



Project Summary

Waste Management Control Handbook for Dairy Food Plants

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In dairy food plant operations, resource management control can reduce losses in product, water, energy, labor, packaging, and sewer surcharges. An efficient program of waste control can increase the profit margin and help to improve the environment in which we live. These economic and environmental factors justify the full-time assignment of one or more persons reporting directly to the plant manager.

The handbook described herein, presents a detailed plan for implementation of a source management program which includes maintenance and education information for labor and management.

This Project Summary was developed by EPA's Industrial Environmental 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

The reduction in loss of product, water, and energy in dairy food plant operations is a goal toward which all dairy plants must strive to improve products, minimize impact on the environment and to meet Federal, State, and local regulations. The handbook described herein is directed primarily toward individuals who have direct responsibility for the development and operation of a waste control program in a dairy food plant.

Dairy plant losses can be categorized as: (a) unavoidable, and (b) preventable. Unavoidable losses are related to plant and process design and are primarily

associated with cleaning operations. Preventable losses, usually over 50% of all losses, are those that can be eliminated by good operational practices. A waste control program aims at eliminating preventable losses and applying engineering improvements to equipment and process design to minimize the level of unavoidable losses.

The information presented in the handbook was developed primarily from experience gained in working with waste control programs in milk, ice cream, and cottage cheese plants. Although many of the illustrations and examples cited come primarily from those products, the principles expressed apply equally in plants manufacturing any dairy product. The handbook can also be used for development of waste control programs in other food industry plants.

Experience shows that the approaches outlined in the handbook can reduce product losses, organic waste loads, water loss and energy wastage by at least 50% in an average plant, when fully supported at all levels of management and operational personnel. The success of the program depends upon the motivation of people and continued attention to a well-organized program. All too often a control program is instituted, works very well in the beginning then, because of lack of continued attention, the waste situation rapidly deteriorates.

Waste control is an important aspect of resource management control and an essential part of dairy food plant operations. Waste control (*quantity control*) should be recognized as equal in significance to quality control. Where plant size warrants, the quantity control task warrants the full-time assignment of at least one person to the waste control

program. Only when this area is given full time attention can long-term benefits be achieved. In most situations, the time spent by one or more individuals will be repaid to the company over a period of a year.

Environmental Effects of Dairy Wastes

The major pollutant and waste discharged from dairy plants is organic material. This is milk diluted with water discharged as wastewater. When dumped untreated into a stream or river, organic material is decomposed by microorganisms in the river. When breaking down the organic pollution, the microorganisms consume oxygen in the water. That action can degrade the water by depleting its oxygen content. Oxygen depletion, in turn, can have a catastrophic impact on life in the water body for fish or other aquatic animals and on plants which must have dissolved oxygen to survive. When all oxygen in a water body is used up, as frequently happens, the decay of organic matter continues without the oxygen. As a result, noxious gases such as hydrogen sulfide and methane are produced and result in an odor much like that of a septic tank.

The measurement of pollutants that consume oxygen in water is called biochemical oxygen demand, or BOD. Water with high BOD contains a large amount of decomposed or organic matter. Another pollutant in dairy plant discharges is suspended solid waste, such as coagulated milk, particles of cheese curd, and in an ice cream plant, pieces of fruit and nuts. This type of pollutant is called total suspended solids, or TSS. These solids discolor and cloud the water. They impair photosynthesis in the aquatic plants. They can settle on the bottom and become sludge beds and further deplete the waters' oxygen content. As the sludge decomposes, it gives off gases that are toxic to aquatic life.

Raw wastes from the dairy plant contain excessive amounts of organic materials and suspended solids. These wastes must be treated before they can be discharged into a river or stream. The major dairy industry water pollutants, organic materials and suspended solids, can be treated successfully either by a municipal treatment facility or by an on-site plant operated by the dairy. Other identified pollutants in dairy plant wastes that may be of concern include phosphorus, nitrogen, chlorides, and heat. Another consideration is the pH of

the wastes. In some situations, whey creates a problem for municipal treatment plants. This usually occurs where the whey discharge is a significant portion of the load to the municipal plant.

The wastewater characteristics for dairy plants are extremely variable. The data of many authors who have studied dairy operations indicate that wastewater parameters may have a range as wide as shown below:

BOD₅ - 500 to 5,000 mg/L

SS - 400 to 3,500 mg/L

Fat - 200 to 3,000 mg/L

Flow - 0.5 to 20 pounds per pound of product

Economic Considerations

Water and sewer charges for larger dairy processing plants can exceed \$50,000 per month. Water and sewer charges are estimated at less than \$2,000 a month for the average dairy plant. Surcharges can approach \$5,000 to \$10,000 per month for the same average dairy plant. Waste treatment plants for a large dairy processing plant might cost \$1.5 to \$2.5 million to meet rigid effluent standards. A strong economic incentive to build such waste treatment plants is the cost of water, sewers, and surcharges — estimated at more than 1/3 of a cent per gallon for a well-operated dairy plant. Plants without adequate waste control programs might pay bills for water, sewer and surcharges which exceed 1 cent per gallon of processed products. When the average

dairy plant makes only 2.6% profit based on sales, and when more than 2/3 of a cent per gallon of profit can be gained from waste control, then control of wastes becomes economically attractive to dairy plants.

The increase in cost of energy also relates to waste control programs. Much of the product that is lost during processing has been pumped, chilled, heated and homogenized. Because each of these cleaning processes require great quantities of warm or hot water, the control of waste also controls energy losses.

The handbook fully discusses all of the economic factors of waste treatment processes.

Legal Considerations

States have the authority to enforce Federal Standards. Most states previously required permits for direct discharges of wastewater. Then PL 92-500 set up a new system of permits at the Federal level 1 — the NPDES of National Pollutant Discharge Elimination System Permits which were developed and promulgated by the United States Environmental Protection Agency (EPA). Now, most states write and enforce the NPDES permits. However, EPA reserves the right to check on the actions of the state. While the law requires industries to follow municipal discharge standards set for 1977 and 1983, the law also allows a state or community to impose stricter requirements if it wishes. The national standards are thus minimum requirements that all industries must meet.

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The complete report, entitled "Waste Management Control Handbook for Dairy Food Plants," (Order No. PB 84-152 826; Cost: \$20.50, subject to change) will be available only from:

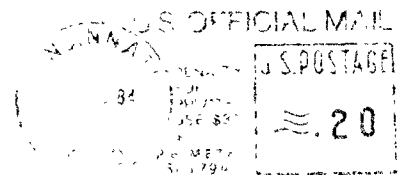
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