Use of Effective Microorganisms for Treatment of Domestic Sewage by the Activated Sludge Process

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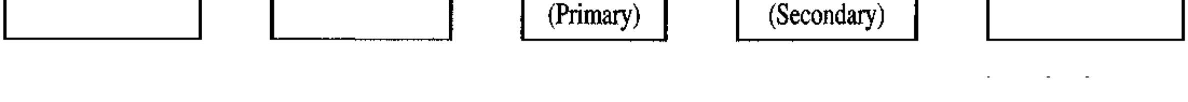
Background

Most treatment systems for domestic sewage depend on a wide array of aerobic and facultative anaerobic microorganisms, mainly bacteria, that can utilize the raw organic materials as a carbon and energy source during their growth and reproduction. As a result, these microorganisms decompose much of the organic fraction into simpler, less-toxic compounds; destroy pathogenic (i.e., disease-causing) microorganisms; stabilize the system by decreasing its volatility; and facilitate the recycling of water for domestic, agricultural and environmental use.

The activated sludge process is widely used for the treatment of domestic and municipal sewage throughout the world. It is an effective method except for the fact that it produces large amounts of sludge, i.e., the stabilized residual (largely organic) material that remains after treatment and must be disposed of in a proper and acceptable manner. Some may not consider this to be a problem since good quality sludges can be composted into biofertilizers and soil conditioners for agricultural use. Nevertheless, it does add to the overall cost of sewage treatment. Consequently, sanitary engineers continue to seek ways and means for increasing the overall efficiency and cost-effectiveness of the activated sludge process. This poster paper reports on the potential benefits of using Effective Microorganisms (EM) in the treatment system to achieve these goals.

Experimental Procedure

A laboratory and a field experiment were conducted to evaluate the effect of EM on the activated sludge process for treating domestic sewage. The following details are relevant:
The laboratory study was conducted in our Experimental Sewage Treatment Unit (ESTU) and simulated the activated sludge process. The setup consisted of a 20-liter reservoir filled with domestic sewage sludge followed by three 2-liter plastic bottles which served as a single activated sludge tank, two settling tanks, and a treated effluent tank connected with appropriate tubing. A small compressor and pump admitted air to the activated sludge tank. Thus, the flowchart for this experimental system was:



The system was operated continuously for 20 days at which time stabilization had occurred. EM was then added each day to the sewage reservoir at a dilution of 1: 10,000 for 5 days. The effect of EM was assessed by monitoring changes in the chemical oxygen demand (COD), pH and electrical conductivity (EC).

The field experiment was conducted after construction of an actual small-scale treatment plant based on the laboratory setup; the only difference being that a biological filter was placed between the secondary settling tank and the treated effluent tank. All units were connected with appropriate piping, The raw sewage came from the house of a tenant farmer which accommodated two adults and three children.

During sludge formation, small amounts of EM were added each day to the sewage reservoir at a 1:10,000 dilution based on a total system capacity of 2,200 liters. After 15 days, the amount of EM was reduced by one-half, and 15 days thereafter EM was added weekly. Aeration was continuous for the first 20 days of operation, then reduced to 8 hours per day and finally 2 hours per day.

An added dimension to the treatment system was the use of water hyacinth (Eichornia crassipes L.) in the treated effluent tank to further improve water quality.

Results

The following preliminary results were obtained in the study:

1. Oxygen consumption in the treatment systems decreased after EM was applied.
2. Sludge volume in the aerated activated sludge tank decreased after EM was applied.
3. Chemical oxygen demand (COD) in the treated effluent tank decreased after EM was applied.
4. Malodors were reduced significantly throughout the application of EM, particularly in the anaerobic settling tanks.

Conclusions

The results of these experiments indicate that EM has the potential to improve the over-all effectiveness and efficiency of the activated sludge process for treatment of domestic sewage. Future experiments will focus on the specific effects of EM on those parameters that can be used to quantify significant changes. Plans are also underway to evaluate the effect of EM technology on the treatment of industrial effluents.

General References

Bassoi, L.J., R. Nieto and D. Tremaroli. 1990. Implementaçõ de testes de toxicidade no controle de efluentes líquidos. Companhia de Tecnologia de Saneamento Ambiental, CETESB, São Paulo, Brazil.

Braile, P.M. and J.E. Cavalcanti. 1993. Manual de tratamento de águas residuárias industriais. Companhia de Tecnologia de Saneamento Ambiental, CETESB, São Paulo, Brazil

Higa, T. and J.F. Parr. 1994. Beneficial and Effective Microorganisms for a Sustainable Agriculture and Environment, International Nature Farming Research Center, Atami, Japan. 16 p.

Kawai, H., J.F.M. Bezerra, J.R. Costa, R.H. Ohno, W.I. Vidal and E.P. Jordão. 1991. Avaliação de desempenho de estações de tratamento de esgotos. Companhia de

TecnoIogia de Saneamento Ambiental, CETESB, São Paulo, Brazil.

São Paulo (Estado). 1990. Demanda química de oxigênio (DQO): Método da oxidação por dicromato de potássio em refluxo. Companhia de Tecnologia de Saneamento Ambiental, CETESB, São Paulo, Brazil.