

HASSAN DAIRY - HASSAN CO-OPERATIVE SOCIETIES' UNION LIMITED **Hassan (Karnataka)**

Unit Profile

HASSAN CO-OPERATIVE MILK PRODUCERS SOCIETIES UNION LTD, was established with an aim to support small, marginal farmers and agricultural labourers through dairy development. Due to scanty rain fall in the milk shed area for the past three years more and more farmers are taking up dairying as their main occupation rather than subsidiary occupation for their livelihood. The milk union is committed to accept all the milk offered by the milk producers in the milk shed area and hence there is a quantum jump in milk procurement during 2004-05. Hassan Milk Union believes that it is a social obligation on part of the union to pay remunerative price to the farmers and hence it has entered new and far off markets like, Pune and Kolhapur in Maharashtra, Trivendrum and Kollam in Kerala.

Hassan dairy, is a unit of Hassan Co-Operative Milk producers. Union Limited registered under the Karnataka co-operative act and has been commissioned in the year 1982. The rated capacity when commissioned was 60 TKPD (Thousand Kgs per day) and was subsequently expanded to 120 TKPD by NDDB under the turn key project in the year 2000. The Union has under its jurisdiction 2 chilling centers and 1 mini dairy. The dairy receives milk in cans directly from dairy co-operative societies spread over in the districts of Hassan and Chickmagalore and also through tankers from chilling centers and mini dairy situated in the districts of Hassan, Chickmagalore and Kodagu. The dairy processes the milk and packs the following qualities of milk:

1. Toned milk with 3.5% Fat & 8.5% Solids not fat
2. Standardised Homogenised milk with 4.5% Fat & 8.5% Solids not fat
3. Double toned milk with 1.5% Fat & 9% Solids not fat

In addition, the following milk products were manufactured during the year 2004-2005 –

➤	Ghee	358.96 MT
➤	Curd	1036.73 MT
➤	Peda	6.50 MT
➤	Butter milk:	206.76 MT

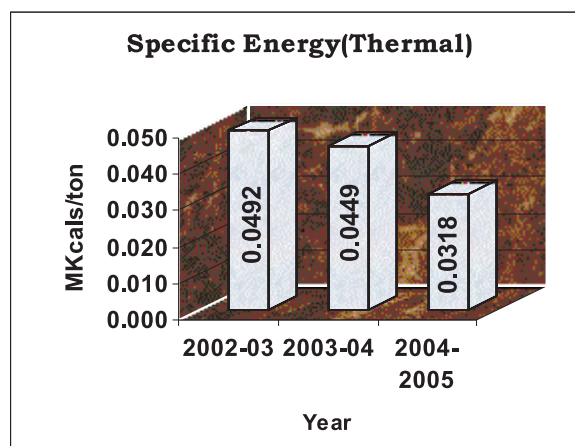
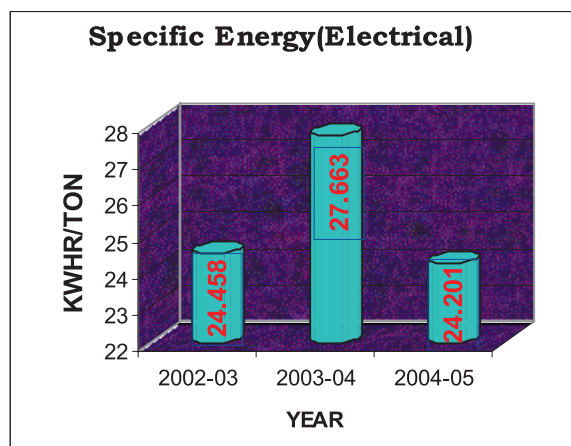
The dairy markets milk and milk products under the brand name “**NANDINI**” which happens to be registered brand name of “Karnataka Milk Federation”, the apex institution at the state level.

Hassan dairy is assisted both technically and financially by National Dairy Development Board, Anand, Gujarat under operation flood and vision schemes.

Energy Consumption

The energy consumption in the years 2002-2003 , 2003-2004 and 2004-05 along with the milk handled is as follows:

DESCRIPTION	UNIT	2002-2003	2003-2004	2004-2005
Milk Handled	Metric Tonnes	45843.72	52107.38	73428.09
Total energy cost	Rs in Lakhs	69.578	76.997	97.902
Energy cost v/s Manufacturing expenses	Percent	71.95	68.99	
Total energy consumption – Electrical	Lakhs kWh	13.504	14.414	17.770
Specific energy consumption – Electrical	kWh/Tonne	24.458	27.663	24.201
Total energy consumption – Thermal	Million Kcals	2256.90	2336.86	2336.46
Specific energy consumption – Thermal	Million Kcals/Tonne	0.0492	0.0448	0.03182



Though there is steady increase in milk procurement, the energy consumption has decreased considerably due to the concerted efforts of the core team inspired by the Total Energy Management program taken up during the year 2001 under the able guidance of NDDB, Anand, Institute of Rural management (IRMA) with support from Karnataka Milk Federation. This program was launched in the entire state in all the 13 milk unions. In the year 2001-02 energy teams were constituted and energy managers were designated. Awareness and orientation programs were conducted to all the members of the core team by eminent faculty from IRMA, leading energy consultants in the field of Boilers, pumps and refrigeration systems. Quarterly review meetings were conducted in the years 2001-02 , 2002-2003 and 2003-2004 wherein the teams exchanged their innovative ideas by way of presentations and discussions and also presented the achievements made under the program.

To start with the actual energy consumption was studied in comparison with the theoretical calculations made depending on the efficiency of the equipment in the dairy. The reasons for higher consumption

were identified and corrective actions were initiated. This process was continued and is being continued. Thus reduction in energy consumption was achieved.

Energy Conservation Commitment, Policy and Set Up

Hassan Dairy considers energy management as a team approach and has included this under the **“TOTAL QUALITY MANAGEMENT”**

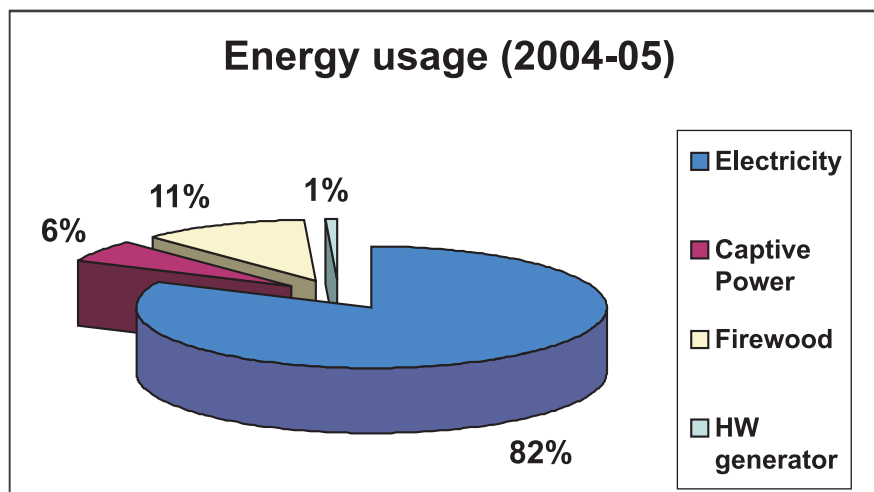
Wherein a continual approach has been bestowed to sustain the achievements made with due stress on improvement of product quality. Hence, the product quality was never sacrificed while saving energy.

Cross functional teams were formed and the philosophy of energy management and quality improvement on a sustainable basis were inculcated among all the employees by way of display of posters, lectures and discussions. HRD experts were also invited to help building up of leadership qualities amongst employees. The dairy also practices the 5 “S” house keeping principles with due stress on Kaizen-a continual improvement. The ideas from the employees were sought, evaluated and considered while achieving cost reduction and quality improvement.

The energy profile of the dairy includes Electricity and Firewood mainly. HSD is used for power generation in case of power failure and for running the hot water generator. The energy cost is 68 to 72% of the total manufacturing cost of the dairy.

The total connected load is 915 KW and maximum demand is 300 KVA. There are standby motors to take over in case of breakdown or preventive maintenance.

Electricity occupies the top position in the energy profile, since 82% of the manufacturing cost is spent on electrical energy. 70% of the total electrical energy is consumed for operating refrigeration system. Hence, major thrust was given in conserving energy in this area. This section has 5 ammonia compressors driven by 5 nos 60 Hp motors. In addition, this section has 3 nos 10 Hp and 3 nos 5 Hp motors to run the chilled water pumps.



Thus, the connected load in this section 258 KW. The total running hours of ammonia compressors and chilled water pumps ranges between 20-23 hours per day. At any given point of time 3 ammonia compressors and 4 chilled water pumps will be in operation while the rest are utilised as standby.

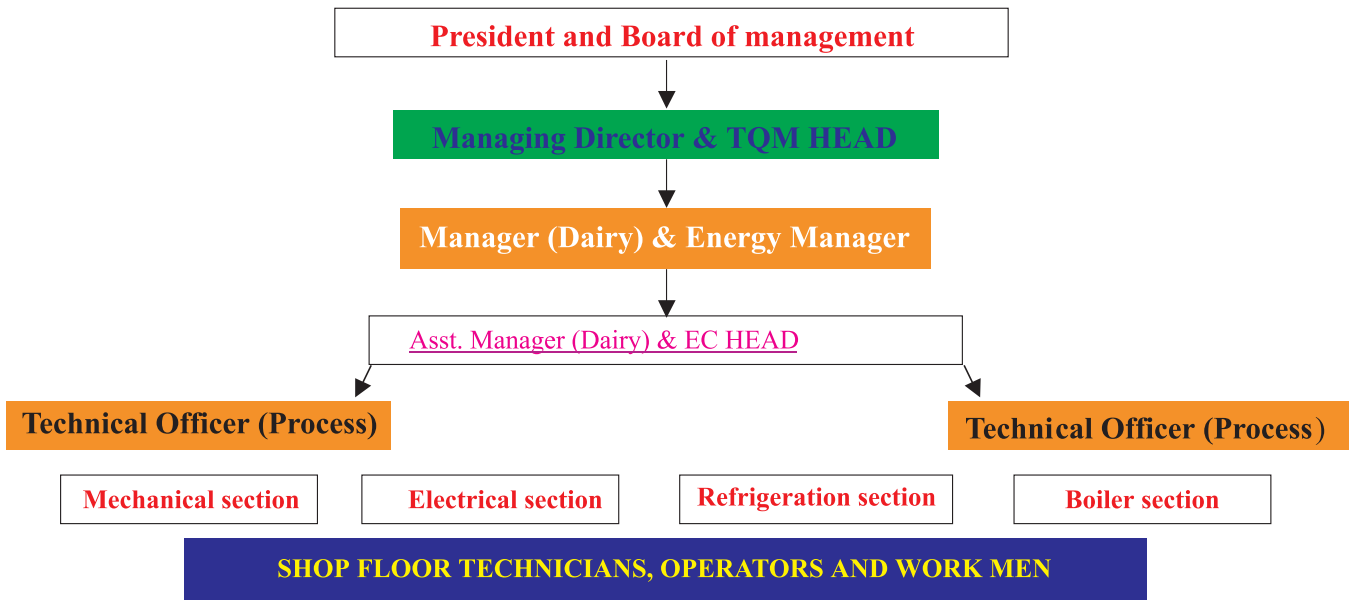
Firewood occupies second position in energy profile. The firewood is purchased from the Karnataka state forest department who are very judicious in deforestation keeping in view the ecological balance (Only eucalyptus is being supplied). The firewood constitutes 11% of the total energy. The major user of this energy is the milk processing section wherein more than 75% of the thermal energy is utilized. Thus this was the major section wherein the thermal energy saving efforts was put forth.

ENERGY CONSERVATION POLICY

We at Hassan Milk Union are committed to establish total energy management system by –

- **Adopting modern and eco-friendly technologies.**
- **Adopting 5 “S” principles to minimize and eliminate wastage at all levels of business operations.**
- **Develop bench marks for optimal use of energy at all levels of process operations.**
- **Creating awareness amongst all the employees and recognising their initiatives.**
- **Reducing specific energy consumption year after year.**
- **Harnessing non-conventional energy wherever viable.**

ORGANISATIONAL SETUP:



Energy Conservation Achievements

From the year 2002-2005, Hassan Dairy has implemented 16 energy saving projects through core team initiatives and innovative ideas by officers and shop floor workers resulted in a saving of Rs. 27.28 Lakhs with an investment of Rs. 32.68 Lakhs resulting in 17.825% reduction in specific electrical energy consumption and 35.36% in specific thermal energy consumption.

The energy saving projects implemented during 2004-05:

I. Installation of new condenser for Refrigeration:

The old closed type ammonia condensers(2nos) were operated with 14 HP (10.5KW)motors. These inefficient condensers were shut down and similar capacity energy efficient condenser with a connected load of 5HP(3.7KW)was installed.

❑ No of hours operated/Day	:	20 hrs.
❑ Savings achieved per day	:	136 Kwh
❑ Electricity saved per year	:	49640 Kwh
❑ Savings per annum	:	Rs. 2.37 lakhs
❑ Investment incurred	:	4.21 lakhs
❑ Pay back period	:	21 months



2. Installation of 20KLPH energy efficient milk pasteuriser:

One of the existing 10KLPH milk pasteuriser was 20years old with a regeneration efficiency of 85% and with milk to chilled water ratio of 1:3. The throughput of the old pasteuriser was 8600KLPH only. The said equipment was replaced with energy efficient 20KLPH pasteuriser having auto controls with 90% regeneration efficiency. The required milk to chilled water ration and milk to hot water ratio are 1:2 and 1:1.2 respectively. The old pasteuriser used to consume additional operational time of 10.7hrs to process the same quantity of milk.

A. reduced chilled water ratio:

❖ Chilled water used by old pasteuriser (ratio 1:3)	:	480 kl/day
❖ Chilled water used by new pasteuriser(ratio 1:2)	:	320 kl/day
❖ Reduction in chilled water circulation	:	160 kl/day
❖ Electrical energy saved	:	7270 Kwh
❖ Savings per annum	:	Rs. 35115

B. Improved regeneration efficiency(90%)and Reduction in milk pasteurization temperature from 82°C to76°C:

➤ Qty of milk processed /day with new pasteuriser	:	16000 kpd,
➤ Delta 'T' heating	:	6°C
➤ Thermal energy saved	:	453.34 Mkal
➤ Fire wood saved	:	187.64 MTS
➤ Savings per annum	:	Rs 2.20 lakhs

C. Improved throughput :

❑ Qty of milk processed /day with new pasteuriser	:	16000 kpd
❑ Electrical energy saved	:	58270 kWh
❑ Savings per annum	:	2.814 lakhs

3. Chilled water management:

Chilled water management is a major thrust area in any dairy, wherein lot of energy is wasted by way of unnecessary circulation of chilled water. The milk to chilled water ratio can be brought down through regular monitoring and automation.



✓ Milk to chilled water ratio (2003-04)	:	1:10.75
✓ Milk to chilled water ratio achieved (2004-05)	:	1:9.25
✓ Total milk handled	:	73428.097 MT
✓ Chilled water circulated if the ratio is 1:10.75	:	789352.045 KL
✓ Chilled water circulated if the ratio is 1:9.25	:	679209.889 KL
✓ Reduction in chilled water circulation	:	110142.146 KL
✓ Total electrical energy saved	:	13694 kWh
✓ Savings per annum	:	Rs. 66143

4. Installation of variable speed drive for butter churn:

The energy consumed by old geared motor drive butter churn was constant irrespective of its RPM. The energy consumed by variable speed drive varies according to RPM of the churn.



- Total quantity of butter produced : 395.78 MT
- Total electrical energy saved : 1845 kWh
- Savings per annum : Rs. 0.09 lakhs

5. Replacement of agitator with blower for ETP aerator:

The air incorporated by the agitator provided for ETP aerator was insufficient when compared to the volume of effluent handled in the aerator. Installation of air blower has improved the waste water treatment.



- Connected load of agitator : 10 HP
- Connected load of air blower : 5 HP
- Total electrical energy saved : 32585 kWh
- Savings per annum : Rs.157386.00

6. Lower capacity pumps for bore wells;

Though the yield of the bore wells had gone down considerably old 10Hp submersible pumps were being used to lift water. 5HP efficient pumps installed are delivering the same quantity of water.

- Number of bore wells : 3
- Connected load : 10HP each
- Replaced load : 5HP each
- No. of hours of operation : 20 hrs.
- Total electrical energy saved : 81463 kWh
- Savings per annum : Rs. 393467.00

7. Lower capacity pump for crate washer:

- Initial connected load : 15HP

- Replaced load : 10HP
- Total electrical energy saved : 10891KWH
- Savings per annum : Rs.52606.00

8. Improved Boiler Efficiency:

The boiler flue tubes(smoke tubes) were replaced with new ones. The boiler efficiency improved from 50.7% to 54.1%.



- ✓ Firewood saved : 32.49MT
- ✓ Savings per annum : 0.38 lakhs
- ✓ Investment made : Rs.2.25 lakhs

9. Rain water harvesting:

- Average rainy days : 60
- Average water collected : 30000L/day
- Electrical energy saved : 1119KWH
- Savings per annum : Rs.5404.00

Energy Conservation Plans and Targets

1. **Methane Gas Utilisation:-** The effluent treatment at the dairy is having anaerobic digester which produces methane gas which is being flared at present. The team intends to utilise the methane gas produced for operating 18 KVA diesel powered generator installed at ETP (with an admixture of methane & diesel in the ratio 70:30). The unit had discussions with Indian Institute of Science.



Bangalore and Karnataka renewable energy development Limited (KREDEL) to obtain a safe and efficient gas kit. At present the generation of methane is sufficient to operate the generator for 10 hours/day on an average. locally developed gas kit developed technical snags, and discussions are on with M/s Hydro-air Mumbai to supply a safe kit. The expected annual savings is **Rs. 1.96 Lakhs** per annum with an investment of **Rs. 0.50 Lakh**.

2. **Pre-Chiller for returned chilled water:-** The temperature of the returned chilled water from process to IBT ranges between 6-8 °C. Plate type chillers can be used along with Ice bank system to reduce power consumption. The returned chilled water from the process shall be first chilled in plate type chillers instead of directly pumping to Ice bank tank using vaporised ammonia (at -10 °C) as cooling medium. The returned chilled water would be chilled atleast 4 °C and the ammonia gains heat by atleast 8 °C. Approximately a power saving of 0.3 BKW/TR can be achieved. At -2 °C the compressor can handle more quantity of ammonia delivering more capacity than at -10 °C. If a nominal 15 hrs. of operation is considered the total savings per year would be 52560 kWh resulting in saving of **Rs. 239670** per annum. the proposed investment is **Rs. 6 lakhs**. The payback period is **2.5 years**.
3. **Heat Recovery Units:-** Heat recovery units can be introduced in the exhaust line of ammonia . This would reduce the load on ammonia condensers and improves cooling efficiency.

SL NO	EQUIPMENT	DISCHARGE TEMPERATURE (DEGREE C)	NO OF HRS OF OPRATION	EXPECTED YIELD OF H.W./DAY
1	AMMONIA COMPRESSORS	114	18	8000lts

The expected savings per annum is **Rs. 1.25 lakhs**. Proposed investment is **Rs. 2.5 Lakhs**. Payback period is **2 years**.

- 4. Changing of Fuel Source from Fire wood to Agriculture Waste:-** The agriculture waste available in the area at a cheaper rate are coconut shell, paddy straw/husk, bagass and coffee husk. Discussions are on to procure briquetted fuel. The boiler manufacturers have been consulted regarding the modifications required for the existing boilers. Estimated savings is **Rs. 1.5 Lakhs**. Proposed investment is Rs. 5 lakhs. The payback period is 3.3 years.
- 5. Water Management and Rain Water Harvesting:-** The unit intends to reduce the present milk to water ratio from 1:2.3 to 1:1.75. opportunities of water conservation have been enlisted and required process and layout modifications have been worked out. Actions have been initiated to harvest rain water in consultation with the experts in the field. Initially, building top rain water is being routed to a sump and run off water is being routed to dummy bore wells to recharge the underground streams.

Environment and Safety

Actions have been initiated to get the EMS 14001:2004 certification. Documents are being developed with the help of consultants.

All the safety measures suggested by the statutory authorities have been implemented. There has been no incidence of accidents from past 3 years.

CHILDREN EDUCATION PROGRAMS

Awareness programs were organized for school children regarding energy conservation both at school and own premises. As per the available records 3045 school children and staff visited Hassan Dairy as part of their educational tour. Children were educated regarding need for energy conservation along with health and nutritional aspects of milk and milk products. The BEE cartoon film "Bijlee" screened was appreciated by all the children.

Second Prize

Dairy

BANGALORE MILK UNION LIMITED **Bangalore (Karnataka)**

Unit Profile

Bangalore Milk Union (Bamul) is the biggest Milk Cooperative Union in South India. At present, the Union is procuring, processing and marketing up to 8.90 lakh liters of milk per day. The Union is offering most remunerative prices to the producers and marketing milk and milk products at most competitive prices. The difference between procurement price and marketing price is regarded to be one of the lowest in the country due to better operational efficiency. In recognition to these efforts, the Union has been awarded continuously for four times the “Best Productivity Award” by the National Productivity Council of GOI, during the last several years.



Energy Management Policy

“Utilization of Energy effectively & judiciously aiming to conserve the energy continuously by adopting eco-friendly methods & thereby increasing the productivity of the Union”

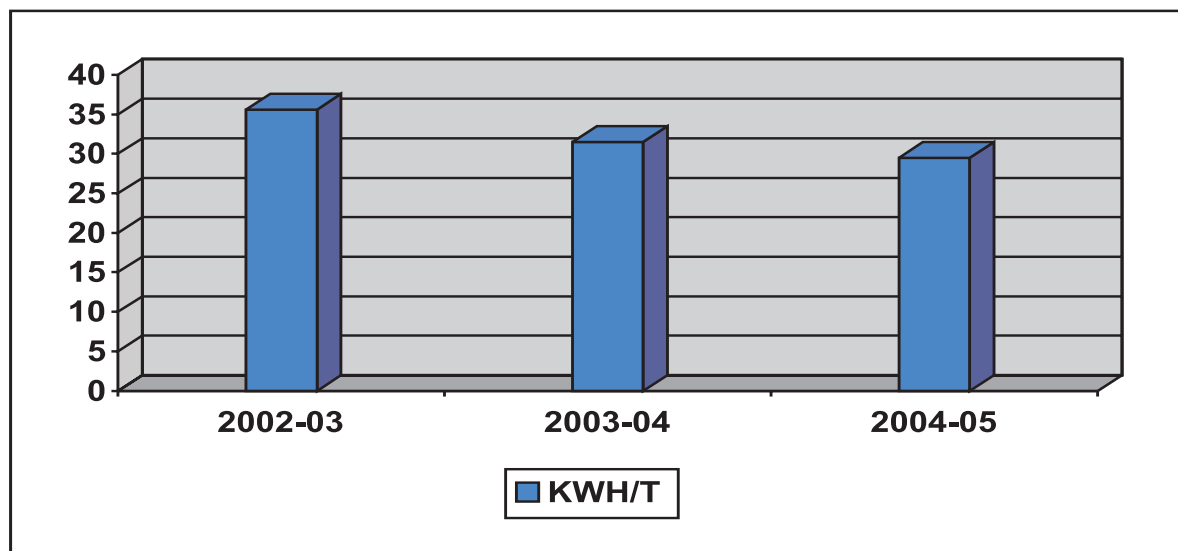
Energy Goal

“To Provide Fresh - Quality Milk & Milk Products at competitive prices to the consumers & thereby uplifting the financial position of the rural milk producers”

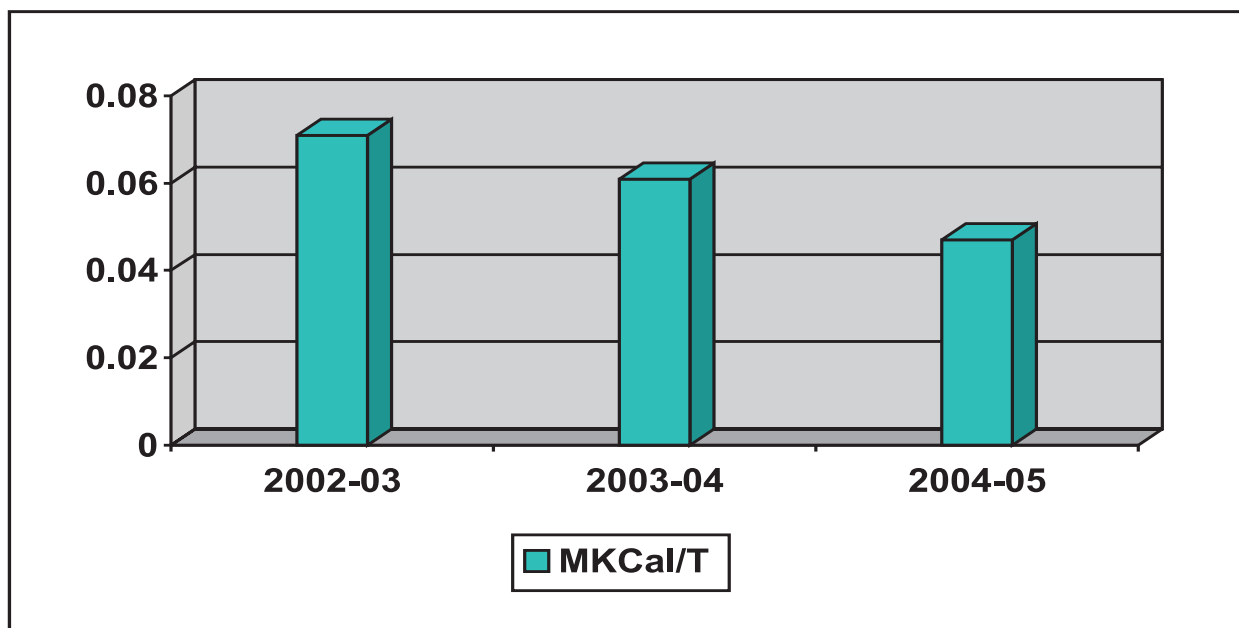
Energy Consumption

Specific Power consumption Details	Unit	2002-03	2003-04	2004-05
Annual Production (Milk)	TONNE	202598.94	238287.41	279231.45
Total Energy Consumption/Anum	KWH (Lakhs)	72.16737	75.14085	82.40136
Total Thermal Energy Consumption	MKCal	14423.03	14605.8	13359.59
Total Energy Cost	Lakhs Rs.	516.61	542.19	595.27
Energy Cost as % of Manufacturing Cost	%	11.82	12.1	17.96
Electrical Specific Energy Consumption	KWH/T	35.62	31.53	29.51
Thermal Specific Energy Consumption	MKCal/T	0.07119	0.06129	0.04784

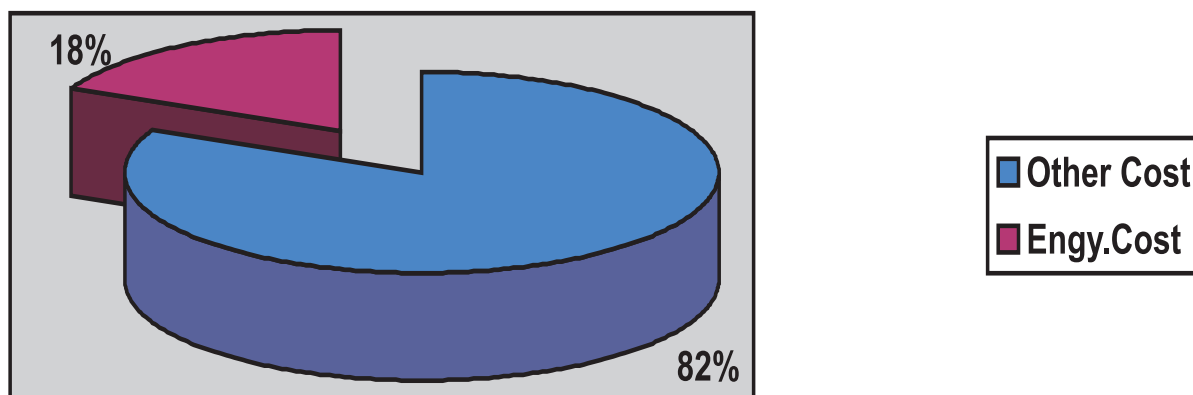
SPECIFIC ELECTRICAL ENERGY CONSUMPTION



SPECIFIC THERMAL ENERGY CONSUMPTION

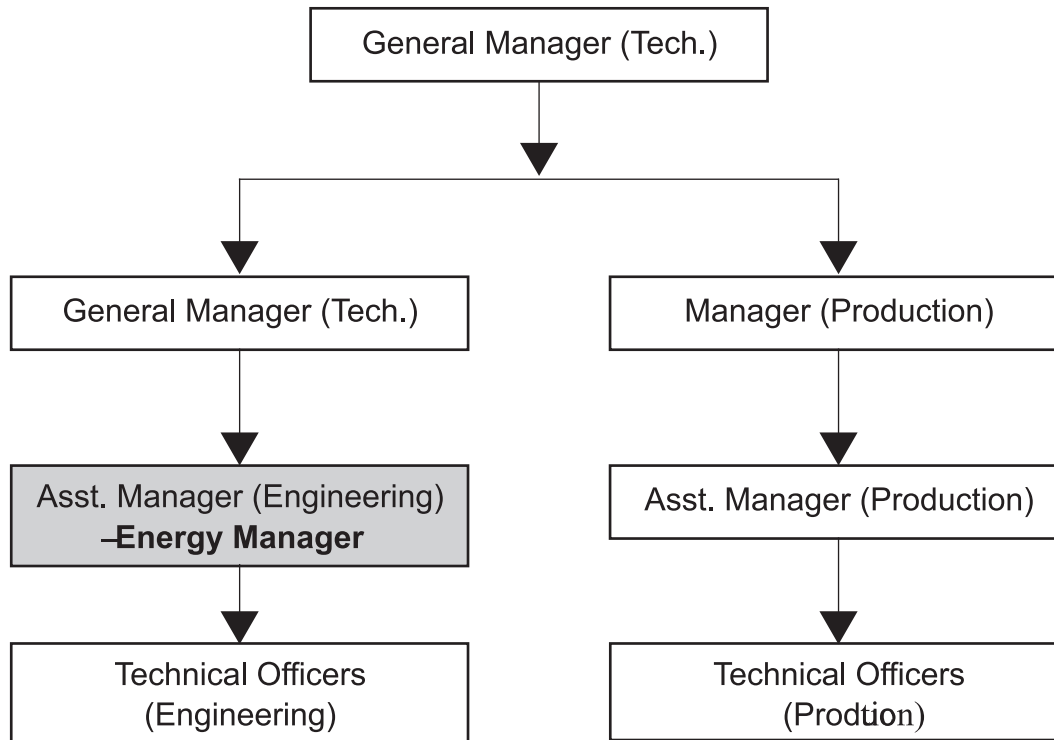


MANUFACTURING COST VS ENERGY COST FOR THE YEAR 2004-2005



Salient Features of Energy Conservation Cell

The General Manager (Technical) is the head of the Energy Conservation Cell. Other Members in this Cell are Manager (Engineering), Manager (Production), Assistant Manager (Engineering) – nominated as the Energy Manager and Assistant Manager (Production).



Salient Features & Functions of Energy Conservation Cell

1. Formal meetings are conducted once in every month under the chairmanship of General Manager (Technical).
2. The consumption of electricity, furnace oil and water are regularly reviewed.
3. Planned Energy Saving programs are monitored for effectiveness
4. Energy Savings opportunities are being identified and action plans are being drawn for implementation
5. Identification of training requirements on TEM for technical personnel

Energy Conservation Achievements

Due to significant savings in the Total Energy Management, Union could able to reduce its operational costs substantially. The difference between the Milk Procurement price and Milk Selling price is one of the lowest in the Country. The Milk Procurement Price to the farmers is regarded to be one among the best in the country. In spite of higher procurement price to the producers, the Union could able to sell milk at prices, which are regarded to be the lowest in the Country. These demonstrate the achievement of Cost Competitiveness by the Union, mainly due to savings accrued through energy savings and other managerial efforts to improve efficiency.

Major Energy projects implemented during the year 2004-05

1. Energy Saved by running 100 CFM instead of 1000 CFM air Compressor by modifying airline suitably.

The unit has provided a butter fly valve at packing section to isolate the air consumption of packing machines during night shift. The 100 CFM Compressor will take load of other sections.

Energy Consumed before Modification	:	3240 kWh/Day
Energy Consumed after Modification	:	2646 kWh/Day
Energy Saved	:	594 kWh/Day
Cost Saved	:	9.07 Lakhs per annum

2. Modifying the PLC program to prevent the agitators of milk storage tanks running continuously.

All the milk Silos (1,00,000 liters capacity X 8 no.s) are provided with agitators (each fitted with 5 KWh motors) for agitating milk. These agitators used to run continuously when in milk is stored in these Silos. Now the PLC programs have been modified to run the agitators for 5 minutes, followed by 5 minutes of stoppage, while the milk is stored in these Silos.

Energy Consumed before Modification	:	880 kWh/Day
Energy Consumed after Modification	:	440 kWh/Day
Energy Saved	:	440 kWh/Day
Cost Saved	:	6.75 Lakhs per annum

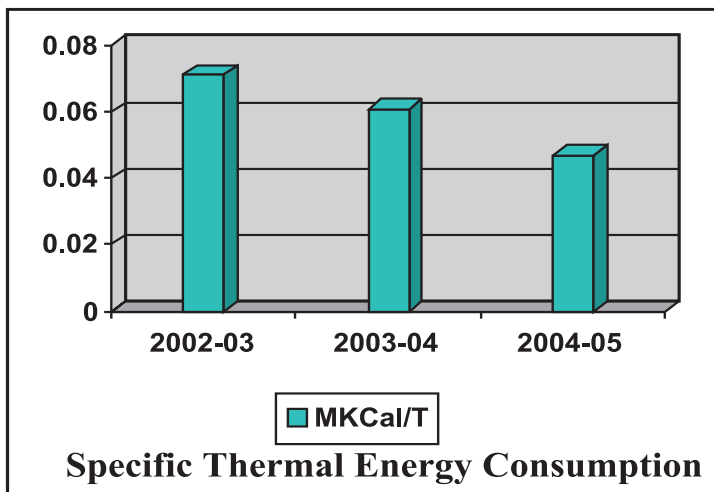
3. Energy Saving by improving Power Factor from 0.94 to 0.99.

Power factor was improved by adding the Capacitor Banks at the load points and few required settings changes at Auto-power Factor Correction Unit at distribution point.

Cost Saved	:	3.67 Lakhs per annum
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4. Improving Combustion Efficiency of Furnace Oil and avoiding Steam leakages.

The furnace oil is used in boilers. The combustion efficiency of furnace oil was improved by adding additives. These additives dissolve the sludge in the furnace oil and also improve the flowability of furnace oil. These results in improvement of combustion efficiency of furnace oil. Further, steam leakages at 18 points were arrested and now it is ensured that no leakage occur at any point. These efforts have resulted in substantial reduction in the consumption of furnace oil, inspite of increase in milk handled at the dairy. The savings resulted due to these efforts amount to Rs. 55.75 Lakhs per annum.



5. Usage of Treated Water from ETP.

The Effluent Treatment Plant of water is being treated and the treated water obtained is being used for gardening and floor washings. For these purposes, about 60,000 liters of treated water is being used and hence, the consumption of fresh water has been saved to this extent. The savings due to this is Rs. 13.14 lakh per annum in the water bill.

6. Timer for Streetlights.

Timers have been installed for the street lighting system. This has resulted in savings of power, hitherto being wasted for not switching off the streetlights in time. The savings due to this amounts to approximately Rs. 36,000 per annum.

**CHAMARAJANAGAR DISTRICT CO-OPERATIVE MILK PRODUCERS'
SOCIETIES' UNION LTD.
Mysore (Karnataka)**

Unit Profile

MYSORE DAIRY, A UNIT OF Mysore – Chamarajanagara District Co-Operative Milk producers. Union Limited registered under the Karnataka co-operative act and has been commissioned in the year 1980. The rated capacity when constructed was 60 TKPD (Thousand Kgs per day) and was subsequently expanded to 150 TKPD by NDDDB under the turn key project in the year 1996.

The dairy receives milk in cans and in tankers from village co-operatives located in the districts of Mysore and Chamarajanagara districts. The milk in tankers from the three chilling centers located in Hunsur, Kollegala and Chamarajanagara towns. Also the dairy receives milk in tankers from 11 Bulk Milk Coolers. As on date the per day quantity of milk received through cans directly from dairy co-operatives, tankers from chilling centers and tankers from bulk milk coolers is as follows:

❖ In cans from village dairy co-operatives	69600 Kgs
❖ In tankers from chilling centers	126250 Kgs
❖ In tankers from bulk milk coolers	21500 Kgs

The dairy processes the milk and packs the following qualities of milk:

1. **Toned milk** with 3.1% Fat & 8.5% Solids not fat
2. **Standardised milk** with 4.6% Fat & 8.5% Solids not fat
3. **Double toned milk** with 1.6% Fat & 9% Solids not fat
4. **Full cream milk** with 6.1% Fat & 9% Solids not fat

In addition, the following milk products are manufactured in smaller quantities:

- Ghee 735.421 Metric Tonnes per year
- Butter 961.60 Metric Tonnes per year in bulk packings of 25 Kgs
- Curd 4640.57 Metric Tonnes per year
- Peda 45.20 Metric Tonnes per year
- Mysore pak 15.52 Metric Tonnes per year
- Sweet Lassi 137.75 Metric Tonnes per year
- Butter milk 130.89 Metric Tonnes per year

The dairy markets milk and milk products under the trade name “NANDINI” a registered trade name of “Karnataka Milk Federation”, the apex institution at the state level.

The technical and financial assistance comes from National Dairy Development Board, Anand, Gujarat under operation flood and vision schemes.

The dairy had taken up market development activities and the dairy has recorded a 13.60%, &



Mr. Upendra as Brand ambassador



Sales Graph (2002-2005)



Energy Conservation day (14-12-04)

4.0 % increase in sale during the years 2003-2004 & 2004-2005 respectively. Energy conservation day was observed on 14 th December 2004. The other market developing activities taken up by the dairy are Creating awareness about milk in public especially among the women folk and school children through “ARIVU”



Training by HRD expert



School children Program



Award Ceremony of ISO Certificate

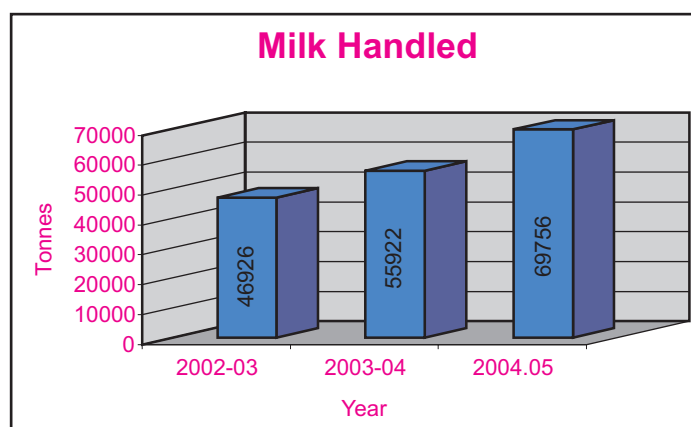
programmes to which HRD experts were invited and the dairy has conducted 81 “ARIVU” programs wherein 9295 people took part and also under the consumers and school children awareness programmes 7421 members participated and 8782 houses were visited under door to door campaign during 2004-05. One of the agenda in all the above programs was educating the participants on energy conservation. The cartoon film on “Save Energy” was screened at the school children programs.

The dairy secured the **ISO-9001 : 2000** certificate for the years 2004-2008.

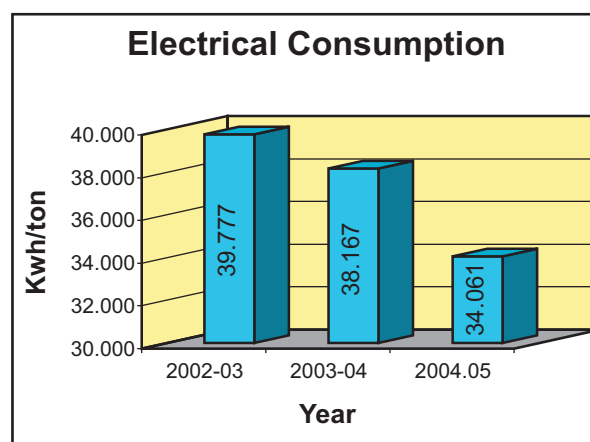
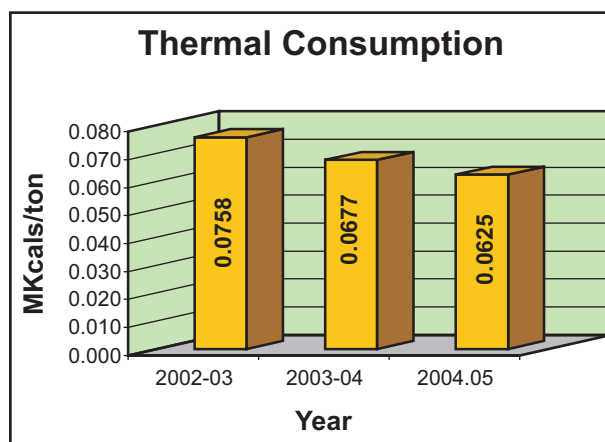
Energy Consumption

The energy consumption and milk handles at the dairy in the years 2002-2003,2003-2004 and 2004-2005 is as follows:

DESCRIPTION	UNIT	2002-2003	2003-2004	2004-2005
Milk Handled	Metric Tonnes	46926.26	55922.06	69755.95
Total energy cost	Rs in Lakhs	127.859	148.038	167.716
Energy cost v/s Manufacturing expenses	Percent	23.74	42.07	19.71
Total energy consumption – Electrical	Lakhs kWh	18.666	21.344	23.759
Specific energy consumption – Electrical	KWh/Tonne	39.777	38.167	34.061
Total energy consumption – Thermal	Million Kcals	3557.45	3786.24	4358.33
Specific energy consumption – Thermal	Million Kcals	0.0758	0.06771	0.06248



Year	Qty Milk Handled	Capacity Utilisation KWHR)	Electrical Energy (Lakh (MK cals)	Thermal Energy
2002-2003	46926.26	93.64	18.666	3557.45
2003-2004	55922.06	104.67	21.344	3786.24
2004-2005	69755.95	118.64	23.759	4358.33



During the years 2002-2005 it can be noted that there has been a steady increase in milk handled and decrease in consumption of energy. The dairy had launched the Energy Conservation Programme in the year 2001. National Dairy Development Board (NDDB), Institute Of Rural Management, Anand (IRMA) & Karnataka Milk Federation (KMF) facilitated the launching of the said programme. The outcome of this programme was that the dairy was able to gear up the employees towards saving of energy. The energy team was setup and this team was responsible in conducting Awareness and orientation programs to all the employees. The members of this team were trained by the IRMA Faculty , leading HRD personnel & eminent energy auditors. The energy team initially conducted an in house energy audit and was able to identify few energy saving opportunities. This has been a continuous process and the objectives of this team has been slightly modified and this team is heading towards “TOTAL QUALITY MANAGEMENT”.

Energy Conservation Commitment, Policy and Organisational Set Up

Mysore dairy transformed the Energy conservation team to

“TOTAL QUALITY MANAGEMENT TEAM”

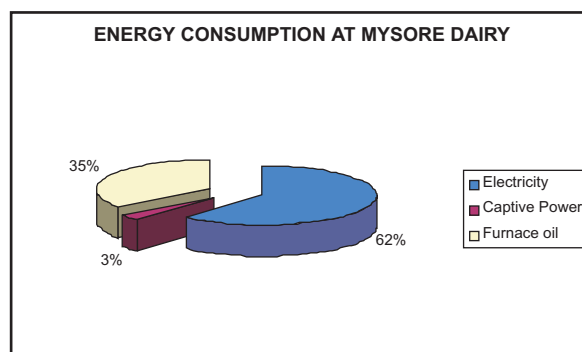
which is putting forth a continuous approach to sustain the achievements made on energy conservation with due stress on improvement of product quality. Hence, the product quality was not sacrificed while saving energy.

At this juncture ISO - 9001 : 2000 quality accreditation was obtained during which cross functional teams were formed and the philosophy of energy conservation and quality improvement and sustainability were inculcated among all the employees by way of lectures and discussions. HRD experts were also invited to help building up of leadership qualities in the employees. The dairy also follows the 5 “S” house keeping principles with due stress on kaizen-a continual improvement. Two 5 S teams have been formed who inspect and suggest the principles of 5 S wherever necessary. The ideas from the employees were sought, considered in achieving cost reduction and quality improvement.

The sources of energy in the dairy are Electricity and Furnace oil. The energy cost is 68 to 72% of the total manufacturing cost of the dairy.

The total connected load is 1151 KW or 1798 KVA and maximum demand is 500 KVA.

Electricity occupies the top position in the energy profile, since 65% of the energy is generated with the help of electricity. The refrigeration section is the major user



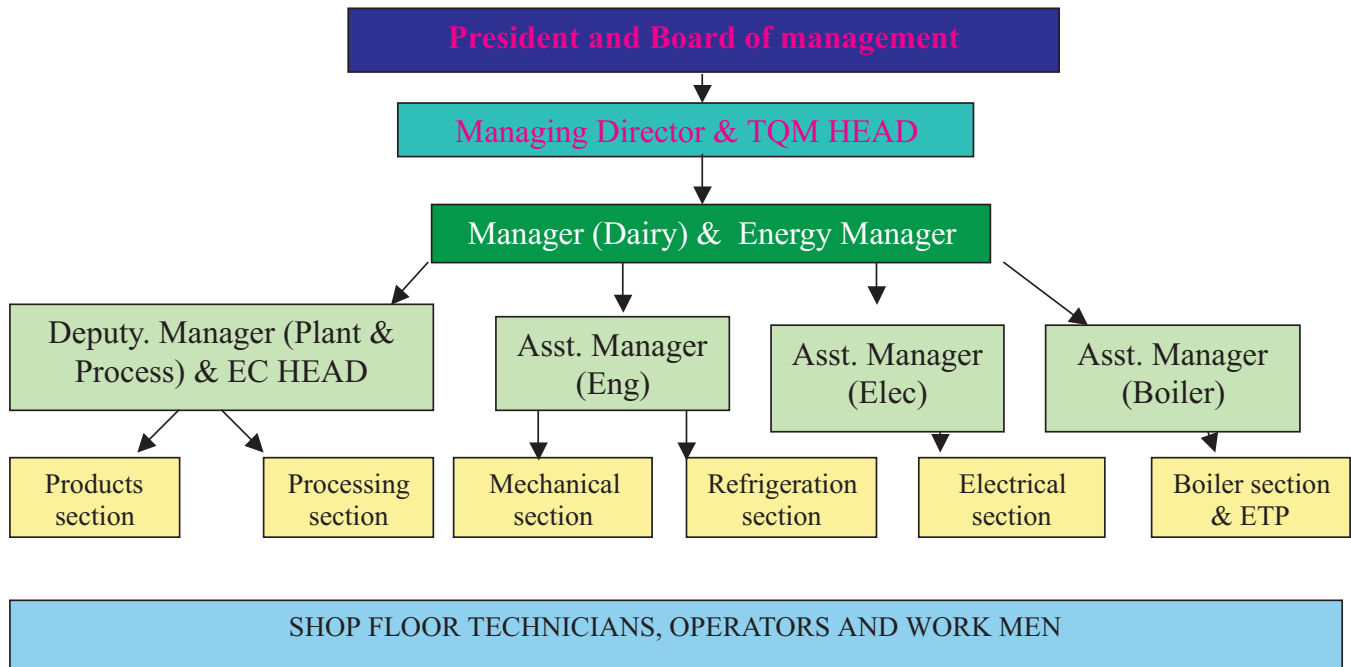
of this source of energy, wherein more than 50% of the total electrical energy is used by this section. Hence, major thrust was given in conserving energy in this section. This section has 4 ammonia compressors, two driven by 2 Nos 100 Hp, one driven by 125 Hp and one by 120 Hp motor. In addition the dairy has 2 booster compressors driven 2 Nos. 20 Hp motors. Also there are 4 Nos. chilled water pumps driven by 4 Nos. 10 Hp motors. Thus, the connected load in this section is 420 KW. The total running hours of ammonia compressors and chilled water pumps ranges between 21-23 hours per day. At any given point of time 2 ammonia compressors and 3 chilled water pumps will be in operation while the rest are utilised as standby.

Furnace oil is another source of energy. This constitutes 35% of the total energy. The major user of this energy is the milk processing section wherein more than 75% of the thermal energy is utilised. Thus this was the major section wherein the thermal energy saving efforts were put forth.

Energy Conservation Policy

THE EMPLOYEES & MANAGEMENT OF MYSORE-CHAMARAJANAGAR MILK UNION ARE COMMITTED TO CONSERVE & SUSTAIN THE CONSERVED ENERGY AT ALL LEVELS OF PROCESSING OF MILK & MILK PRODUCTS BY ADOPTING MODERN, ECO-FRIENDLY & ENERGY EFFICIENT TECHNOLOGIES TO OFFER THE SUPREME QUALITY MILK & MILK PRODUCTS TO CUSTOMERS AT COMPETITIVE PRICE WHILE TRANSFERING REMUNERATIVE PRICE TO THE PRODUCERS.

ORGANISATIONAL SETUP:



Energy Conservation Achievements

During 2002-2005, Mysore dairy has implemented **11** energy saving projects through engineers initiatives, sub section team suggestions and innovative ideas by officers and have achieved savings of Rs. **28.21** Lakhs with a meager investment of Rs. **19.56** Lakhs resulting in **14.37%** reduction in specific electrical energy consumption and **17.58%** in specific thermal energy consumption.

The energy saving projects implemented during 2004-05:

Chilled Water Management:- The refrigeration section has 4 chilled water pumps driven by 4 Nos. 10 Hp motors. Study on the running hours of these motors revealed that these motors were run more than required resulting in an abnormal milk to chilled water ratio. The ratio when worked out was 1:23.85 as against the standard of 1:9.25 to this dairy. Efforts were put to curtail the running of the chilled water pumps with close watch on the chilling temperature of milk. Finally the ratio was brought down to 1:13.99. The further reduction requires changes in the pipe line system. Hence, the same is targeted for 2004-05.

➤ Initial Milk to Chilled water ratio	1:25.85
➤ Achieved Milk to chilled water ratio	1:10.99
➤ Total quantity of milk handled	69755.95 Thousand Kgs
➤ Water pumped if ratio 1:25.85	1803191 Thousand litres
➤ Electricity required	225398 kWh

➤ Water pumped when ratio reduced to 1:10.99	766617 thousand litres
➤ Electricity required	95827 kWh
➤ Electricity saved	129570 kWh
➤ Savings per annum	Rs. 5.95 Lakhs

Auto Controls for Milk Pasteurisers:- There were 2 Nos 10 TKPH pasteurisers in the dairy. These pasteurizers were running without auto controls. The third new pasteurizer was purchased and this pasteurizer was supplied with auto controls. On running these pasteurizer unit observed lesser consumption of steam since the heating temperature was maintained between 73 ° C to 75 ° C.

➤ Furnace oil required to generate 1000 Kgs steam	76.92 Litres
➤ Steam consumed by 10 TKPD pasteuriser if the Pasteurization temperature is 78-85° C	200.00 Kgs
➤ Furnace oil requirement to run the pasteurizer for 1 hour	15.38 Kgs
➤ Steam consumed by 10 TKPD pasteuriser when the Pasteurization temperature is 73-75° C	198.00 Kgs
➤ Running hour of each pasteurizer per day	8.0 Hrs.
➤ Furnace oil saved by one pasteurizer/day	16.0 Lts.
➤ Furnace oil saved by two pasteurizers/day	32.0 Lts.
➤ Furnace oil saved for 1 year	11680.0 Lts.
➤ Savings per annum	Rs. 1.58 Lakhs

Co-efficient Of Performance (COP) of ammonia compressors:- The study revealed that the COP of the system was as low as 4.0 as against the stipulated standard 5.0 fixed by the manufacturer. Reasons for the reduced COP were identified and corrective measures were implemented by which the COP improved resulting in lesser running hours of ammonia compressors. The reduction was little less than 1 hour and with this reduced running hour the total energy saved was 60472 kWh **resulting in monetary saving of Rs. 2.78 Lakhs per annum.** Further improvement is expected once the new Plate Heat Exchange type ammonia condensers are made operative during the year 2005-06.

Condensate Recovery:- The dairy has three 10 KLPH pasteurizers out of which two are running with auto controls and the third one without the same. In all the three pasteurizers it was observed that considerable amount steam condensate and at times flash steam was running into the drain. The dairy requires hot water at around 80 ° C for CIP and washing purpose. Hence, it was decided to reroute the condensate and flash steam into the hot water tank of the CIP system using available old C class pipes which were removed from old condensers. By doing this change we were able to recover around 3000 Litres of hot water for CIP & washing purpose.

➤ Quantity of hot water obtained/day	3000 Litres
➤ Delta T for hot water	51.5 ° C
➤ Energy required for the above delta T	153415 Kcals
➤ Furnace oil saved per day	15.38 Litres
➤ Furnace oil saved per year	5613.7 Litres
➤ Savings per annum	Rs. 75784.00

Liquid level indicators and float controls for Ice Bank tank and butter deep freeze:

The study revealed that the ammonia compressors were being run more than required since the level of the liquid was not being maintained at optimum level in the surge drums of ice bank tank and also it was found that more of liquid was being circulated in the butter deep freeze in the absence of float controls. Hence, the liquid level indicators along with the float controls were installed at the IBT and butter deep freeze. As a sequelae the running hours of compressors and allied equipments at the refrigeration section was reduced to slightly more than $\frac{1}{2}$ hour and this resulted in saving of around 120 Kw/hr and this resulted in a **net savings of Rs. 2.01 Lakhs per annum.**

Installation of lower capacity pumps for milk pasteurizers:- The L&T pasteurizer with capacity of 10 KLPH was being run with 5 Hp milk & hot water pumps. Since this pasteurizer was connected to 5 KL homogenizer the 5 Hp pumps were replaced with 3 Hp pumps. Similarly 10 KLPH IDMC plant was being operated with 5 Hp monoblock hot water pump. This pump was replaced with coupled hot water pump driven with 2 Hp motor. Thus in all there was a reduction of 7 Hp. These pasteurizers run on an average 12 hours per day. The net savings in Kw/hr is 22995 resulting in an **annual savings of Rs. 1.06 Lakhs.**

Replacement of old batch type curd milk pasteurizer with continuous curd milk pasteurizer:-

The milk for preparation of curd was being pasteurized with the conventional batch type curd milk pasteurizer. This was consuming considerable quantity of steam. Hence, this was replaced with continuous PHE type curd milk pasteurizer.

➤ Steam consumed by batch type pasteurizer	170 Kgs/2000 kgs milk
➤ Steam required per Kg milk	0.085 Kgs
➤ Steam consumed by 3000 LPH pasteurizer	100 Kgs/Hour
➤ Steam required per kg of milk	0.033 Kgs
➤ Steam savings per kg of milk	0.0517 Kgs
➤ Quantity of curd milk pasteurized	4843.74 MT
➤ Steam saved	250259.9 Kgs
➤ Furnace oil required to generate the steam	19251 Litres
➤ Savings per annum	Rs .2.60 Lakhs

Energy Conservation Plans and Targets

1) Renovation of effluent treatment plant & Methane Gas Utilisation:- The dairy is being expanded by addition of efficient energy conserving equipments.



As a result of this the effluent treatment plant also is being expanded and renovated. The plant is proposed to have two Bio-reactors one an acidic phase reactor and the other alkali phase reactor. Since, the treated water from these reactors will have optimum BOD & COD it is planned to lend the treated water to Mysore Zoo for maintenance of garden at the Zoo. The reactors produce methane gas. It is intended to run a 30 KVA diesel generator by using the methane:diesel mixture. It is estimated that the methane gas production would suffice to run the generator around 10 hours a day. The power generated would propel the motors fit in ETP section also would cater to the lighting load of this section. The savings that could be turned out of this is estimated to be Rs. 2.26 Lakhs per annum. The investment that is being done on this project including the expansion of ETP is Rs. 27.26 Lakhs.

2) Water management & Rain water harvesting:- During the year 2005-06 the dairy has given major stress on water conservation. Hence, the rain water harvesting has been taken up. The study was conducted by FES and the cost of the project was estimated to be around Rs. 3.16 Lakhs including the consultancy charges of FES. The work has been handed over to FES. The project includes drilling of three dummy bore wells to which the water harvested would be diverted. Apart from this a portion of water harvested will be diverted to water sump. The approximate quantity of water that would be diverted to sump would be around 2.5 lakh KL to 3.0 lakh KL per season. By this approximately Rs. 1.35 lakhs is expected to be saved per annum.



3) Auto Controls for Milk Pasteuriser:- The dairy has three pasteurisers and two have been equipped with auto controls and these auto controls have helped the dairy in saving Rs. 1.54 Lakhs during 2004-05. Hence, it is proposed to equip even the third pasteuriser with auto controls with an investment of Rs. 1.75 Lakhs. The proposed annual savings is Rs. 0.95 Lakhs.

4) Installation of New Plate Heat Type Condenser for refrigeration system:- The dairy has 4 Nos. 9X9 ammonia compressors. The hot ammonia gas that is discharged from these are being cooled with the help of 4 evaporative type condensers. The efficiency of cooling ammonia in these condensers being very low and also the condensers were old and since they were to be replaced, new plate heat exchange



type of condensers are being installed. These would cool the ammonia efficiently and would improve Co-efficient of Performance of ammonia compressors. This improvement would save energy to the tune of Rs. 2.17 Lakhs per annum by reducing the running hours of ammonia compressors. The investment on this project is Rs. 22.0 Lakhs.

5) Heat Recovery Units:- Heat recovery units can be introduced in the exhaust line of ammonia and air compressors. This would reduce the load on ammonia condensers and improves cooling efficiency in addition to yielding considerable quantity of hot water at around 70 – 75 °C. This hot water can be used as boiler feed water and also utilised for washing purposes. The expected savings per annum is Rs. 1.25 lakhs. Proposed investment is Rs. 5.0 Lakhs.

6) Renovation of existing milk cold store to avoid heat loss & to reduce the packing hours:- The existing cold store capacity is 60,000 Ltrs. Since this dairy markets more than 1.2 Lakh litres per day the cold store is intended to be expanded. The new cold store would be equipped with energy efficient equipments to maintain the required cold store temperature. With the cold store expansion the milk packing is expected to be completed by 5.00 PM everyday as against the present condition wherein the packing is being continued till 3.00 AM of the next day. By this the running hours of air compressor run by 75 Hp motor would be reduced by 10 hours. This project would result in an annual savings of Rs. 4.71 Lakhs. The proposed investment on this project is Rs. 18 lakhs.

7) Installation of butter pre-stratification tank & butter melting vat :- The dairy is manufacturing Ghee from butter by using ghee vat. The major energy is spent to evaporate the moisture present in butter. In order to save this thermal energy to an extent of 50% it is proposed to install butter melting vat and a pre-stratification tank. Butter after being melted would be taken into the pre stratification tank wherein around 50% moisture can be removed by the process of sedimentation wherein no thermal energy is spent. The approximate savings expected is Rs. 3.30 lakhs and the proposed investment is Rs. 9 lakhs.

8) Hot water battery system for cream pasteurizer:- The cream pasteurizer installed at the dairy is being operated without hot water generation unit wherein considerable amount of steam is lost. To harness this wastage it is proposed to install a hot water battery system wherein the steam is used to generate hot water which would be circulated in closed circuit. The proposed investment is Rs. 0.75 lakhs and the expected savings per annum is Rs. 0.44 lakhs.