Energy conservation for the Indian Dairy Industry

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Classification of Energy

Energy can be classified into three ways
A. Primary & secondary

Primary Energy
➢ Coal, lignite, oil, Natural gas, biomass.
➢ Nuclear energy from radioactive substance and thermal energy stored in earth.

Secondary Energy
➢ Coal, oil and Natural gas – steam & electricity

B. Commercial & Non commercial

Commercial Energy
➢ Lifeline for industrial, agri, transport and commercial development
➢ Electricity, coal, lignite, refined petroleum product, natural gas – at price

Non-commercial Energy
➢ Traditional fuel like firewood, cattle dung and agro waste
➢ Solar, wind and animal power

C. Renewable & Non renewable

Renewable Energy

Wind power, solar, geo thermal energy, tidal power and hydro electric / bio diesel

Non-renewable Energy

Conventional fossil fuels such as coal oil and gas, they go on depleting with time

World Energy Facts and Figures
➢ Oil is going to last for 45 years, Natural gas for 65 years & Coal for 200 years.
➢ 65 % of the world use coal in electricity generation.
➢ 80 % of the worlds population of developing countries consume 40% of the world total energy consumption.
➢ The worlds average energy consumption per person is equivalent to 2.2 T of coal.
➢ In developed countries people use 4-5 times more energy than world average and 9 times more than the average of developing countries.
➢ 2 Billion people lack access to affordable and reliable energy supplies in developing country.
➢ Primary energy consumption in world is projected to grow at an average annual rate of 2.7%.
➢ Coal use world wide is projected to increase by 2.3 billion tones between 2001 to 2025.
➢ Natural gas is projected to be fastest growing primary energy source worldwide.
➢ Electricity generation is expected to nearly double between 2001-2025.
➢ Coal and natural gas reserves increased somewhat while those of oil declined slightly

World Reserves Of Primary Energy Sources

Coal
➢ USA - 25.4 % of the world reserve.
➢ Russia 15.9%, china 11.6% and India 8.6%.

Oil
➢ Saudi Arabia had the highest and the

Invited Articles

largest share of the reserve with almost 23%.

Gas

- "Century of Gas".
- Russian Federation had the largest share of the reserve with almost 27%.

Indian Energy; Some Facts and Figures

India's absolute primary energy consumption is only 1/29th of the world, 1/7th of USA.

Dairy Available Energy Sources

The available dairy energy sources are electricity from State electricity board / co-generation.

Energy conservation in utility/engineering

Areas for Energy Conservation

Utility

1. Boiler
2. Air Compressor
3. Refrigeration
4. Water supply and distribution
5. ETP
6. Electrical

1) Boiler
- Auto blow down system.
- Economizer for boiler.
- O2 analyzer with modulating burner.
- Installation of Steam flow meter
- Use of Agro based Briquette as a fuel. Cost of steam generation can be reduced by 3 times.

2) Air Compressor
- VFD / Soft starter for Compressor motor.
- Chilled water type Air dryer for discharge air.

3) Refrigeration
- Cooling Tower pump and fan automation with Delta T

- Efficient chilled water supply pump
- PID control valves for chilled water
- Integration of compressor motor speed with discharge pressure
- VFD for CW supply pump and flow meter – cascading of the same

4) Water supply and distribution

i. Hydro-flow system with Vertical pumps.

ii. Cleaning guns / Reducers for cleaning hose

5) ETP

i. Zero discharge Plant with RO plant

ii. Recycling of water for crate washer, gardening etc

iii. Use of UASB Digestor

6) Electrical

i. Automatic Voltage Stabilizers
ii. Lighting transformer
iii. Maximum demand controller
iv. Electronic ballasts for lighting
v. High efficiency motors
vi. Powerless air ventilation system
vii. CO_2-generation plant
viii. Dry type transformers

New inventions for energy saving

- **Electric Heat Pump**

   CO_2 based compressor giving heating as well as chilling energy simultaneously at a time

- **Flat Storage - Raw material storage at cattle feed**

   Can able to store two times high as compare to conventional storage

- **Rust-grip paint to avoid corrosion on MS structure**

- **PU based flooring at sub-station**

Table - Electric heat pump installed at FCM, Mogar

Heating capacity of the EHP	63 Kw
Kcal /hour	54180
Boiler efficiency	60.00%
FO saving/hr	10.7 kg
FO saving/year@ 16.6 hrs operation/day	64200 kg
Saving in Rs/year@ 40 Rs./kg FO price	25,68,000
Additional annual electricity required	79200 kW
Annual electricity cons. In Rs/year	5,26,680
Net saving in Rs/year	20,41,320
Import duty	11,34,000
Other expanses	8,00,000
Payback period	11.3 months/Say 1 Year

Opportunities for Energy conservation in Dairy Plants

The areas for cost reduction are

Production

a. Process
b. Milk Packing
c. Butter and Ghee
d. Paneer
e. Dahi
f. Powder
g. Icecream

Milk Processing

i. High regeneration efficiency pasteurizers.
ii. Automation of processing. Efficient Homogenizer
iii. Automation of CIP by using flow meters and conductivity transmitter
iv. Stand aloneTanker CIP system

Butter and Ghee

i. Spiral flow system
ii. Pressure reducing station
iii. PID control valve for ghee boiler

Milk Packing

A. Retrofitting of pneumatic packing machines.
B. Downsizing of gear box.
C. Usage of high speed machines withAuto conveyors.
D. Automatic pick and place – Robotics
E. Stackers and Lifters for Crate handling

Milk Powder Plant

i. VFD for supply and discharge air fan.

New Inventions for Energy Conservation

1) Ice-cream Manufacturing

- Use of inline Hardening tunnel
- Efficient Hardening technology
- Automation of Ice-cream conveying system

2) Cattle Feed

Flat Storage - Raw material storage at cattle feed

Can able to store two times high as compare to conventional storage