



## Project Summary

# Strategies for Water and Waste Reduction in Dairy Food Plants

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A study was undertaken to reduce water and waste discharges in a complex, multiproduct dairy food plant through management control and modifications of equipment and processes. The objectives were to develop approaches that would be broadly applicable throughout the dairy industry and to determine the economic and environmental impacts of the programs instituted.

The Kroger Dairy Company at Indianapolis, Indiana, was the study site. This plant was chosen because it was well engineered, discharged its wastes to a municipality, was under average management control, and had not previously had an extensive waste control program. As such, it was typical of more than two-thirds of the dairy plants in this country.

Detailed studies were made to determine the plant areas contributing major waste loads and the economic feasibility of reducing these loads. A management control program was developed and implemented over a 6-month period. This program included major increases in direct supervision of waste control. A computer linear program was applied to the four processing areas to determine economic factors involved in wastewater discharges and to help select the most economical process and equipment changes that could be made.

The study concluded that material reduction can be achieved economically in dairy food plants that have not previously given attention to this matter.

*This Project Summary was developed by EPA's Water Engineering Research Laboratory, Cincinnati, OH, to announce key findings of the research project that is fully documented in a separate report of the same title (see Project Report ordering information at back).*

### Introduction

As regulations of effluents from municipal water treatment plants become more restrictive, dairies and other major contributors of organic matter will face considerable pressure to reduce their loads, increase pretreatment, or provide full secondary treatment. The Kroger Dairy Company at Indianapolis, Indiana, has conducted a 2-year investigation to reduce processing wastewater through a combination of management control and process equipment modification. The objectives were to develop approaches that would be broadly applicable throughout the dairy industry and to determine the economic and environmental impacts of the programs instituted.

The Kroger plant receives up to 2 million lb of fluid milk per day, and it manufactures fluid milk products, cottage cheese, and frozen desserts. The company operates three shifts per day 5 to 6 days per week. All wastewater is discharged to the Indianapolis Municipal Treatment Plant.

### Plant Description

Before control procedures were introduced, the plant discharged 400,000 to



800,000 gal of wastewater per processing day. This water contained 10,000 to 15,000 lb of BOD. The composition of the wastewater was typical of other dairy plants of the same type and size. The mean strength of the wastewater components is listed in Table 1.

### Procedures

Detailed studies were made to determine the areas that contributed major waste loads, and an investigation was conducted of the economic feasibility of reducing these loads. Determinations were made of the unavoidable and preventable wastes in each department. Preventable waste made up about 50% of the total waste load and was considered to be controllable by the application of good management practices. Unavoidable wastes were associated with the design of the plant. Studies were therefore done to determine the feasibility of altering the process, or the equipment, or both to reduce these wastes further.

A management control program was developed and implemented in the plant over a 6-month period. This program included appointing two waste control supervisors (first and second shift), increasing supervision on the second shift by creating a new position of general foreman, implementing an educational program, altering the maintenance program to cover items that caused major losses of water or ingredients, and implementing plant surveys and recordkeeping.

A computer linear program was applied to the four different processing areas to determine the economic factors involved in wastewater discharges and to provide a basis for determining the most economical process and equipment changes that could be made.

### Results and Conclusions

As long as direct supervision was maintained on a regular basis, water use in the plant was reduced by one-third and the organic waste load was reduced by one-half. When this emphasis was decreased because of other responsibilities of the waste supervisors, the wastewater volume and strength returned to the level that existed before the introduction of the program. For this reason, a full-time resource control manager was appointed to work on a flexible time program. With renewed emphasis, the waste loads were again reduced and maintained at the levels previously achieved.

**Table 1.** *Composition of Kroger Dairy Wastewater\* in Indianapolis, Indiana*

<i>Parameter</i>	<i>Mean Concentration (mg/L)</i>
<i>COD</i>	<i>4100</i>
<i>BOD<sub>5</sub></i>	<i>2200</i>
<i>Total solids</i>	<i>3130</i>
<i>Suspended solids</i>	<i>566</i>
<i>Volatile suspended solids</i>	<i>500</i>
<i>Fat</i>	<i>260</i>
<i>Protein</i>	<i>446</i>
<i>Carbohydrate</i>	<i>1300</i>
<i>Chloride</i>	<i>400</i>
<i>Phosphorus</i>	<i>52</i>
<i>Sodium</i>	<i>230</i>
<i>Calcium</i>	<i>168</i>
<i>Magnesium</i>	<i>28</i>

\*pH = 6.6.

Process and equipment changes were made that reduced water discharges by 100,000 gal per day and reduced waste strength about 20% at an economic savings projected at \$200,000 per year.

The study at the Kroger plant in Indianapolis indicates that material reduction can be achieved economically in dairy food plants that have not previously given attention to this matter.

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**Kenneth Dostal** is the EPA Project Officer (see below).

*The complete report, entitled "Strategies for Water and Waste Reduction in Dairy Food Plants," (Order No. PB 85-216 505/AS; Cost: \$25.00, subject to change) will be available only from:*

*National Technical Information Service  
5285 Port Royal Road  
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