



Technews

National Dairy Development Board

For Efficient Dairy Plant Operation

November-December 1999

No. 23

ENERGY MANAGEMENT

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

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

*The theme of information in this issue is **Energy Management**. It may be understood that the information given here is by no means complete.*

In this issue:

1. *Some Energy "Mishaps"*
2. *Energy Conservation: Attractive Proposition*
3. *Benchmarks for Energy Consumption*
4. *An Approach for Energy Management*

Technews Wishes a Happy New Year to All Readers

1. SOME ENERGY "MISHAPS"

During studies of several dairy plants, the following were common findings:

- Steam leaked at several joints of steam pipes in many plant sections. In a plant such leaks were observed to cause 18375 kg steam loss every day, **equivalent to an annual loss of Rs.36 lakh!**
- Overflows of hot water from water heating sets of pasteurizers were let to go to drains. The heat in this 82°C water caused a loss of **Rs.1.5 lakh annually** to a dairy handling 2 lakh litres of milk daily.
- Chilled water return from the cream storage tank jacket overflowed considerably from its return collecting receptacle/hopper.
- Cooling water from the air compressor at around 65°C-70°C was drained in some dairies and pumped to cooling towers in many others. **The entire heat was lost.**
- When the milk was being packaged in pouches, the workers kept the cold store door wide open, although hatch-door was there, in several dairies. **The refrigeration was wasted for several hours.**
- The exhaust air from spray dryers, at 85°C-90°C was released to the atmosphere along with its tremendous quantity of heat. A dryer producing 20 tonnes of powder daily lost about **Rs.2.5 lakh monthly in the exhaust air heat.**

These are only some typical examples. And the list does not end here. Each energy "mishap" hurts a unit a lot of money; they all together devastate it. Have you examined seriously that your plant is not wasting energy in such magnitude and costing the cooperative probably tens of lakhs of rupees every year? It is not too late to take stock of energy use and 'abuse', and save all that money being wasted now.

2. ENERGY CONSERVATION: ATTRACTIVE PROPOSITION

The cooperative dairy industry consumes an estimated 48 thousand tonnes of furnace oil and 15 crore electrical units (kwh) to process about 47.5 lakh tonnes of milk every year in market milk and different products. Thus, the industry spends about 34 crore rupees on furnace oil (or equivalent of coal/gas etc) and about 60 crore rupees on electricity annually on energy consumption. This huge expenditure strongly calls for employing ways and means to optimize the consumption and reduce the energy cost.

The studies and experience indicate that in most of the dairy plants there is a possibility of reducing energy consumption by 20-30%, if not more. If 25% saving could be effected, it would mean saving of Rs.24 crore annually nationally! For a dairy handling 4 lakh litres of milk a day and paying a total annual energy bill of about Rs.2.8 crore, a 25% saving will be Rs.70 lakh annually! Even a modest saving 10% (Rs.28 lakh) will be substantial and attractive.

In Technews issue No.5 (November-December 1996) on 'Energy Conservation', several practical measures and tips were suggested for decreasing energy losses and optimizing energy use.

This issue of Technews provides some useful information and approaches to dairy plant management for energy management

3. BENCHMARKS FOR ENERGY CONSUMPTION

In any energy accounting and conservation scheme, an important requirement is the information on what should be the consumption of energy (heat or electrical) in a particular process. For determining if the energy consumption as obtained in specific processes is appropriate, the plant figures may be compared with the benchmarks given in Table 1. These figures can be taken as guidelines as indicated in Section 4.

A dairy plant may set its own benchmarks through a comprehensive energy audit.

Table 1 Suggested benchmarks for energy consumption in different processes			
Process	Energy Consumption		
	Steam	Electricity	Refrigeration
	kg/100 kg product or as specified	kwh/100 kg product or as specified	ton-h/100 kg product or as specified
a) Can Washing, entire process			
● Rotary	0.51 kg/can	3.8 kwh/100 cans	-
● Straight through	0.42 kg/can	3.8 kwh/100 cans	-
b) Milk pasteurisation (90% regeneration efficiency)			
● Pasteurization alone	1.2	0.18	0.25
● Full process, including cleaning	1.44	0.19	0.25
● Pre-chilling (from 30° to 6° C)	-	-	0.75
c) Cream pasteurization (70% regeneration efficiency)			
● Pasteurization alone	2	0.56	0.95
● Full process, including cleaning (also storage tank)	3	0.6	0.95 (both above with well water section)
d) Butter manufacture (batch process)			
From cream,			
● loading onward, full process including cleaning	5	6.75	3.4 kg chilled water/kg -do-
● loading onward, only butter making	1.8	6.75	
e) Ghee manufacture (batch process)			
● From butter, entire process	75	-	-
● From butter, kettle only	60	-	-
● From cream (60% fat)	100	-	-

4. AN APPROACH FOR ENERGY MANAGEMENT

A key component of effective energy management is energy audit. Energy audit attempts to balance the total energy inputs with its use, and determines ways to reduce energy consumption per unit of product output. It also helps in setting benchmarks for specific processes for the plant. The energy audit gives a final prioritized list of recommendations. After measures are installed, a post audit should be done on specific sub-systems to assess the actual economics. Energy auditing is not a one time exercise, as the plant performance may change over time. Energy audit should be done at regular intervals, every year if not more often, in order to be effective.

Dairy plant managers must make all efforts to see that optimum conditions exist in the plant for minimum energy consumption. A coordinated approach, such as suggested below (see Fig.1), will help in achieving the goal.

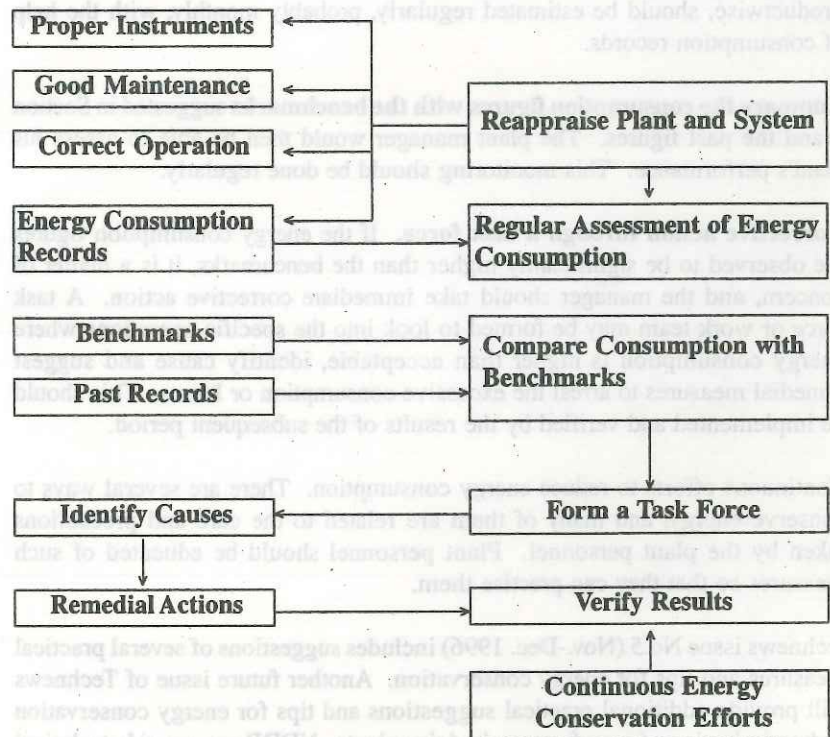


Fig. 1 An Approach for Energy Management

- i) **Reappraisal of the plant conditions and system.** The dairy manager must ensure that all equipment are equipped with appropriate instruments and controls, as necessary, and that they are kept in good shape.

It is very useful if each important section has independent meters for steam and electricity.

The plant manager should ensure that proper and accurate records are maintained for consumption of steam, electricity, water, etc, sectionwise/productwise.

Good plant maintenance and correct operation of plant should be ensured. 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 appraisal of consumption.** The energy consumption, sectionwise/productwise, should be estimated regularly, probably monthly, with the help of consumption records.
- iii) **Compare the consumption figures with the benchmarks** suggested in Section 3 and the past figures. 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 energy consumption figures are observed to be significantly higher than the benchmarks, it is a matter of concern, and the manager should take immediate corrective action. A task force or work team may be formed to look into the specific operations where energy consumption is higher than acceptable, identify cause and suggest remedial measures to arrest the excessive consumption or losses. This should be implemented and verified by the results of the subsequent period.
- v) **Continuous efforts to reduce energy consumption.** There are several ways to conserve energy, and many 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 practise them.

Technews issue No.5 (Nov.-Dec. 1996) includes suggestions of several practical measures and tips for energy conservation. Another future issue of Technews will provide additional practical suggestions and tips for energy conservation and optimization of use of energy in dairy plants. NDDDB can provide technical assistance and guidance to milk unions on this, if requested.