(Nestle India ltd., Moga)

A). Thermal Energy Savings:

Reduction in Coal consumption in boiler

Earlier we had a De-alkalizing plant for boiler feed water & its conductivity was in the range of 400 ppm. As we are a food company we generally keep TDS level not more than 1800 ppm in boiler blow down water. For keeping TDS below that level we had to blow down at rate of 5%. This was a substantial wastage of heat energy & subsequently a wastage of coal.
We wanted to reduce this blow down quantity. So, we decided to switch over to Reverse Osmosis plant whose conductivity at outlet is not more than 25 ppm. This helped in reduction of blow down quantity to 1%& thus saving coal consumption.

Calculations:-

Average annually steam generation =	166,263	Ton
Average Blow down = 5% of steam generated =	8313	Ton
Heat Loss due to blow down = Blow down Qty.*Sp.Heat*(Blow down water temp - feed water temp.)	914448	Kcal /ton
Steam loss equivalent to heat loss =	1616	Ton
Cost of wasted steam due to blowdown in INR for year '05 =	1328050	
Blow down rate after RO plant = 1%	1,663	Ton
Heat Loss due to blow down = Blow down Qty.*Sp.Heat*(Blow down water temp - feed water temp.)	182890	Kcal /ton
Steam loss equivalent to heat loss =	323	Ton
Cost of wasted steam due to blow down in INR for year '06 =	265610	
Savings in INR per year =	**1062440**	

Steam coil provided between HP fan & Air Heater inlet to preheat the inlet air.

We have 8 number of Air heaters for providing hot air to dryers in Egron deptt. for drying of milk into base powder. The temp. of hot air is around 360°C. Furnace oil is used as fuel for its operation. A high pressure (HP) fan forces ambient air into the heater which is eventually passed on to dryers through induced draft ID fans after heating.

Now what we have learnt technically & also from our experience is that the cost incurred for heating of air with steam is 5 times lower as compared to that of FO. So we decided to use steam for air heating, as much as possible.

We opted to preheat the inlet air, which has ambient temperature with a help of steam heat exchangers.
We installed a steam-heated coil in between HP fan & heater furnace to increase the temperature of inlet air to 100°C. This increases the efficiency of heater as already high temperature air is forced into the furnace.
Before modification FO consumed / hour of Air Heater operation was 98 lts.
After modification oil consumed / hour is reduced to 88 lts per heater.

For one Air heater:
Oil cons. Without steam coil = 98 lt/hr
Oil consumption with coil = 88 lt/hr.
Steam reqd. to heat the coil = Heat energy in 10 lts. of oil / Enthalpy of Steam
= 10 * 0.94 * 9500 / 550 = 162 kg/hr

Further, Steam reqd. for deaeration in feed water tank corresponding to steam cons.
= 162 *(102-28) / 550 = 21.8 kg/hr.

Heat recovered from condensate = 162 * 70 / 550 = 20.36 kg/hr.
Cost of steam = Rs 0.85 / kg.
Cost of steam consumption = Rs 139 / hr. / air heater
Cost of oil saved = Rs 207 / hr/ air heater

Saving = Rs 68 / hr/air heater

As 3 number of air heaters are reqd. for one Egron. Therefore,
Total savings = Rs 68 * 3 egrons * 20 hrs* 330 days.
= Rs 13.46 lacs / year / egron

Correct selection & replacement of faulty steam traps

An audit was done of all the steam traps, total 140 number of the factory to detect losses and take corrective actions. Following were the observations:

S.NO.	Description	Quantity
1	Total no. of traps audited	140
2	Number of traps working OK	77
3	Number of traps water logged	12
4	No. of traps leaking steam	14
5	No. of cold traps	37
6	Estimated steam leakage , kg/hr.	202

At some locations it was found that Inverted Bucket trap & Float traps were installed on line drain application. Also Thermodynamic traps were installed on heating applications.

S.No.	Tag.No.	Type/Make	Size	Pr. KG/cm2	Application	Steam leak, Kg/hr.
1	1	TD3/SPIRAX	20	17	Drain	Trap isolated (leaking trap)
2	3	TD3/SPIRAX	20	4.8	Drain	19
3	19	No Trap	15	3.5	Heating	15
4	53	IB	25	3.5	Drain	11
5	63	No Trap	20	0.3	Drain	5
6	64	No Trap	20	0.3	Drain	5
7	67	FT/SPIRAX	50	2	Drain	30
8	71	No Trap	20	2	Tracing	22
9	96	TD3/SPIRAX	20	16.5	Drain	20
10	112	TD3/SPIRAX	15	3	Heating	10
11	130	TD3/SPIRAX	15	17	Drain	20
12	132	TD3/SPIRAX	20	17	Drain	10
13	133	FT/SPIRAX	20	3	Heating	15
14	138	TD3/SPIRAX	15	15	Drain	20
					TOTAL	*202*

Recommendations :
Replacement of leaking steam traps with appropriate ones.
Replacement of inverted bucket traps on line drain application with Thermodynamic traps.
Replacement of Inverted bucket traps on heating applications with Ball Float traps.

Estimated investment = Rs 5.58 lacs.

Steam loss from traps = 202 kg/hr*23hrs*365days = 1695.8 tons / year

Savings achieved = Cost of steam = Rs 850* 1695.8 tons = Rs 14.41 lacs/year.

B). Electrical Energy Savings:

Installation of Energy Saver EN-25 for factory & CFL Bulbs for residential quarter lighting load

Normally the luminous efficiency of gas discharge lamp depends on the operating electrical conditions like discharge current & voltage in relation to the vapor pressure. In reality, the lighting control gear as a unit generally draws more current than the rated.

Keeping this in mind three number of energy savers EN-25 are installed for factory lighting load and its real effect was analyzed. This energy saver optimizes the electric load thus giving substantial savings.

Four stage effect of ES-25:

Stage 1 – Starting period of lamp ignition:

During this period no savings, no effect of starting voltage/current drawn by lamp etc.

Stage 2- Running period. maintenance of ionization of gas lamp:

Current drawn by lamp reduced to have optimum current level to maintain ionization.

Current drawn in the circuit reduced there by losses in the connecting cables, choke, & lamp wires.

Stage 3- I^2R losses in the choke reduced:

Marginal reduction of voltage reduces iron losses.

Direct reduction in energy consumption in the lamp.

Stage 4- Cumulative effect:

Total savings of 20 – 25 % can be achieved.

Following were the findings: -

Meter NO.	Average Power cons. before EN-25 / month	Average Power cons. after EN-25 / month	Units saved per month
PBB00342	75810 kwh	61200 kwh	14610 kwh
PBBB0340	51960 kwh	46020 kwh	5940 kwh
PBB00331	10950 kwh	9420 kwh	1530 kwh
		Total saved units	22080 kwh

Savings for one year = 22080*12months*Rs4.12 = 10.92 lacs/year

Power consumption reduction of residential quarter

40 no. of 70 watt Sodium Vapor lamps replaced with 23 watt CFL bulbs for street lighting.
Before: -

Average units consumed / year = 10080 kwh

Cost of power cons. = Rs 41530/-

After: -

Average units consumed per year = 3312 kwh

Cost of power cons. = Rs 13645/-

Savings: - Rs 27885/-
= Rs 0.278 lacs/year

Sanction load increased by 500 kw during Peak Load hrs

Mostly during evening times like from 7:00 pm to 10:pm factories are allowed only to use some part of electricity load, which they consume during regular hours. This time period is known as Peak Load hours. To compensate for the remaining power load Diesel generator sets are run which consumes thermal fuel & generally cost of unit produced by DG set is much more as compared to that of Govt. supply.

Keeping this in mind we applied for an increase in sanctioned peak hour load & we successfully got a 500 kw increase in quota from Govt.
This helped in saving of High Speed diesel.

Units produced by DG set = 3.7 kw/ lt. of HSD cons.
Units to be produced by DG reduced by = 500 units
Saving of HSD = 500 / 3.7 lts. / Hr = 135.14 lts/ hr.

HSD saved per year = 135.14 lt/hr. * 3hrs/day * 360 days/year = 145.95 kl/yr

Cost of HSD saved = Rs 46.75 lacs / yr

Cost of extra electricity used = Rs 500*3*360*Rs 4.12 = Rs 22.25 lacs/yr.

So, Total Savings = Rs 24.5 lacs/ year

Reduction in power consumption of milk chilling unit.

A direct expansion type milk chilling plant was earlier used for storage of milk at 8°C. This consumes power for compressor operation. We already had chilled water line set up in that area. After study it was found that cooling by chilled water will be cheaper than that of gas expansion type.
So, the unit was converted into chilled water-cooling system with savings around Rs 6o,ooo/- per annum.

Direct Expansion System

VOLTAGE	410
AMPS	10
PF	0.9
RH	20
DAYS/YEAR	300
COST PER KWH	4.12
COST OF OPERATION (IN Rs LACS)	1.58

Chilled Water System

MILK DELTA T IN °C	4
MILK QTY (LTRS)	2500
SPECIFIC HEAT OF MILK	1.2
HEAT REMOVED IN K CAL/HR	12000
CHILLED WATER DELTA T	4
QTY OF CHILLED WATER (LTRS)	3000
COST OF 1 M3 OF CHILLED WATER	6.0
RH	20
DAYS/YEAR	300
COST OF OPERATION WITH CHILLED WATER (IN Rs. LACS)	1.08
SAVINGS IN RS per year (IN Rs LACS)	**0.50**

Before: -
Cost of power cons. By 10A motor = Rs 1.58 Lacs per year

After: -
Qty. of chilled water cons. = 1800 kl / year
Cost of chilled water = Rs 1.08 Lacs per year

Savings: - Rs 0.50 Lacs per annum.

Reduction in power consumption in AHU operation.

Air handling units are installed for comfort at workplace. An extensive study was done regarding usage of offices & workplaces. It was found that due to negligence some of the times AHUs run for extra time without any need. Moreover temperature maintained was too low than actually required.

Following measures were taken for optimum utilization of AHUs:

Real time switches installed for avoiding unnecessary running of AHU.
Room temperature for comfort increased from 24°C. to 27°C.

On comparing with the actual readings of previous months, units saved came around 3000 per year per AHU.

As these changes were done only on one AHU,

Cost of 3000 units saved = Rs 12360/-p.a.