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# Adsorption for Waste Gas Treatment: A Short Review

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**Abstract**— Removal of various gases from waste stream can be carried out by various methods. Absorption, biofiltration, catalytic beds are few options available for this. Many off gases like hydrogen sulphide, sulphur dioxide and carbon dioxide needs to be removed from waste gas streams before they are discharged to atmosphere. The present review aims at studying the research carried out on adsorption for waste gas treatment.

**Keywords**— Wind, offshore, resources, energy, cost

## I. INTRODUCTION

These Environmental problems can be dealt with proper and effective treatment of waste streams emitted from the industries and households [1, 2]. Various methods are available for treatment of waste water like membrane separation, adsorption, and ion exchange, biological treatment [3, 4, and 5].

The removal of selective waste gases from the waste gas streams can be done by using catalytic converters, biofilters and adsorption [6, 7, 8]. The current review aims and summarizing the research carried out for removal of various waste gases from effluent gas streams by adsorption.

## II. ADSORPTION FOR WASTE GAS TREATMENT

Kulkarni and Shinde carried out review on removal of hydrogen sulphide by adsorption [9]. Hydrogen sulphide is very irritating and cause many health problems. According to this review, adsorption of hydrogen sulphide was one of the promising methods to remove hydrogen sulphide. Grande worked on biogas upgrading by pressure swing adsorption [10]. According to him pressure swing adsorption is second largest used technique for biogas up gradation. Biogas at 4-10 bars is kept in contact with adsorbent material. This adsorbent selectively retains carbon dioxide. Adsorbents like activated carbons, zeolites and molecular sieves can be used for adsorption. According to this study, for small flow rate application of the technology, still further research is required.

Shepherd studied activated carbon adsorption for removal of volatile organic carbon from waste gases [11]. According to him if properly applied; this method can remove volatile organic carbon to almost undetectable levels. In this operation, the removal cost mainly comprises of the cost of adsorbent. Use of low cost adsorbents can reduce this cost considerably.

Studies on carbon capture were carried out by Liu et.al [12]. Uncontrolled release of waste gases can be handled by using adsorption. According to the author, the adsorbent material must be stable and easy to regenerate. Metal-organic frameworks (MOFs), constructed with organic legends with metals were excellent in this respect. MOF s are having high surface area, selectively and carbon capture capacity.

Studies were carried out on removal of volatile organic compounds by adsorption by Ambrožek [13]. He studies the cyclic thermal swing adsorption (TSA) process for volatile organic compounds recovery from the waste air. He tried to remove toluene and isopropanol from the waste gases. He used activated carbon in these studies. The simulation and experimental results for the recovery of toluene and iso-propanol in TSA system were in agreement.

Feng et. al. studied the effect of pore structure and surface chemistry on activated carbon adsorption of heavy metals [14]. They carried out adsorption/desorption tests in a fixed-bed reactor. Higher surface area showed higher sulphur retention.

Yasyerli et. al. investigated removal of hydrogen sulphide by clinoptilolite in a fixed bed adsorber [15]. The removal percentage was satisfactory. Also the experimental results were in agreement with the model predictions.

## III. CONCLUSIONS

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Removal of various gases from the waste streams is possible by using adsorption. Use of low cost adsorbent which can be obtained from waste material will be added advantage in this regard. The desorption of the gases in order to regenerate the adsorbent needs more investigation. The recovery of various volatile organic compounds is also possible by using adsorption.

### REFERENCES

- [1] Sunil J. Kulkarni, Ajaygiri K. Goswami, "Adsorption Studies for Organic Matter Removal from Wastewater by Using Bagasse Flyash in Batch and Column Operations", International Journal Of Science And Research (Ijsr), Vol. 2, No. 11, November 2013, pp.180-183.
- [2] Sunil J. Kulkarni, "Removal Of Organic Matter From Domestic Waste Water By Adsorption", International Journal Of Science, Engineering And Technology Research (Ijsetr) Vol. 2, No. 10, October 2013, pp.1836-1839.
- [3] S.J. Kulkarni, Dr.J.P. Kaware, "Fixed Bed Removal of Heavy Metal- a Review", International Journal of Research (IJR), vol.1, no.6, pp.861-871, July 2014.
- [4] Sunil J. Kulkarni \*, Ajaygiri K. Goswami, "Applications and Advancements in Treatment of Waste Water by Membrane Technology- A Review", International Journal Of Engineering Sciences & Research Technology, vol.2, no.9, pp.446-450, 2014.
- [5] Pallavi Amale, Sunil Kulkarni, Kavita Kulkarni, "A Review on Research for Industrial Wastewater Treatment with Special Emphasis on Distillery Effluent", International Journal of Ethics in Engineering & Management Education, vol. 1, no. 9, pp.1-4, September 2014.
- [6] Tanmay Uttam Gound, Veena Ramachandran, Sunil Kulkarni, "Various methods to reduce SO<sub>2</sub> emission- a review", International Journal of Ethics in Engineering & Management Education, vol. 1, no. 1, pp.1-6, January 2014.
- [7] Veena Ramachandran, Tanmay Uttam Gound, Sunil Kulkarni, "Biofiltration for waste gas treatment – a review", International Journal of Ethics in Engineering & Management Education, vol. 1, no. 2, pp.8-13, February 2014.
- [8] M. R. Shahmansouri, H Taghipour, B Bina, H Movahedian, "Biological removal of ammonia from contaminated air streams using biofiltration system", Iranian Journal of Environmental Health Science and Engineering, vol. 2, pp.17-25, 2005.
- [9] Sunil J. Kulkarni, Nilesh L. Shinde, "A Review on Hydrogen Sulphide Removal From Waste Gases", International Journal of Advanced Research in Science, Engineering and Technology, vol. 1, no. 4, pp.187-189, November 2014.
- [10] Carlos A. Grande, "Biogas Upgrading by Pressure Swing Adsorption", Biofuel's Engineering Process Technology, pp.1-21, 2011.
- [11] Austin Shepherd, "Activated Carbon Adsorption For Treatment Of Voc Emissions", the 13th Annual EnviroExpo, Boston Massachusetts—May 2001.
- [12] Yangyang Liu, Zhiyong U. Wang and Hong-Cai Zhou, "Recent advances in carbon dioxide capture with metal-organic frameworks", Greenhouse Gas Sci Technol. vol.2, pp.239–259, 2012.
- [13] Bogdan Ambrozek, "Removal And Recovery Of Volatile Organic Compounds (Vocs) From Waste Air Streams In Thermal Swing Adsorption (Tsa) System With Closed-Loop Regeneration Of Adsorbent", Environment Protection Engineering, vol.34, no.4, pp.1-8, 2008.
- [14] Wenguo Feng, Sejoon Kw O N, Eric Borguet, And Radisav Vidic, "Adsorption of Hydrogen Sulfide onto Activated Carbon Fibers: Effect of Pore Structure and Surface Chemistry", Environ. Sci. Technol. Vol.39, pp.9744-9749, 2005.
- [15] Sena Yasyerli, İrfan Ar, Guls, en Dogua,, Timur Dogu, "Removal of hydrogen sulfide by clinoptilolite in a fixed bed adsorber", Chemical Engineering and Processing, vol. 41, pp.785-792, 2002.





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