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Natural Soil as Bio-activator for Wastewater Treatment System

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Abstract. The wastewater treatment process has various kinds of problems that can disturb and hinder the treatment process. Issues that usually occur are wastewater contains irritating and robust odour. Based on the production of different amounts can change the characteristics of effluents. The number of organic variation decreases the effectiveness of biological processing and others. So based on this, the right solution is needed and can expedite the treatment of wastewater. Bio-activator is an excellent material that can be used. Bio-activator consists of naturally occurring microorganisms attached to organic compost. It quickly stimulates the bacteria in situ so that the waste soon decomposes. In the process, it prevents the generation of smells. Bio-activator is entirely natural, and it does not contain any hazardous or poisonous chemicals or enzymes. Bio-activator also inhibits the production of odours, increases the metabolic of bacteria. It is most effective on organically overload treatment plants it increases treatment plant capacity. Bio-activators can come from soils where soils contain lots of microorganisms. The amount of microbes found in the soil depends on the type of soil. Soil consists of micro and macro fauna and flora, which provide an excellent carbon source and a large number of microorganisms. So in this paper, by utilizing microorganisms in the soil as a bio-activator for wastewater treatment.

1. Introduction

Wastewater treatment is essential to be discussed at this time because, with the increasing population, the demand for water is very high. The amount of water needed is very high, and water quality is also necessary for health. Then to realize this, we need the right method for treating wastewater [1]. The technology of wastewater treatment can be made with many techniques, such as physics, chemistry, and biology. The different methods are available to treat wastes water. However, biological wastewater treatment methods are high most valuable because their economic benefits are high [2]. The sustainable operation of a biological wastewater treatment plant is significantly connected to removal efficiency. The most commonly applied in a natural process is the use and exploitation of bacteria species for removing pollutants. By using a biological system, organic matter in wastewater can be significantly reduced because microorganism will use organic matter in wastewater to be a source of energy. Bio-activator is entirely natural, and it does not contain any hazardous or poisonous chemicals or enzymes. [3] Bio-



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activator also prevents the generation of odours, increases the metabolic of bacteria. Bio-activator consists of microorganisms that can improve the quality of biological methods. Bio-activator is entirely organic and eco-friendly material to solve problems in biological treatment. Bio-activator can be made from natural soil.

Soils are the essential portion of the landscape, and their features are primarily controlled by the landforms on which they are developed [4]. The characteristic of soil is different depends on its landform. Microorganisms are isolated from soil, can also be found in live plants, leaf litter, and dung in soil support microbial ecosystems that are different from those of the bulk soil [5]. The spread of soil microorganisms has also been thoroughly studied where the spread of microorganisms shows that bacterial cells are aggregated on a scale of several micrometres because of the soil structure and even the way bacteria multiply. Microbes contained in the soil distribution varies so that the type of microorganisms in the soil also varies [4].

2. Bio-activator

Bio-activators are agents in the form of microorganisms whose role is to initiate the process of changing the physical and chemical aspects of organic material into a product of a different nature. [6] Bio-activator is made from natural ingredients that do not contain harmful and toxic substances, thereby making environmentally friendly. Bio-activators consist of natural microorganisms that can stimulate bacteria to accelerate the process of decomposition. Bio-activator can be liquid, powder (bulk or water-soluble bags), tablets and capsules, pellets, and slow-release little bars. Bio-activator has become one of the solutions in wastewater treatment. There are several bio-activator properties, such as improving the quality of activated sludge, reducing the occurrence of foam, and reducing sludge [7]. In wastewater, there are high organic components such as COD, BOD, suspended particles, fats and elements with nitrogen and phosphorus [8]. The advantages of bio-activator in wastewater treatment are prevents the generation of odours, stops the production of hydrogen sulfide, significantly increases bacterial metabolic rate, improves the bacterial breakdown of organic material, increases the rate of nitrogen cycling [8]. In a research journal on the use of bio-activators for wastewater treatment can reduce the amount of COD and BOD below the quality standard. Following is the comparison of the use of bio-activators in wastewater treatment by not using bio-activators [6].

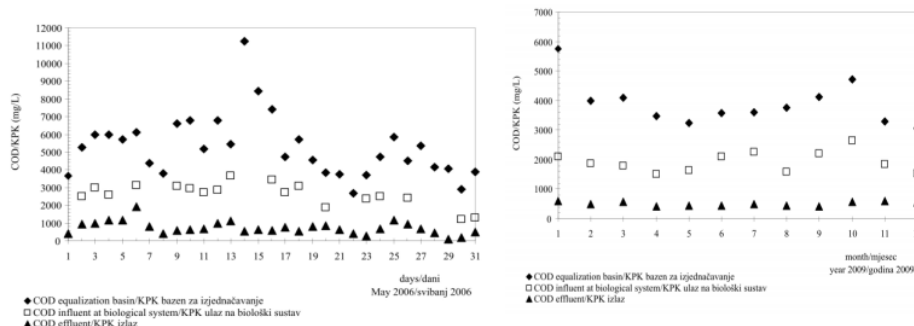


Figure 1. (a) Bioactivator not added (b) with the addition of bio-activator

3. Natural soil

Natural soil can also be called organic soil matter which consists of micro and macro fauna, cells and microorganisms [9]. Soil microorganism is one that improves soil function. Naturally, it also regulates the soil for agriculture, because microorganisms play an essential role in processing the shape of soil structure including decomposition of organic matter and the removal of toxic materials as well as the cycle of carbon, nitrogen, phosphorus, and sulfur [10]. Natural soil becomes a habitat for heterogeneous microbiota where there are 6 different forms of soil structure such as sand, silt, clay, and organic matter [11]. In the soil, there are a total number of bacteria which is 1.5×10^{10} per g [12]. in organic soil, there are bacteria on average 10^6 - 10^7 per gr [13].

4. Lake soil

Swamps are land derived from a mixture of peat and minerals that are inundated and relatively fertile because they have obtained sedimentation from runoff in the surrounding environment [14]. Land on swamps consists of peat and mineral soils [15]. Swampland is a form of a complex ecosystem because it has high biodiversity, such as plants such as grasses and woody and also fish [16]. There are unique characteristics possessed by swamps such as a) limited oxygen molecules, b) decreasing electron receiving compounds and reduced to reduced compounds, c) oxidation of topsoil, d) Occurrence of dissolved compounds between soil and water, e) Organic material accumulation, and f) Aquatic plants [17][18].

Sediment from swamps or wetlands can reduce metals as it can reduce zinc content which was initially 150 mg / l to 0.2 mg / l; copper from 55 mg / l to 0.05mg / l; iron content initially from 700 mg / l to 1 mg / l; and manganese at an initial state of 80 mg / l to 1 mg / l [17]. There are fundamental characteristics of black swamp sediments that have been known according to existing research with Carbon (C) content of 36.25%, Nitrogen (N) of 0.32% and Phosphorus of 0.19% [19].

Wastewater treatment has been carried out in various ways, both biologically, physically and chemically. In this treatment, not all parameters in water can be treated with only one type of treatment. For example, in setting aside organic content, physical processes cannot be used, so biological processes are needed. In this biological process, what is required is a microorganism that can set aside organic material. Organic matter contained in wastewater becomes food for microorganisms by degrading carbon, to accelerate and create quality microorganisms, bio-activators are used that are useful for reducing odours. Bio-activators can contain bacteria, fungi, mixtures of either bacteria or fungi, humic/fulvic acids, and seaweed extract.

As explained above, natural soil has a lot of microorganisms that help to improve soil forms and the processes of carbon, nitrogen, phosphate and sulfur cycles. A variety of diverse microorganisms in natural soil can be used as a bio-activator that can treat wastewater. The role of microorganisms as bio-activators to accelerate the initial process in wastewater treatment, besides that according to the graph above there is a significant difference where the figure before being given bio-activator efficiency is still low then given higher efficiency bio-activators.

5. Conclusion

Natural soil containing microorganisms can be used as a bio-activator and can be applied to treat wastewater containing organic matter in biological processes.

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