

A compatibility study of the effects of dairy and brewery effluents on the treatability of domestic sewage

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Abstract

It is generally accepted that industrial waste waters are more complex than domestic sewage, and relatively more difficult to treat. While the organic matter component of domestic wastes can generally be classified into 65% protein, 25% carbohydrates, and 10% fats; industrial effluents vary in composition from one industry to another because of differences in starting materials (products handled) and manufacturing processes. This wide variability often presents serious problems in waste-water treatment plant design and operation. However, not all industrial wastes are detrimental to the efficient operation of biological treatment processes.

A study of the treatment of domestic, dairy, and brewery waste waters, as well as 50/50 mixtures (by volume) of the domestic with the dairy and separately with the brewery waste water in laboratory-scale anaerobic ponds was carried out. Five model anaerobic ponds, each with a working capacity of 48 l were used for the treatment studies. The ponds which were in continuous use for about 3 months were operated at average retention time of about 4 d and volumetric organic loading rates ranging from 0,081 kg BOD/m³d (for the pond treating the domestic sewage) to 1,147 kg BOD/m³-d (for the pond receiving the brewery waste water).

The results show the average COD and BOD reduction efficiencies to be generally higher than 60% and the BOD/COD ratios for the 5 influent feeds as well as the effluents from the model ponds to be greater than 0,50.

The relative degree of biodegradability of the 5 influent feeds was assessed on the basis of the values of the BOD/COD ratios. The results indicate that the dairy and the brewery wastes have no adverse effect on the treatability of the domestic sewage. Furthermore, the effluents from the 5 ponds have BOD/COD ratios within ranges that are generally accepted as indicating a high degree of biodegradability. They would therefore not be expected to have any adverse effect on the efficiency of secondary biological treatment processes.

Abbreviations

BOD	= biochemical oxygen demand
COD	= chemical oxygen demand
DO	= dissolved oxygen
Eff.	= effluent
Inf.	= influent
KCC	= Kenya Co-operative Creameries

- Effluents from chemical industries, e.g. petroleum and pharmaceutical.

Introduction

Industrial effluents may have 3 major effects on sewers and waste treatment plants:

- ° They may pose great risks to the health and safety of sewer operators
- They may cause the degeneration of the structural strength of sewers
- They may result in reduction of the efficiency of the treatment works.

It has therefore been generally suggested and widely accepted that industrial effluents must be pretreated to acceptable standards before discharge into the municipal sewers.

Industrial effluents can generally be classified into 4 broad groups (Kilani, 1985):

- Effluents from food and drink industries, e.g. dairy
- Effluents from industries using animal or vegetable materials as raw material; e.g. paper pulp mill and tannery
- Effluents from metal industries, e.g. iron and steel rolling mills

Waste water from the first 2 classes is generally biodegradable while effluents from metal industries are not easily biodegraded and are often toxic, even at very low concentrations. Wastes from chemical industries are very complex because of the non-uniformity of most of their products. Since all dissolved or colloidal organic matter does not oxidise at the same rate, with the same ease, or the same degree, the rate of decomposition of biodegradable industrial wastes, such as food, and animal or vegetable-based industries could either be faster or slower than that of sewage organic matter. Sanitary engineers do believe that this difference must be considered in the design and operation of biological units. Unfortunately, however, most municipal waste-water treatment plants are often designed, constructed and operational, long before requests from industrial establishments for admittance of their effluents into the domestic sewer system are made to the municipal authorities.

Municipal authorities will be wise not to accept any waste discharges into the domestic sewer system without first learning the facts about the characteristics of the wastes, the sewage system's ability to handle them, and the effects of the wastes upon the system. They must take into consideration the oxidisability or biodegradability of such wastes before embarking on a joint disposal venture with private industries. A useful approach for this assessment is presented in this paper, based on investigation of the treatability of sewage/dairy and sewage/brewery wastes mixtures. The domestic sewage sample was from influent to the Kariobangi Sewage Treatment Works in Nairobi, Kenya while the dairy and the brewery effluents were respectively from the Kenya Co-operative Creameries at Dandora and the Tusker Brewery at Ruaraka, both being suburbs of Nairobi.

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