Technews

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For Efficient Dairy Plant Operation

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DAIRY PLANT EFFICIENCY : MILK SOLIDS LOSS CONTROL - I

This bulletin includes technical and latest development on products, systems, techniques etc. reported in journals, companies' leaflets and books and based on studies and experience. The technical information on different issues is on different areas of plant operation. It is hoped that the information contained herein will be useful to readers.

The theme of information in this issue is **Dairy Plant Efficiency: Milk Solids Loss Control - I**. It may be understood that the information given here is by no means complete.

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INTRODUCTION

The goal of a dairy processing plant is to produce dairy products of highest quality **most efficiently**. The balance sheet may not give the correct picture of plant performance: profit is affected positively or adversely by pricing policy for raw milk and products, market situation and marketing efforts etc. The only reliable method of measuring the efficiency of the plant is to compare its performance in important areas with performance standards/benchmarks, and to take necessary steps to keep improving the performance. Important areas which should be considered for regular performance measurements are energy consumption, water consumption, milk solids recovery efficiency and material losses. The norms for milk solids losses were suggested in Technews Issue 16 (September-October 1998). Plant efficiency can be improved, and hence costs can be reduced, by implementing some measures and following some important guidelines. In a series of issues, Technews would provide these important control measures. This and the next issue suggest some measures to minimize milk solids losses. Milk solids losses are very expensive. For example, **reducing fat losses by only 1%** in a 5 lakh litres a day dairy plant would result in **saving of Rs.150 lakh a year**. Any effort in reducing losses is worth.

FACTORS AFFECTING

Both equipment and operation conditions considerably effect solid losses. Poor equipment maintenance results in leakage, product contamination and hence spoilage, spillage, overfills and such other losses. Likewise, imprudent operating decisions, like too frequent product changes too early and

incomplete production cycles, result in unnecessary additional 'water pushes' and 'product pushes'. These lead to more frequent product-water mixture getting drained and in the case of incomplete production cycles also to more cleaning cycles thereby increasing losses.

Incorrect design of a dairy processing plant is likely to increase the problem of solid losses. If the capacities are not well coordinated in a plant, frequent interruptions of certain parts of production process can occur, usually leading to product wastage. Long paths for the products increase wastage. Product lines and valves, which are not clearly marked, can cause product wastage. Importantly, a plant must have adequate capacity for reception, cooling and storage for the maximum quantity during peak production in order to avoid spoilage of the products due to processing delay.

Another very important factor, probably the most important one in controlling losses, is the personal involvement of the staff. Insufficiently trained, insufficiently supervised and poorly motivated staff will be a cause of much loss. Hence, the staff must be carefully trained, supervised and motivated to operate dairy plant correctly and maintain it is a good condition.

In controlling the losses one of the most important factors is the awareness of the plant operation staff and the commitment of the management. The staff should be educated about the economic implications of the plant losses, and should be trained to reduce losses to an unavoidable minimum level. In the long run, a major part of the loss reduction must be engineered into the plant as far as possible and economic.

It must be stressed that plant management remains as a major factor in loss control and must formulate precise instructions on avoiding loss.

It is seen, therefore, that "avoidable losses" can be prevented, or at least greatly

reduced under certain achieveable conditions which also include inexpensive and simple modifications. These standard conditions include the following:

- Proper plant design
- Proper and standard equipment for processing, handling and testing
- Proper production planning
- Proper and correct plant operation and procedures: trained and motivated staff
- Proper and good maintenance of equipment and systems: trained and motivated staff

In an efficiently managed plant, these conditions would obtain and hence losses would be minimum.

The effect of the introduction of automation and mechanisation in the complexity of larger plants on the solids loss is often not correctly understood. While the use of more precise controls, such as in packaging machines would reduce or eliminate overfilling losses, there are factors which in fact tend to increase losses. For example, separators are de-sludged automatically at regular intervals of about 20 minutes, pipelines in CIP systems will hold more if not properly designed for prior draining and given adequate provision for air push, equipment and storage tanks/ silos will drain more product if instruments work erroneously, storage tanks/silos will drain more product if level transmitters are placed at wrong locations. Hence, proper plant design and good maintenance of instruments, controls and equipment for reliable operation become very important.

GENERAL MEASURES

There are certain precautions and measures which can reduce the losses to a great extent, if not prevent them altogether. It would be very useful to plant managers if they implement suggestions given below for reducing plant

losses.

Controlling leakages

Even small leakages from pipelines or equipment cause remarkable solids losses. Therefore, these should be immediately repaired. If this is not possible, the wastes should be collected in suitable containers and reprocessed, if possible. Any such containers should be checked frequently to ensure that overflow of milk or milk product does not occur.

All fittings, valves, cocks and seals should be regularly checked for leaking. Manually operated valves should be readjusted, if necessary, and defective seals replaced.

Valves, seals, fittings, pump parts and parts of packaging machine must be treated carefully when being dismantled, cleaned and reassembled to ensure that the finished surface is not spoilt, as this causes uneven surfaces and thus wastage due to leakage. If a finished surface is scraped, it should be reground.

The pipelines should not have any expansions, narrow parts, syphons or dead ends which may cause increased product losses. With long pipelines, shut up devices should be mounted at intervals to reduce the product quantity when emptying. As far as possible pipe connections should be welded rather than screwed together, in order to prevent wastage due to leakage.

Avoiding spillage

In order to avoid overflow losses, containers and cans should be constantly checked while being filled. It is, therefore, useful to provide checking devices for the filling level and suitable high level control devices where overfilling may occur.

Tanks and vats containing milk and milk products should never be filled to such a level that the product overflows during agitation. They should have well rounded corners, be well sealed and designed for ease of emptying and rinsing.

Splashing from open liquid discharges can be avoided by providing splash guards.

It is useful to provide standby pumps for all important points to prevent uncontrolled loss of milk and milk products when the normal pump fails to work. The provision of a standby generation plant should not be overlooked. Sufficient generation capacity to allow the minimum of plants to be operated in order to process the milk already within the system is essential. In some plants it may be a sensible idea to install suitable collecting vessels in the basement so that in case of a power failure the product flowing out of the production plant can be collected.

Preventing foaming wastages

Foaming of milk, skim milk etc. is often responsible for overflowing and thus the actual cause of wastage of milk solids. Excessive foaming is often caused by open type separators and incorporation of air during filling of the tanks.

To prevent foaming, the pipelines and its connections on the suction side of the pumps have to be tight. Foaming during filling process can also be reduced by a suitable arrangement to the packaging machine pipelines.

PRECAUTIONS IN MILK RECEPTION AND STORAGE

Can supplies

Filled cans may be a source of spills because of splashing when they are being transported due to conveyor shock and when being emptied. Cans used for milk transport should, therefore, be checked frequently to ensure that no damage has been caused and shocks should be avoided in order to prevent spillage during transport.

Spillage also results from carelessness in emptying cans into hoppers and weigh bowls as well as from overfilling receiving tanks.

Milk continues to drain from a can after it is moved away from the receiving hopper. After emptying cans, drip savers should be placed under the conveyors leading to the can washer in order to collect drips from cans and lids. To give sufficient drainage time, say about 30 seconds, a reasonable length of conveyers before entering a can washer is essential. On or before the can washer a first pre-rinse with a small amount of water should be applied and the rinse water should be collected and utilised.

Milk obtained from drips and pre-rinsing could be reused.

Milk losses may also be caused by drips on lids, overflowing containers and incorrect pipe connections. All such drips should be collected on drip savers and reused.

Bulk supplies

Transport tankers are a source of wastage when they are not completely emptied. Incorrect construction of tankers and associated equipment also result in losses. Adequate slopes should be provided in tanker reception bays. It should be ensured that the tankers are fully emptied, possibly by visual inspection or automatically.

Special care should be taken to prevent spillage or leakage from the pipe or hose connections (during making connections and disconnections of hoses) from the tankers. Tankers should be drained completely before disconnecting the sanitary pipe or hose. The hoses may also contribute to spills if not fully drained.

Milk tankers should not be permitted to stand for more than one hour before unloading to avoid creaming and excessive loss of product in rinsing and cleaning of the tankers. Once creaming occurs even extensive agitation will not prevent adherence of the milk fat to the side of the tanker.

In the handling, cooling and storage of raw milk after

reception, any leaks or drips from pipelines and pumps or from overflows and spills should be collected and reused.

Careful weighing and measurement

Maximum care should be taken in weighing of milk/milk products at the time of receiving and at various stages of handling. The weighing balances used in dairy should be got stamped by the Weights & Measures Department on specified intervals. The weighing balances should be properly maintained. There should be a regular and proper system of ensuring the accuracy of balances, e.g., the milk weighing balances should be checked up twice - once in the morning and again in the evening, and recorded well in advance before receiving starts, which would provide enough time for repairs, if required. The measurement of milk, cream etc. in storage tanks should be done accurately by using a dip-stick or through some other reliable means.

Similarly, regular and proper system of checks should be employed while packing/filling milk and milk products. Quality control laboratory should take random samples for correctness of weight regularly. The empty containers, used for packing, should also be checked up to give an average weight for the purpose of counter weighing such as in the packing of whole milk powder, baby food etc. in small packs of ½ kg, 1 kg etc.

The filling/packing machines should be adjusted properly to deliver predetermined quantities in the packages/ containers.

Accuracy in sampling and testing

Wrong sampling and testing will give such misleading loss which may not be detected. The samples should represent the lot. Milk samples from cans, weighing bowls etc. should be collected after proper mixing. Standardisation of milk for sale/distribution should be strictly adhered to.

Similarly, standardisation of milk for manufacture of whole milk powder, baby food etc. should also be done properly.

Testing should be done with proper care and doubtful tests should be repeated.

The next issue of Technews would suggest control measures specific to processes and products.

Next Issue:
Dairy Plant Efficiency: Milk Solids Loss Control - II

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Only entertaining ☐ Boring ☐

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I would like information in any subsequent issue on _____

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