



ENERGY MANAGEMENT

WHY ENERGY MANAGEMENT ?

India is a Developing nation. Its per capita Energy Consumption is very low. To achieve Economic Growth, we need to & have to use more & more energy to increase the pace of development. We need to increase the manufacturing of good in Quality & Volume.

It is estimated that Industrial energy use in developing countries constitutes about 45-50 % of the total commercial energy consumption. Much of this energy is converted from imported oil, the price of which has increased tremendously so much so that most of developing countries spent more than 50 % of their foreign exchange earnings. Not with standing these fiscal constraints, developing countries need to expand its industrial base like us if it has to generate the resources to improve the quality of life of its people. The expansion of industrial base does require additional energy inputs which becomes more & more difficult in the present scenario.

Generation of power needs resources. **Resources** available on earth are of **Diminishing Nature**. It is getting **depleted very fast** with time as use is increasing exponentially. There are some resources, which are Renewable e.g. Solar Power, Wind Power and Geothermal Power. Technology is also being developed to harness these Renewable Resources to generate Power. The capital investment requirement is very high as compared to normally available resources. It can be quoted here that with the available technology, we could hardly generate 5% of total power generation as on date .Hence, to restrict the use or increase the life of diminishing type of resources.

Let us see the other aspect of life, whereas everybody can't understand all technical reasons or benefits of the whole world until he himself realizes some benefit for his action or efforts. In this competitive world, cost competitiveness is very very essential for survival of every individual. To establish any work / motive or task, energy in one or other form is an essential component.

Thus the need to conserve energy, particularly in industry and commerce is strongly felt as the energy cost takes up substantial share in the overall cost structure of the operation.

Hence it calls MANAGEMENT OF ENERGY or in other words MANAGEMENT OF RESOURCES or ENERGY CONSERVATION.

It becomes clear from the above data & statement that Energy needs to be Managed / Resources needs to be managed irrespective of a DEVELOPED NATION or A DEVELOPING NATION.

HOW TO MANAGE ?

Energy management is not by chance / incident / accident. It is a Mission with a Target.

It can't be done single handedly or by sitting on a table. It needs coordinated effort by team of energy conscious people with a milestone to be established.

Very concerted efforts in a planned manner to established Energy Management. Strategy needs to be established based on the Target of Energy Conservation.

Strategy / Methodology of Energy Management:

Having established the need of Energy Management / Conservation. A systematic approach needs to be discussed and concluded. Some of steps to reach to the target of Energy Conservation can be listed as below: -

- 1) Identification of Inefficient areas / Equipments: -
 - ✳ Enlistment or knowledge of type of energy being used.
 - ✳ Study of machines / Technology employed.
 - ✳ Process study and identification of major energy consumption areas.
 - ✳ In depth process study to identify the inefficient use of energy.
- 2) Identification of Technology / Equipment requirement.
- 3) Discussion, Brain storming & Conclusion of resources requirement.
- 4) Management of resources like Manpower, Machine or Technology.
- 5) Evaluate your actions / efforts to estimate the Rate of Return

“INEFFICIENT ACTION / EFFORTS CAN NOT GIVE EFFICIENT RESULTS.”

“ONLY EFFICIENT EFFORTS & ECONOMIC IDEAS NEED TO BE TESTED.”

- 6) Implementation of New Process / New Technology / New Machines.
- 7) Re-evaluate your actions / Your Efforts.

ENERGY MANAGEMENT TECHNIQUES:

- 1) Self knowledge & Awareness among the masses
- 2) Re-engineering & evaluation
- 3) Technology Upgradations

1. Self Knowledge & Awareness Among The Masses:

For the successful Energy management & implementation, the knowledge of process & machine for the leader is very important. On the first instance, there is always a resistance from the user. There might be psychological mind blocks in the user's mind. This needs to be made known & clarified. It is further more important to make the owner of the process understand the cost benefit of the energy conservation. Creating Awareness to the process owner can give most economic & low cost solutions to save energy. We have realized about 5 % of energy saving just because of Awareness of the people.

e.g.:-

A. We advertised the concept of

“Zero Production = Zero Power consumption”.

People realized this concept and they started switching off the Auxiliaries during Idling of main machines.

B. Later on, we introduced microprocessor-based timer to auto switch off auxiliary equipments during Idle period of machines.

2. Re-engineering and Technology Up gradations:

After utilizing the low cost or awareness concept, we need to do in depth study the process / machine. We need to ascertain, the scope & extent of Energy Conservation in the area under consideration. Evaluate the existing situation / employed technology interms of process requirements & production capacity & capability. Sometimes, we do land into a situation of handicap with machine capacity & capability for the sake of Energy Conservation. **It must not be done.**

Once it is established, that there is a potential of energy optimization. We need to start evaluation & re-engineering of the process / equipment. It may be terms of layout, motor capacity, types of starters employed, nature of loads etc.

3. Technology Upgradations:

After having established the scope of energy conservation in the specified area. The latest technology availability is suitability, sustainability & pricing needs to be studied.

Economics needs to be worked out like Pay back period, Return of Investment, Quality of energy savings etc.

Please remember

“ BETTER THE DIAGNOSIS,

BEST WILL BE THE RESULT. ”

The following case studied will elaborate more on the above views & prove my point.

CASE STUDY: I (Energy Saving For Water Pump)

Application : Transfer of hot return water from Reheating furnace to the cooling Tower fans.

Motors Employed : 3-phase AC induction motors

1. 37 kw, 415 v, 1460 rpm = 2 nos
2. 22 kw, 415 v, 1440 rpm = 1 no.

Previous System :

1. Star Delta starter for motor operation.
2. Flange coupling for operating the centrifugal pumps.

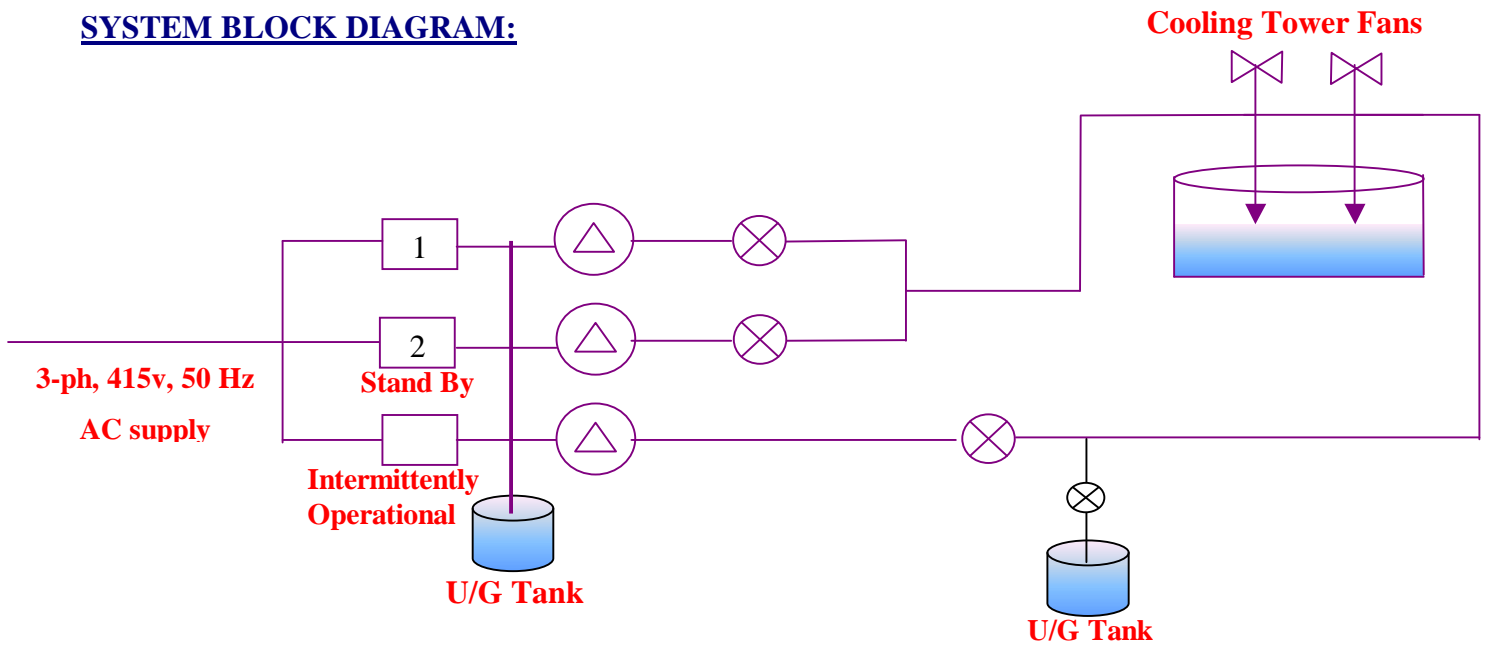
Observations :

1. One centrifugal pump was being operated with 60% outlet valve opening.
2. Cooling Tower Tank level was not maintained with the operation of single pump.
3. Second pump was being operated to maintain to Tank level for short intervals. It was operated approx. 40times in 24 hrs.
4. Sometimes, second pump was being operated with by-pass valve half open to drain tank to avoid the over flow of Cooling Tower Tank.

Process Study & Experimentation:

- ★ Pump was operated at full capacity to realize the increased flow to cooling tower. Motor got overloaded.
- ★ Observations were done physically about Tank levels with one pump in operation.
- ★ Psychological fear of lower water level was taken and range of water level was given.
- ★ It was observed that the standby pump needs to operated only 6 to 7 times in a day (24 hrs.)
- ★ Further low & high level switch was installed with an Alarm & Indicator to take care of manual labour & manpower wastage.
- ★ **To utilize the motor power effectively a VFD was installed and operated at 30 Hz frequency. The pump RPM takes as 900 and outlet valve was operated fully.**
- ★ Power consumption reduced from 32 kw to 16 kw.

SYSTEM BLOCK DIAGRAM:



MERITS OF NEW SYSTEM:

1. Mechanical & Electrical stresses during starts of the motor reduced to negligible. Hence the life of the equipment increased.
2. Presence of a supervisor or monitoring of the level got avoided. Hence the manpower cost reduced.
3. System power consumption reduced.
4. No churning of water in the pump & hence increases life of impeller.

COST BENEFIT ANALYSIS:

Previous System (Without Drive)	: Speed=50 Hz, Kw (Consumption)=32
Present System (With Drive)	: Speed=30 Hz, Kw (Consumption)=16
Energy Saving per year	: 16 Kw X 20 X 300 = 96,000 KwH
Cost incurred in the installation of New VFD	: 2 X 1,50,000 = Rs. 3,00,000 /-
Saving in Rupee Terms / Year	: 96,000 X 4 = 3,84,000 /-

Pay Back period – Approx. 10 Months

CASE STUDY: II

ENERGY SAVING FOR FUME EXHAUST SYSTEM BLOWER IN 4HI COLD ROLLING

MILL:

Motor Rating : 3-ph AC Induction motor of 50 HP, 415 V, 1460 RPM

Previous System :

1. Star Delta starter for motor operation
2. Belt pulley system for power transmission to fan.

Observation :

1. Blower fan kept working continuously at a constant speed.
2. Blower fan working at full speed irrespective of fumes generated or not at rolling mill.

PROCESS STUDY & EXPERIMENTATION:

1. Fume generation was very low during first pass rolling.
2. No fumes generation during coil handling.
3. Actual rolling duration at full and hence maximum fume generation takes place only 60% of the total duration of mill operation.
4. Manual control of inlet valve of blower fan was impractical.

PRESENT SYSTEM:

1. AC electronics speed variable drive installed.
2. Drive operation studied & software designed accordingly, optimise the power consumption during idling of mill.
3. Further optimisation done to reduce the power consumption in accordance with fumes generation.

MERITS OF NEW SYSTEM:

1. Smooth start resulting in increased life of motor and mechanical system.
2. Energy saving due to speed / voltage variation during idling of the mill.

COST BENEFIT ANALYSIS:

Previous System (Without Drive) : Speed=50 Hz, Kw (Consumption)=30

Present System (With Drive) : Speed=0-20-45Hz, Kw (Consumption)=15

Energy Saving per year : 15 Kw X 20 X 300 = 90,000 KwH

Investment : Rs. 1,50,000 /-

Saving in Rupee Terms / Year : 90,000 X 4 = 3,60,000 /-