anaerobic to decompose ammonia to Hydrogen and Nitrogen gases.

VI. At elevated pH with Line and NaOH in 9.5-10.5, the Ammonia will escape from body water through the air or steam stripper or the reactor in scrubbing with sulphuric acid to produce Ammonium Sulphate as fertilizer.

2. AIM AND OBJECTIVE

Aim:

Removal of nitrogen from industrial effluent

Objective:

- The main objective of the project is to reduce the nitrogen concentration from the industrial effluent with the help of microorganisms.

It includes

- Set up of the pilot plant.
- Determination & analysis of different parameters.

3. EXPERIMENTAL WORK

We are considering raw material as industrial effluent i.e., the wastewater contains an ammonical nitrogen. This effluent initially first tested for to check the amount of nitrogen content. This will be done in the laboratory. These effluents then undergo aeration using aerators with some of the bacteria. By this method 80-85% of removal ammonical nitrogen we achieved within 15 days at the normal condition.

Figure 1: Experimental Set up

Material Used

- Industrial effluent containing ammonical nitrogen
- Microorganisms like Nitrosomonas, Nitrospira, Nitrogyra

Apparatus

- Aerator
- Glass Tank

Procedure

- Initially check the ammonical nitrogen content.
- Take an effluent containing ammonical nitrogen in a glass tank.
- Give biological treatment for removal of ammonical nitrogen. For this add a microorganism which was incubated in the incubator before its uses.
- Give aeration with the help of aerator.
- Constant monitoring it took for up to 15 days.
- Testing the effluent to check the ammonical nitrogen content.

Observation Table

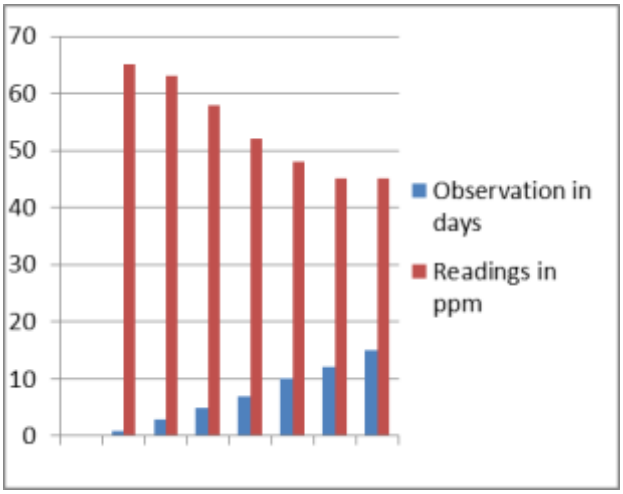
Sr. No.	Observation (day)	Readings (ppm)
1	1	65
2	3	63
3	5	58
4	7	52
5	10	48
6	12	45
7	15	45

Observation table for lab scale work (nitrifying bacteria)

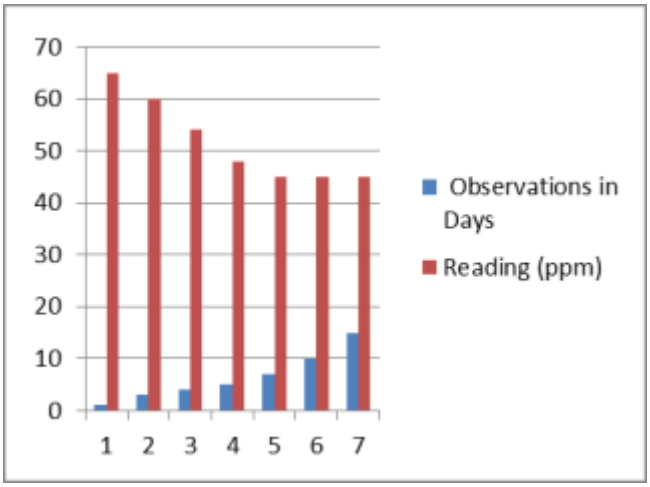
Sr. No.	Observation (day)	Readings (ppm)
1	1	65
2	3	60
3	5	58
4	7	48
5	10	45
6	12	45
7	15	45

Observation table for lab scale work (de-nitrifying bacteria)

4. RESULT



Graph representing the removal of ammonical nitrogen (nitrifying bacteria)



Graph representing the removal of ammonical nitrogen (de-nitrifying bacteria)

5. CONCLUSION

The microbial method shows promising aspect and provides nitrogen reduction in all treatment conditions. This method provides a better alternative than the conventional systems. The nitrogen removal in the treatment of wastewater has been found to be bacteria dependent and gives the reduction of 15-20 ppm. According to the results of experiments, the nitrogen content in the effluent is reduced. We have compared the results of experiments done by nitrifying and denitrifying bacteria. Practical has been performed separately for nitrifying and denitrifying bacteria.

6. ACKNOWLEDGMENT

The project opportunity I have with this year is a great chance for learning and technical development. Motivation and co-operation are the two main pillars for the success of any project. A technical write paper should be incomplete if we do not convey our heartfelt gratitude to those people from whom we have got considerable support and encouragement during this technical write paper preparation. Many people have helped, provided direction, technical information and it's our pleasure to say a vote of thanks to all of them.

It is my radiant sentiment to place on record my best regards, deepest sense of gratitude to all the staff members & lab operators for their careful and precious guidance which were extremely valuable for our study both theoretically and practically.

I perceive as this opportunity as a big milestone in my career development. I will strive to use gained skills and knowledge in the best possible way, and I will continue to work on their improvement, in order to attain desired career objectives.

7. REFERENCES

[1] Campbell, W.A.B. Methaemoglobinaemia due to nitrates in well-water. Br. Med. J. 1952, 2, 371–373.

[2] Timmermans, P.; van Haute, A. Denitrification with methanol: Fundamental study of the growth and denitrification capacity of Hyphomicrobium sp. Water Res. 1983, 17, 1249–1255.

[3] Bill, K.A.; Bott, C.B.; Murthy, S.N. Evaluation of alternative electron donors for denitrifying moving bed biofilm reactors (MBBRs). Water Sci. Technol. 2009, 60, 2647–2657.

[4] Yamashita, T.; Yamamoto-Ikemoto, R.; Zhu, J. Sulfate-reducing bacteria in a denitrification reactor packed with wood as a carbon source. Bioresour. Technol. 2011, 102, 2235–2241.

[5] Liamleam, W.; Annachhatre, A.P. Electron donors for biological sulfate reduction. Biotechnology Adv. 2007, 25, 452–463.

[6] Chen, M.; Zhang, Y.; Zhou, J.; Dong, X.; Wang, X.; Shi, Z. Sulfate removal by Desulfovibrio sp. CMX in chelate scrubbing solutions for NO removal. Bioresour. Technol. 2013, 143, 455–460.

[7] Yucel, M.; Galand, P.E.; Fagervold, S.K.; Contreira-Pereira, L.; Bris, N.L. Sulfide production and consumption in degrading wood in the marine environment. Chemosphere 2013, 90, 403–409.

[8] Emerson, S.; Widmer, G. Early diagenesis in anaerobic lake sediments—II. Thermodynamic and kinetic factors controlling the formation of iron phosphate. Geochim. Cosmochim. Acta 1978, 42, 1307–1316.

[9] Till, B.A.; Weathers, L.J.; Alvarez, P.J.J. Fe(0)-supported autotrophic denitrification. Environ. Sci. Technol. 1998, 32, 634–639.

[10] Yamashita, T.; Yamamoto-Ikemoto, R. Phosphate removal and sulfate reduction in a denitrification reactor packed with iron and wood as electron donors. Water Sci. Technol. 2008, 58, 1405–1413.

[11] Gonzalez, L. E., and Bashan, Y. (2000). Increased growth of the microalga Chlorella vulgaris when coimmobilized and cocultured in Alginate beads with the plant-growthpromoting bacterium Azospirillum brasilense. Applied and Environmental Microbiology, 66, 1527–1531.

[12] Orlando,US,Baes,A.U.,Nishijima,W.,Okada,M.,2002b.A new procedure to produce lignocellulosic anion exchange from agricultural waste.3