



# Technews

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For Efficient Dairy Plant Operation

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## NORMS FOR MILK SOLID LOSSES

*This bulletin includes technical information, latest development on products, systems, techniques etc. reported in journals, companies' leaflets, books and based on studies and experience. The technical information would be on different areas of plant operation in different issues. It is hoped that the information contained herein, if employed in the factory, will help in making dairy plant operations more efficient.*

*Your contributions and suggestions will make the bulletin more useful, and are welcomed.*

*The theme in this issue is Norms for Milk Solids Losses. It may be understood that the information given here is by no means complete.*

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## 1. INTRODUCTION

Under *OPERATION FLOOD* programme 145 dairy processing factories have been set up in the cooperative sector, which collectively have processing capacities of 206 lakh litres of milk per day (llpd), and 980 tonnes of powder per day (tpd). During 1997-98, these dairy plants processed, on an average, 125 llpd of milk and produced 278 tpd of milk powder.

It is, therefore, obvious that even a small improvement in the operational efficiency of these plants would result in significant saving in terms of money. One of the important indicators of operational efficiency of a dairy processing plant is the percentage of milk solids recovery - higher the recovery, and therefore, lower the milk solids losses, higher is the operational efficiency.

The target of a dairy plant would be to have minimum milk solids losses. If suitable and acceptable norms on milk solids losses are available to the plant management, then they can compare their plant losses with these norms and take remedial actions accordingly.

These norms can serve the plant managers as guidelines/benchmarks. An excellent management can even achieve better results.

Considering the importance of milk solids control in dairy plants, the NDDDB has taken suitable steps in this direction: to set up appropriate norms, and to provide consultancy service for loss control. In this issue the norms on the milk solids losses in different dairy plant processes are proposed.

Milk solids losses would occur during the various stages of milk and milk products processing and handling. Usually, each milk product has some definite, well defined steps in processing as well as standard operating parameters which are common to all dairy plants manufacturing those products. Hence, losses are process or product specific and are not per se much influenced by the processing capacities. Please also see item 2 for further clarification.

The significance of having norms which continuously prompt the plant management to improve operational efficiency by reducing losses can be more clearly impressed by taking an example. If fat losses are reduced by 1% in an effort to come closer to norms, there would be a direct saving of over Rs.35 crore annually nationwide in addition to savings in effluent treatment and disposal. In a dairy plant handling 3 llpd milk, this saving would be over Rs.85 lakh annually.

The proposed norms have been arrived at through carrying out practical studies in 13 dairy plants processing market milk or products, spread all over the



country, and covering published information on this matter.

As mentioned earlier, the process steps in the manufacture of the product in all the dairy plants are almost the same as well as many other facilities, and hence minimum losses are likely to be identical under 'standard conditions'.

## 2. STANDARD CONDITIONS

The proposed norms of losses would be applicable under standard conditions. These conditions include the following :

- a) Proper plant design
- b) Standard equipment for processing, handling and testing
- c) Proper production planning
- d) Proper plant operation and procedures
- e) Proper maintenance of equipment and systems
- f) Trained and motivated staff

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

Both equipment and operation conditions considerably affect solid losses. Poor equipment maintenance results in leakages, product contamination and hence spoilage, spillages, 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'. This would invariably lead to higher 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 processes can occur, usually leading to product wastage. Long paths for the products increase wastages. Importantly, a plant must have adequate capacity for reception, cooling and storage for the maximum quantity during peak production.

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 in a good condition.

## 3. PROPOSED NORMS

The proposed norms for milk solids losses in milk reception, milk processing, milk packaging, table butter manufacturing, ghee manufacturing and milk powder manufacturing are given in the Table 1.

**Table 1 Proposed Norms for milk solids losses in different dairy plant operations**

Operation and process stage	Proposed loss Norms, %		
	Fat	SNF	TS
<b>Reception</b>			
Improper sampling	0	0	
Testing errors	0	0	
Inaccuracy in weighing	0	0	
Flushing chiller, pipelines, storage tanks	0.06	0.06	
Flushings, can	0	0	
tanker	0.025	0.025	
Samples	0	0	
Total, max.	<b>0.085</b>	<b>0.085</b>	
Drip saver, in can reception (gain)	(-) 0.166	(-)0.166	
<b>Processing</b>			
Flushings	0.20	0.20	
Leakages/spillages	0	0	
Samples	0	0	
Total	<b>0.2</b>	<b>0.2</b>	
<b>Milk packaging</b>			
Inaccuracy in standardization	0.33	0.33	
Flushings	0.01	0.01	
Overfilling in pouches	0.20	0.20	
Pouch leakages	0.10	0.10	
Samples	0.001	0.001	
Total	<b>0.64</b>	<b>0.64</b>	
<b>Buttermaking &amp; Packaging</b>			
Cream pasteurization	0.18		
Churning & washing butter	0.27		
Excess fat butter	0.125		
Equipment flushings	0.15		
Overweight packs	0.10		
Damaged packs	0.02		
Total	<b>0.85</b>		
<b>Gheemaking &amp; Packaging</b>			
Equipment flushing	0.10		
Residuc	0.10		
Overweight packs	0.10		
Leaky packs	0.10		
Total	<b>0.40</b>		
<b>Powder Manufacture &amp; Packaging</b>			
Evaporator condenser tailwater	-	-	0.03
Equipment flushings	-	-	0.30
Dryer exhaust air (stack)	-	-	0.40
Spoiled powder (floor sweepings etc.)	-	-	0.05
Undermoisture powder	-	-	0.10
Overweight packs	-	-	0.10
Total	-	-	<b>0.98</b>



In connection with the proposed norms, the following points may be noted :

- \* The figures of losses given in the table are based on input of fat, SNF or total solids (TS) to the concerned section.
- \* These norms are based on the good milk received. Sour milk and curdled milk are not included in these norms.
- \* Losses due to pilferage or theft, if any, are not considered here. In any case, such losses should be zero when norms are considered.
- \* Quantities of milk and milk products, if any, used or consumed officially are not considered losses and should be properly accounted.
- \* It may be noted from the table that in some of the operations, the norm for the loss is zero. The reasons for this are given below :

**Samples :** In can reception, samples are drawn from weighing bowls before the milk is weighed. Hence, the losses are zero for the dairy plant. Likewise, in case of tanker reception, the loss is insignificant.

**Improper sampling :** With proper care, suitable mechanical agitation, if required, and by employing appropriate method, it is possible to eliminate any error in sampling.

**Testing errors :** Under carefully controlled conditions, the average of a large number of tests within a period should agree in accuracy with the results obtained during any other period to within a small fraction of the quantity of fat represented by the smallest division on the test bottle. With careful adherence to the details of the regulation governing these test methods, there should be no significant loss due to testing errors.

**Inaccuracy in weighing :** The systems of weighing have high accuracy if their accuracy is checked regularly by plant personnel in addition to professional or regulatory inspection. It is, thus, possible to obtain zero losses.

**Drip saver :** In can reception, drip savers are employed to recover the milk remained in cans after emptying. The milk so saved is not weighed along with the milk received, and is a gain to the dairy.

\* A proper milk solids accounting system is necessary for effective control of product quantities and accurate calculation of solids losses. Please also see item 5.

#### 4. SOME OBSERVATIONS ON ACTUAL LOSSES

Norms for milk solids losses for dairy plant operations have been suggested in some European countries including the UK, and they are stricter than those proposed here. Many dairy factories in those countries have been reported to be meeting the norms, some even bettering them.

Likewise, in India, there are dairy plants that are well managed, and their losses are close to the proposed norms. For example, four dairy plants had reception losses less than 0.1%, seven had processing losses not more than 0.2% and nine had milk packaging losses of less than 0.6%. Similarly, four dairy plants measured less than 0.2% losses in ghee making. In four plants, ghee packaging losses ranged from 0.02 to 1.58%. In milk powder making and packaging in five plants, the losses ranged from 1.08 to 4.94%.

During the study, higher losses in the dairy plants were observed mainly due to the negligence and carelessness of the plant personnel.

Some plants equipped with modern equipment had higher losses than some other plants equipped with comparatively older equipment but managed by alert and careful personnel. By implementing some of the suggested measures, some dairy plants acknowledged reduction in their losses and coming closer to the norms.

#### 5. PROPER MILK SOLIDS ACCOUNTING SYSTEM

A proper milk solids accounting system is necessary for accurate estimation of solids losses. It would only then be meaningful and useful for a plant manager to compare the dairy's losses with the proposed norms, and learn about the performance of the plant. The system should include maintaining the solids accounts of all the sections separately on daily basis, if possible, otherwise at least on weekly basis. This would then give the management indication of the problem areas and quick action can be taken to control them.

For the milk solids accounting system to be effective, it is necessary that the dairy has clearly defined shift timings, according to which all the shift records, control sheets, and other forms are completed. For the purpose of accounting, a day should be clearly defined, for e.g. 8 am to 8 am the next day. The daily stock should be taken accordingly. In the example cited, the stock would be taken at 8 am everyday.



The percent loss, L, of fat, SNF or TS of individual sections or of the entire dairy is estimated as follows:

$$L = \frac{(a+b) - (c+d)}{b} \times 100$$

Where, a = opening stock in kg.  
b = receipts in kg.  
c = despatches in kg.  
d = closing stock in kg.

A detailed accounting system is not presented here.

#### 6. AN APPROACH FOR LOSS CONTROL

Dairy plant managers must make all efforts to see that optimum conditions exist in the plant for minimization of the losses. A coordinated approach, such as suggested below, will help in achieving the goal.

i) Reappraisal of the plant conditions. The dairy manager should evaluate the existing plant conditions with respect to the 'Standard Conditions' mentioned in item 2 above, and take corrective actions, if required. Simple and comparatively inexpensive modifications may be carried out, if they help in reducing

the losses. In fact, considering the financial gains through decreased losses, even some investment in upgrading the systems is well justified, as it would be paid back within a short period. It should be ensured that only standard equipment are used in processing, handling and testing. Production planning should be such as to ensure full production cycle before cleaning or changeover. Good plant maintenance and correct operation of the plant should be ensured, as should be the testing procedures. If necessary, the plant personnel may be sent for appropriate training.

And most importantly, the plant manager should ensure that all plant personnel are well educated and made conscious of the importance of preventing losses.

ii) Regular estimation of losses. The plant losses should be estimated regularly - may be daily or weekly - and accurately employing an appropriate milk solids accounting system (see item 5) for individual sections and for the dairy. Often it is found that losses are not estimated/reported accurately due to one reason or the other.

iii) Compare losses with the norms. The regularly estimated losses should be compared with the proposed norms. The plant manager would then be able to assess his plant's performance. This monitoring should be done regularly.

iv) Corrective action through a task force. If the losses are observed to be significantly higher than the norms, it is a matter of concern, and the manager should take immediate corrective action. A task force or work team may be constituted to look into the specific operations where losses are higher, identify the causes and take remedial measures to arrest the

excessive losses. This should be verified by the results of the subsequent period.

v) Continuous efforts to reduce losses. There are several ways to reduce the solids losses, and most of them are related to the care and precautions taken by the plant personnel. Plant personnel should be educated of such measures so that they can practice them. Such efforts should be made on continuing basis.

All the efforts in this direction are worth making and save considerable amount of money. If milk unions need any guidance or technical assistance in controlling milk solids losses in their plants, they may request the NDDB for the same.

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