

# Effluent production and disposal in the South African dairy industry: A postal survey

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## Abstract

In South Africa, where water has been identified as the country's most important natural resource, the dairy industry is significant, both from a water intake and discharge point of view. The requirements of the dairy industry in relation to on-site effluent treatment were thus determined by means of a postal survey. Of the 247 questionnaires sent out, 81 were returned. The data obtained indicated that the respondents from the survey receive and process 70% of the total milk production in South Africa. A diverse range of effluents was described by the respondents. The larger factories generally discharge their effluents to municipal sewers resulting in high disposal costs. The majority of smaller factories and dairies dispose of their effluents by means of irrigation onto lands and pastures. A possible side-effect of this practice is of course ground-water pollution. Most of the respondents expressed a need for more information on the subject and a proposed project for the development of a biological effluent treatment procedure was supported by 49% of the respondents. These respondents represent 40% of the total milk volume processed in the country. The supportive respondents were also responsible for 84% of the reported municipal levies.

## Introduction

Three years ago it was estimated that the South African dairy industry, with over 150 dairies, consumes approximately 4,5 x 10<sup>6</sup> m<sup>3</sup> water per annum (Water Research Commission, 1989). This makes the dairy industry a comparatively large water user. The specific water intake (water consumption : raw milk) ratio in the different dairy manufacturing sectors varies considerably and is dependent on the type of product and also on the individual management practices. The overall range varies between 1,4 and 9,5 with an overall mean of 3,6 (Water Research Commission, 1989).

Milk buyers annually receive and process approximately 1,86 x 10<sup>1</sup> l of milk (Dairy Board, 1990). However, dairies also discharge large quantities of different effluents arising from milk processing, producing different milk products and from the cleaning processes. The ratios are dependent on the types of dairy products manufactured. It has been estimated that between 75% and 95% of the water intake emerges as effluent (Water Research Commission, 1989).

Milk and related products have exceptionally high chemical oxygen demand (COD) values (milk : 218 000 mg-l<sup>-1</sup>; skimmed milk : 100 000 mg-l<sup>-1</sup>; whey : 80 000 mg-l<sup>-1</sup>). The inevitable wastage of milk and milk products can contribute greatly to the pollution loads discharged. It has been estimated by Jones (1974) that for the USA the average COD of dairy effluents is approximately 3 800 mg-l<sup>-1</sup>. The average pollution load (as COD) for the South African dairy industry is not known but, since dairy practices in South Africa are similar to those practiced in the USA, it can be safely assumed that the average values would be similar.

Water management in the South African dairy industry for the purpose of effluent control is well documented (Funke, 1970; Water Research Commission, 1989). Significant recommendations have been made towards the in-house water management in the South African dairy industry (Water Research Commission, 1989). However, the nature of dairy effluents

changes significantly when the water usage of a factory is reduced.

Currently, another problem found in the dairy industry is the disposal of the effluents. Until fairly recently, the issue of effluent disposal or treatment did not receive any serious consideration in the dairy industry. It is thus important that before any studies on the treatment and disposal of dairy factory effluents can commence, the need for such a study has to be evaluated. A comprehensive questionnaire on this subject was thus compiled and sent to all registered milk buyers in South Africa. This country-wide postal survey was also used to determine the scope of other effluent-related issues. These included the volumes of milk received, the products manufactured, the water usage, the expenditure associated with the effluent, the chemicals used in the factory, and the degree of effluent-awareness of the factory's management. This paper thus reports on the results from this national postal survey on dairy effluents.

## Experimental

The questionnaire, sent to the 247 milk buyers registered during 1991 (Nell, 1991), covered the following aspects:

- Milk volume received
- Products manufactured
- Water usage
- Chemicals used in the dairy or factory
- Effluent volume and strength
- Effluent treatment prior to disposal
- Effluent disposal
- Economics related to effluent disposal
- Interest in the intended future effluent treatment and/or disposal projects.

In the questionnaire, specific questions were used to determine figures on daily rates. These included daily water usage, milk reception volume and effluent discharge volume. The answers were converted, where applicable, to yearly rates by multiplying with a factor of 264, assuming a month consisted of 22 work-days.

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