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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 Ambrożek[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

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.

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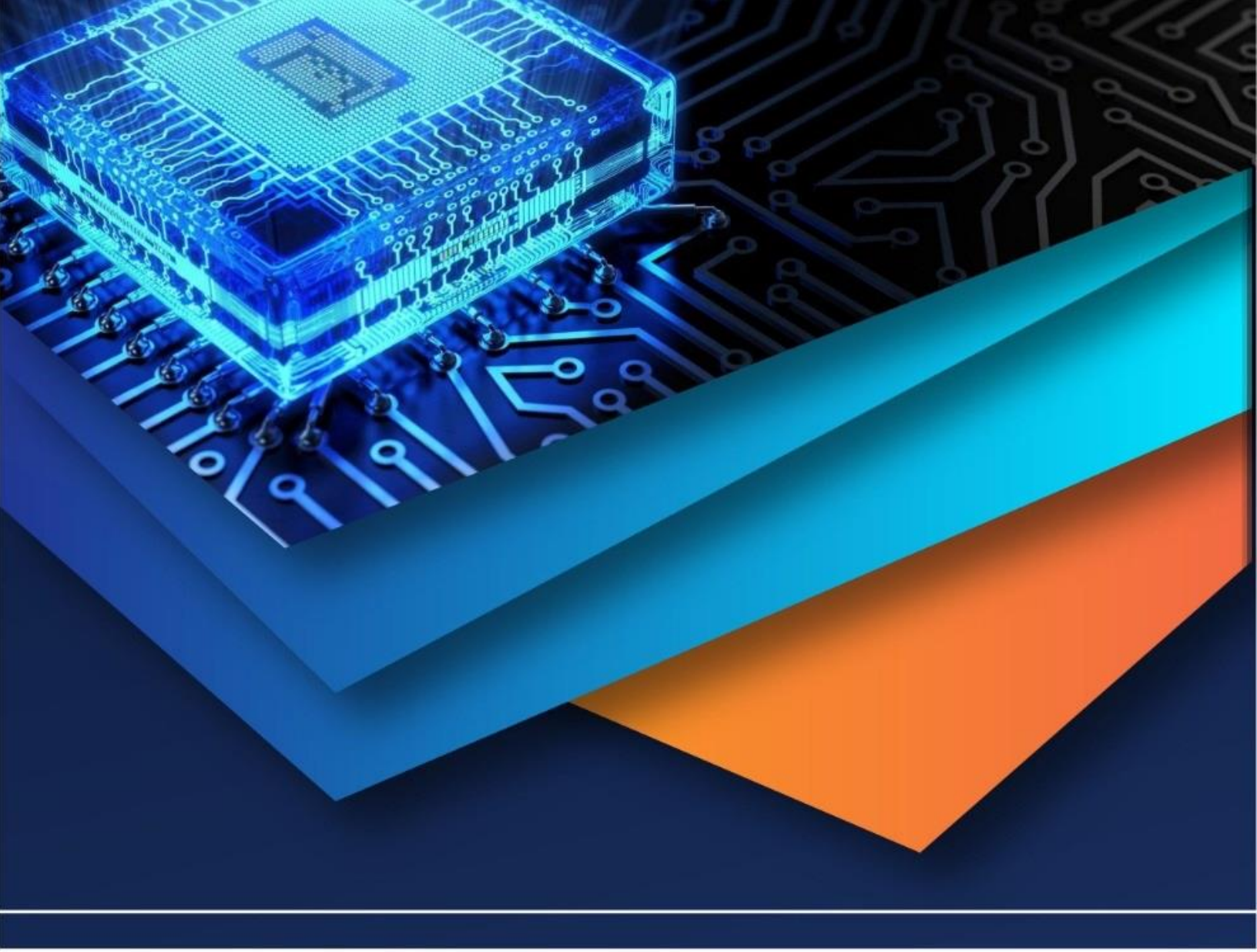

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