MANGANESE ORE (INDIA) LIMITED
FERRO MANGANESE PLANT BALAGHAT MINE

UNIT PROFILE

Manganese ore(India) Limited is a largest Manganese ore producing company in India as well as all over world. MOIL produces almost 55% total production of High grade Manganese ore produced in India. MOIL operates a 10000 TPA capacity Ferro-Manganese plant at Balaghat (M.P.), producing 78% grade of High Carbon Ferro Manganese. There is no competitor in private industry producing such a high grade of Ferro Manganese India. MOIL has commissioned 4.8 MW Wind Energy Generators in June 2006 in district Dewas (M.P.)

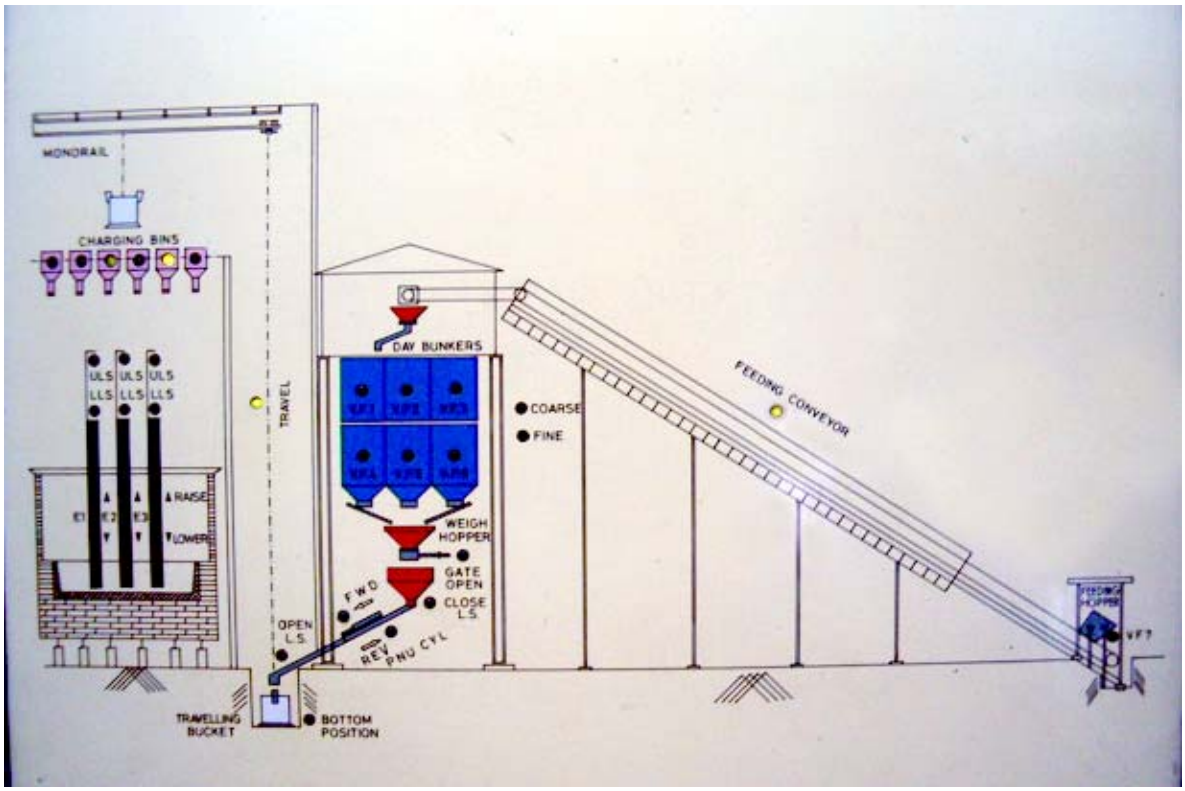
Ferro Manganese Plant at Balaghat Mine had produced 10200 MT of High carbon Ferro Mnaganese in the year 200-6 and 2007 and turn over was Rs. 397.10 Million. Considering the rising trend in the demand of Ferro Manganese, MOIL has embraked upon an expansion plan by forming a joint venture with SAIL & RINL to produce Ferro Manganese and Silico Manganese. In spite of severe comptetion from Private producers of Ferro Manganese MOIL has established its product in the market due to sheer quality and its competitive cost.

The plant uses latest technology and continues to strive hard for innovation and employing the best techniques by interacting with world renowned company like BHP BIilliton. Special efforts are being made for reduction in energy consumption as the power is being used in Ferro Alloys industry as raw material.

This was the first plant in a Public Sector to manufacture Ferro Manganese. The total installed capacity of plant is 10,000 Tons per annum. The quality of product is well established in market and it has been awarded ISO 9000 in the year of 2002. The plant specializes in a particular grade of Ferro Manganese to produce stainless steel. The product is having Higher contents of Manganese and lesser Phosphorous suitable for production of high quality of steel. It is also helpful in reducing the amount of slag generation while producing steel thereby reducing the cost of power per ton.

The Ferro Manganese produced from the plant, process flow chart is as below,

Flow Diagram

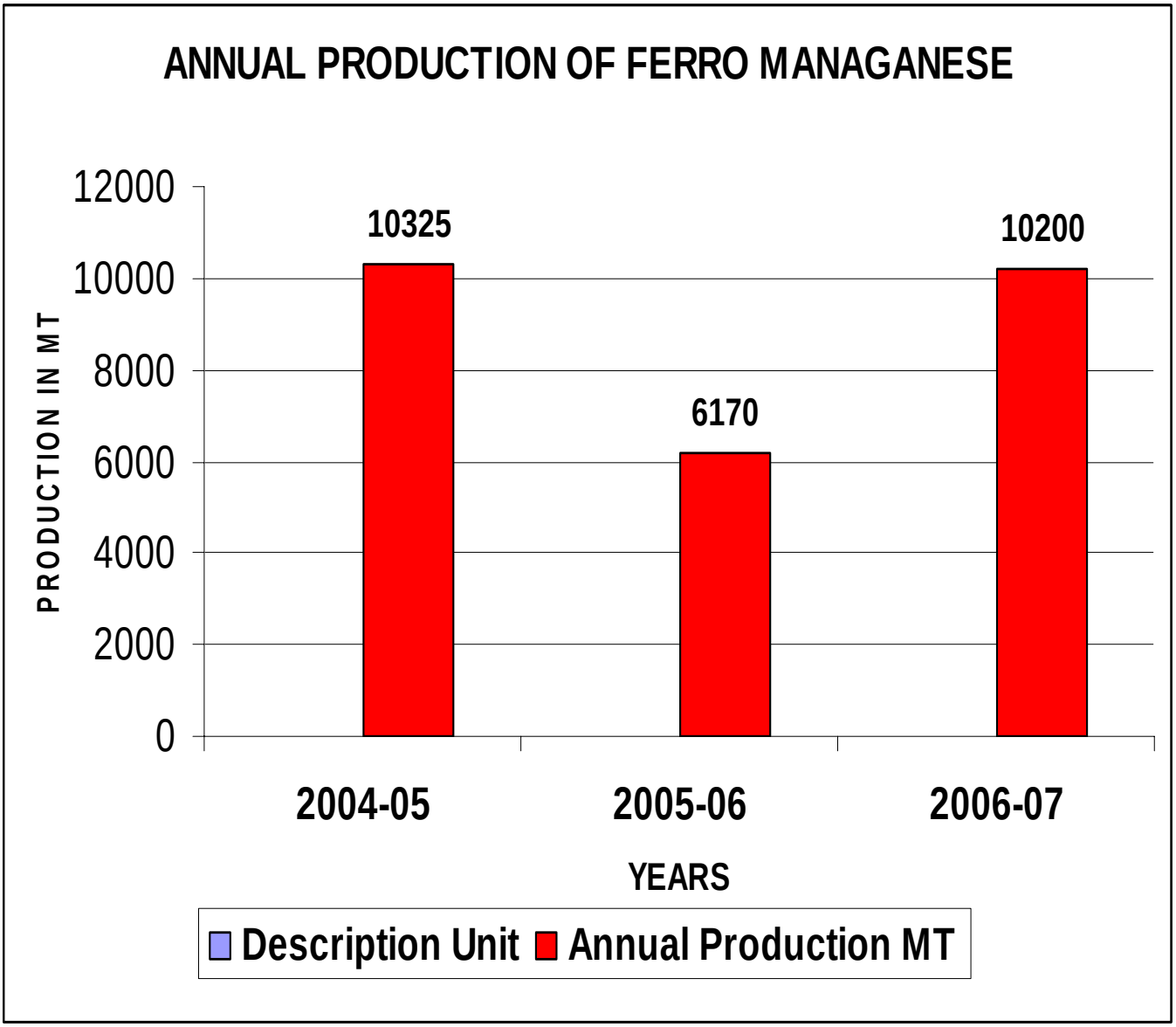


ENERGY CONSUMPTION

The energy consumption is controlled by taking various measures like improving the efficiency of the equipments, proper sizing and use of raw materials, reduction in breakdown time and increase in utilization of equipments.

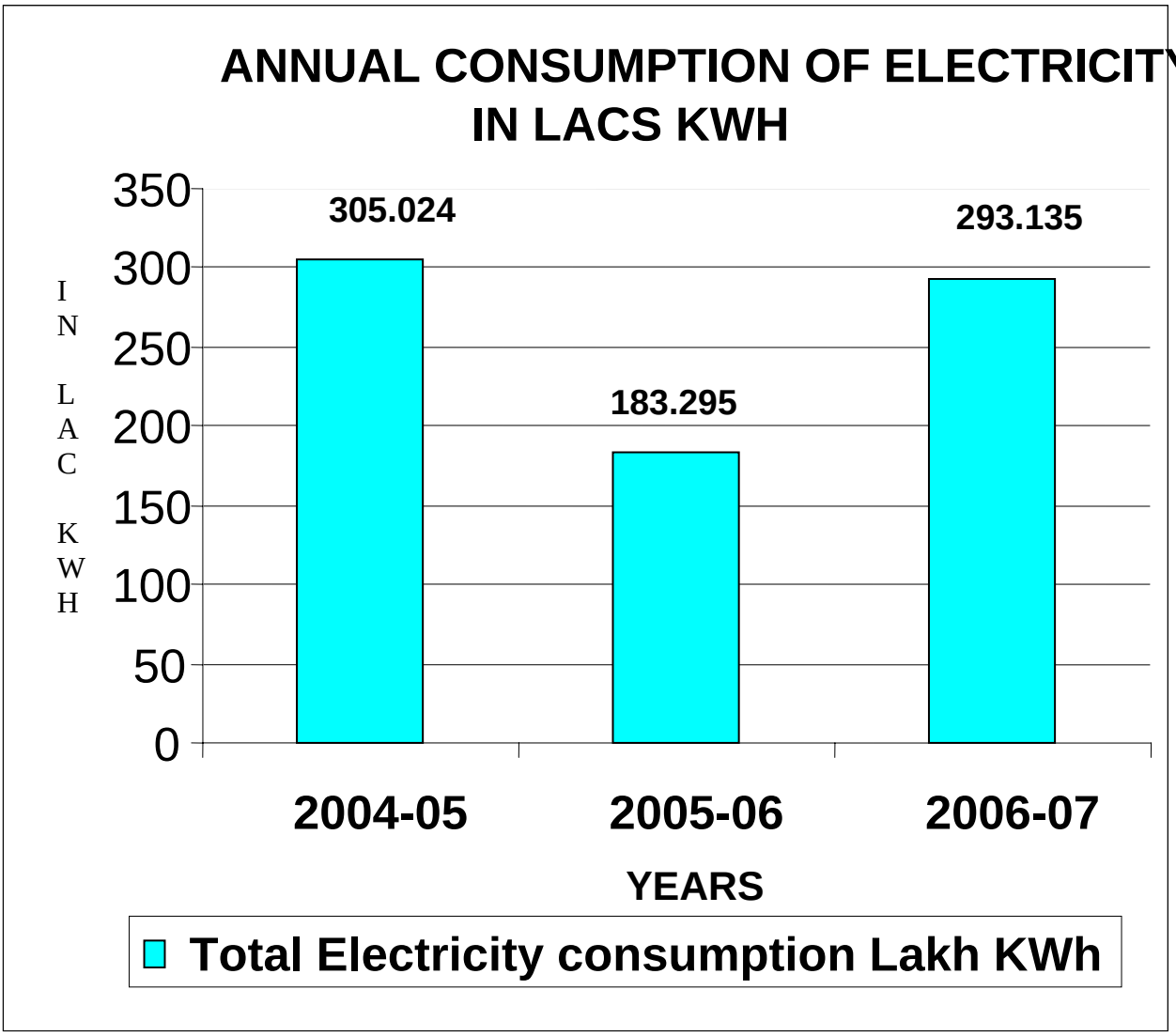
ANNUAL PRODUCTION OF FERRO MANGANESE

Description	Unit	2004-05	2005-06	2006-07
Annual Production	MT	10325	6170	10200



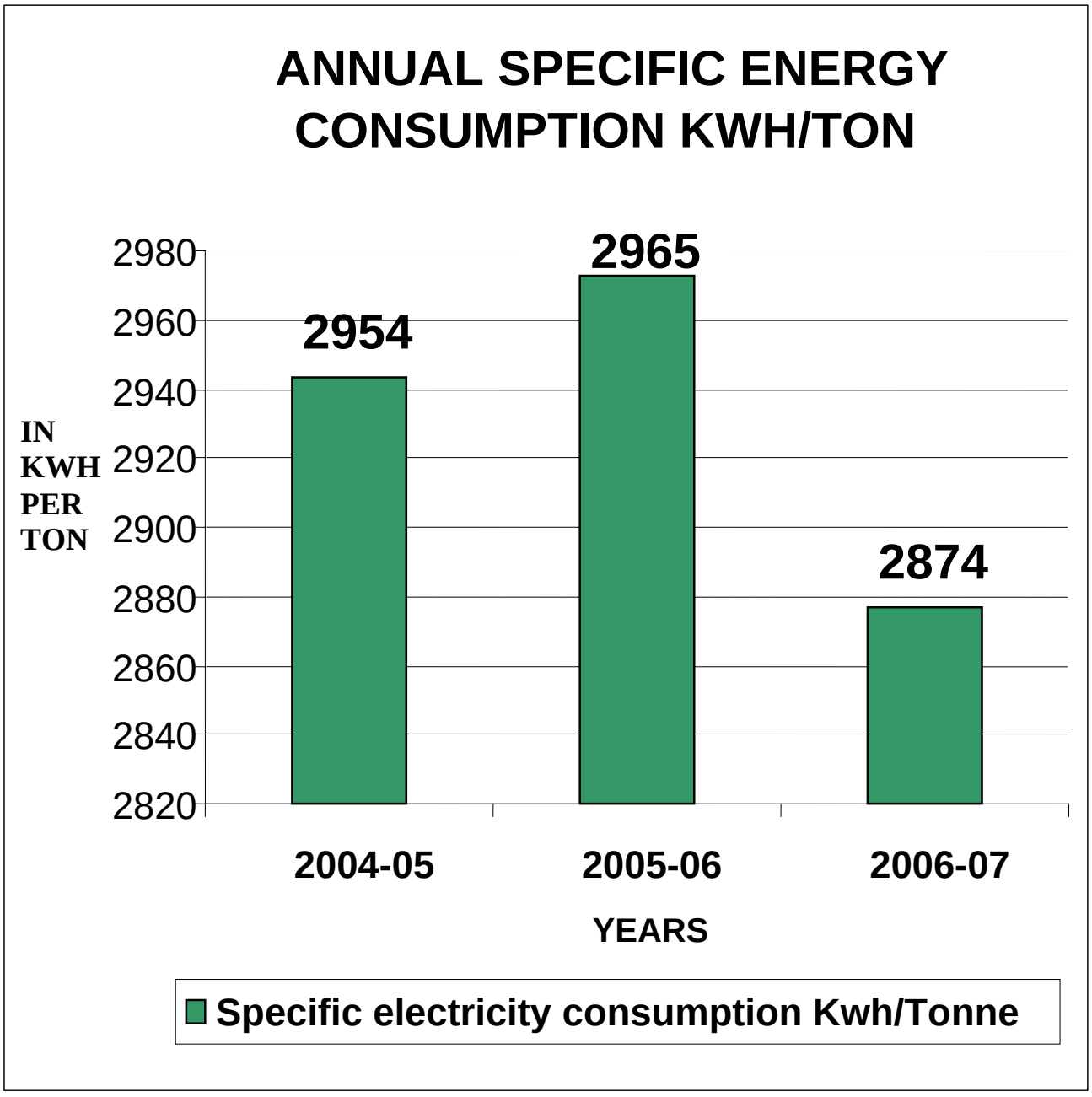
ANNUAL CONSUMPTION OF ELECTRICITY

Description	Unit	2004-05	2005-06	2006-07
Total Electricity consumption	Lakh KWh	305.024	182.95	293.135



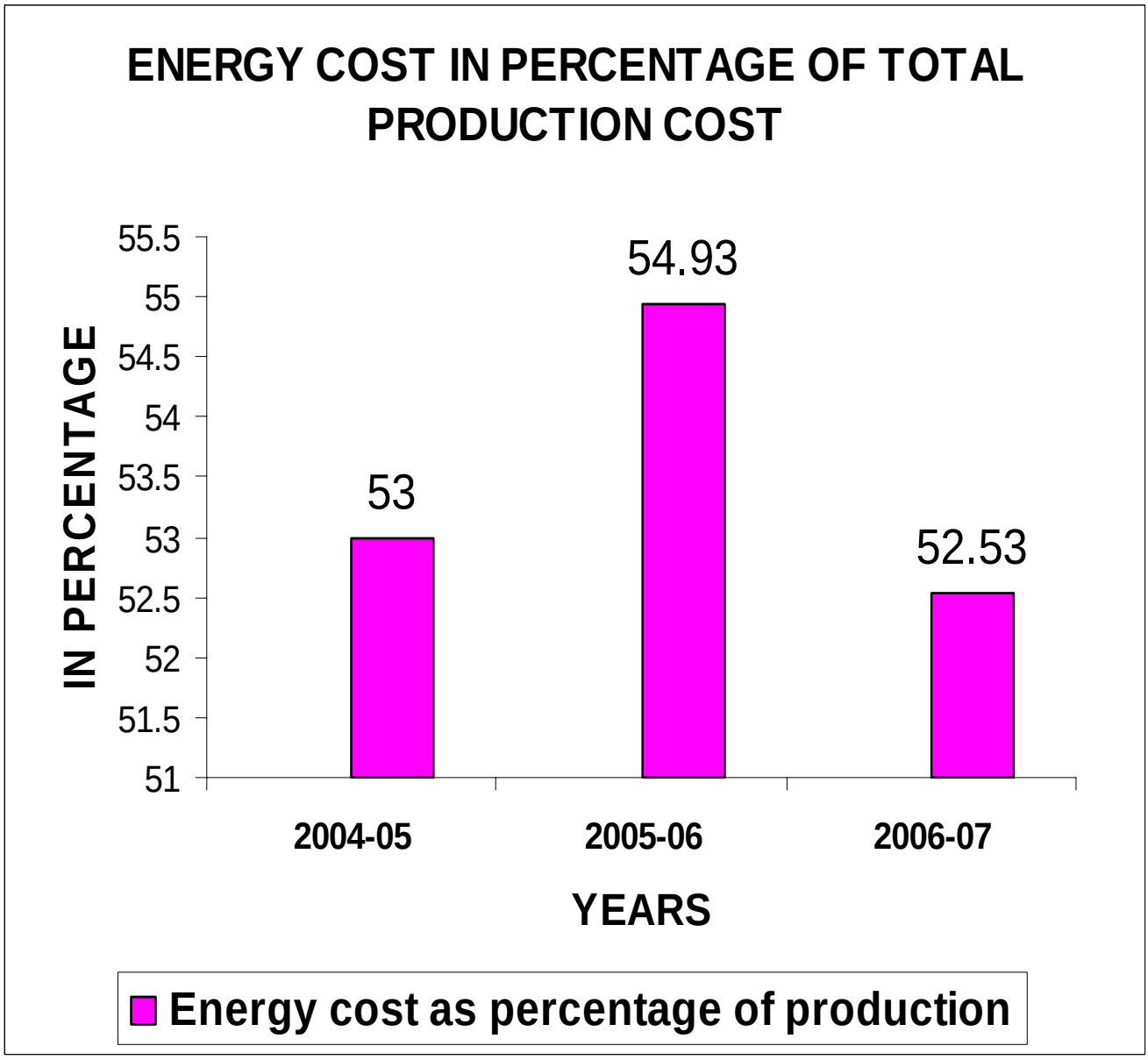
ANNUAL SPECIFIC ENERGY CONSUMPTION

Description	Unit	2004-05	2005-06	2006-07
Specific electricity consumption	Kwh/Tonne	2954	2965	2874



(4) Energy cost percentage of production cost:-

Description	2004-05	2005-06	2006-07
Energy cost as percentage of production	53.00	54.93	52.53



(1) ENERGY CONSERVATION DUE TO POWER FACTOR CORRECTION

Our Ferro Manganese Plant is connected by 33 KV overhead line. For improvement of power factor near to unity and to maintain the same the following steps are taken on our end

(a) Installation of 1800 KVAR fixed capacitor bank no.1

The 5 MVA Furnace Transformer is directly connected to 33 KV supply. The fixed capacitor bank of 1800 KVAR capacity is connected on 33 KV side for central compensation

(b) Installation of 900 KVAR fixed capacitor banks no.2

(c) Saving from incentive in energy bills of M.P.P.K.V.V. CO. LTD. for power factor-

Year	Incentive in Lac
2004-05	50.53
2005-06	34.61
2006-07	45.65
Total Saving-	130.79

Total incentive in 2006-07 : Rs. 45.65 Lacs

(2) ENERGY CONSERVATION DUE TO EFFECTIVE USE OF COKE.

Yearwise comsumption of coke

Year	Production	Coke quantity in MT
2004-05	10325	5452.72
2005-06	6170	3606.9
2006-07	10200	5273.4

Specific consumption of coke

Year	Production	Sp.Coke Consumption in MT
2004-05	10325	0.528
2005-06	6170	0.585
2006-07	10200	0.517

Saving in consumption of coke, an equivalent amount of KWH was achieved by monitoring various process parameters. The basic process parameters are monitoring of Electrode operation, analysis of flue gases,covering of electrode with raw material. We are monitoring level of electrode for each batch under process so that maximum penetration of electrode is achieved. Energy analysis assists us in monitoring, operation of each electrode at optimum power factor.

Reduction in use of coke in 2006-07 as compared = 0.585-0.517=0.068 Say 68 Kg to 2005-06

100 kg of coke have 72 % fixed carbon

In our case fixed carbon in coke = 68 x 0.72 = 48.96 Kg

1 Kg of fixed carbon generates 600 Kcal heat

Total heat generated by coke saved = 48.96 x 600 =29376 Kcal
1 Kwh = 856 Kcal

Power saved per MT = 29376/856 = 34.31 Kwh

Total power saved = 34.31 x 10200/100000
= **3.50** Lac Kwh

Total power saved in Rs = **13.99** Lac

Savings due to effective use of coke in MT =0.068 x 10200
In 2006-07 =693.60 MT

Savings due to effective use of coke in Rs (Lac) =693.60 x 6600
In 2006-07 = **45.77** Lac

TOTAL SAVINGS DUE TO COKE IN 2006-07 : 59.76

Measures taken for reduction of coke

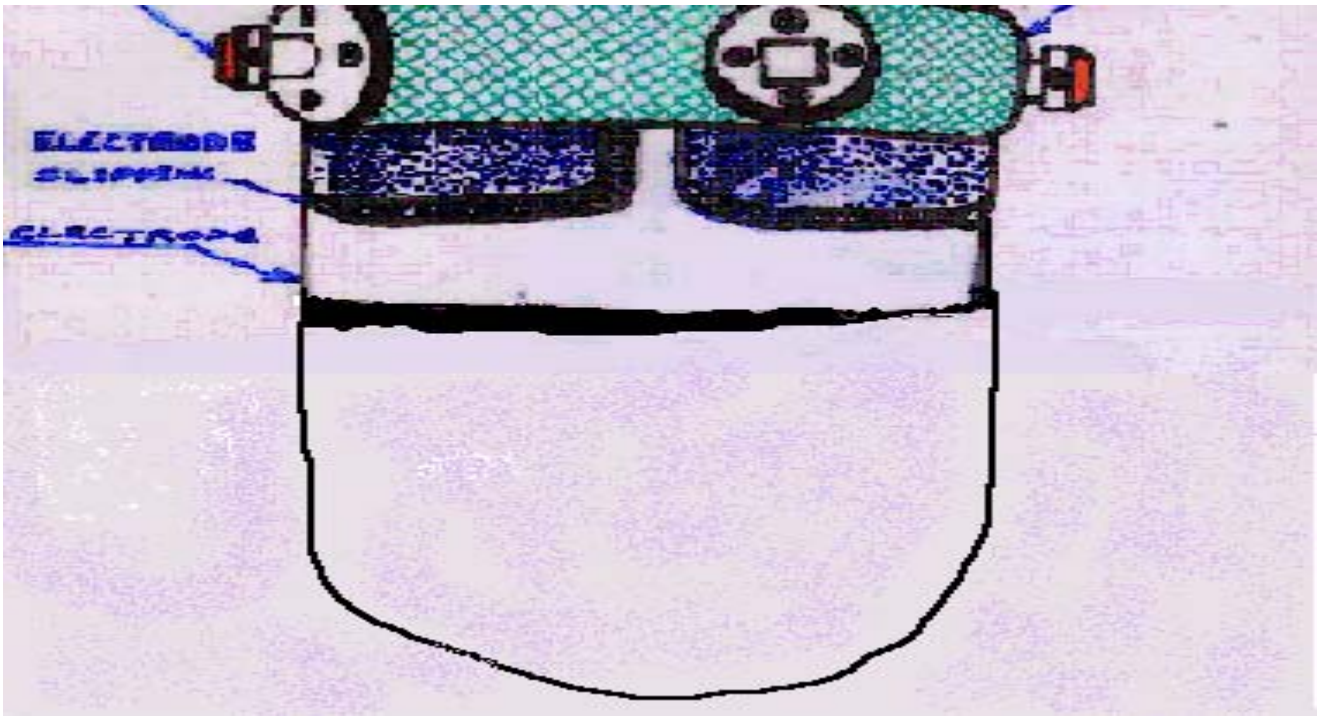
a) Maintained & used the quality of coke as per our process requirements.

b) Optimisation of the production by using the furnace on full load.

(3) ENERGY CONSERVATION DUE TO REDUCTION IN BREAKAGE OF ELECTRODE

We are resizing of electrode paste after receipt from supplier between 3" to 4 " to make it free from dust and foreign materials and paste is filled in electrode casing and ramming properly to achieve formation of joint free monolithic electrode. Breaking of electrode, its temperature in breaking zone, consumption of electrode paste/Ton of product., is monitored . It has drastically reduced brakage of Electrode and break down in Plant. The total labour cost for this work is Rs 20,000/-.

Year	Downtime due to Electrode Breaking in Hrs
2004-05	84.40
2005-06	34.00
2006-07	21.10



Reduction in Downtime due to reduction in breaking of electrode in 2006-07 as compared to 2005-06 in Hrs = 34-21.10=12.90 Hrs

Note: Breaking of electrode causes complete breakdown of plant. It requires preheating of raw material which is the wastege of electricity.

Savings due to reduction in downtime = Breakdown time x KW per hour x unit rate/100000

In 2006-07 in KWH =12.90 X 3800 X /100000

=**0.49** Lac KWH

Savings due to reduction in downtime = Breakdown time x KW per hour x unit rate/100000

In 2006-07 in Rs in Lac =12.90 X 3800 X 4.0/100000

Rs. =**1.96** Lac

(4) ENERGY CONSERVATION DUE TO INCREASE IN VOLUME OF CHARGE FOR PREHEATING

We are always maintening the volume of charge of raw material for getting the energy conservation.

1. Effective VOL $= \frac{3.14 \times D^2 \times h}{4}$

$= \frac{22/7 \times 5 \times 5 \times 4.06}{4}$

$= 79.72$

2. Full VOL = 79.72 cm3
   ¾ VOL = 59.79 cm3
   Diff. = 19.73 cm3

   [(= 75 Batches/Day), Qty -1625 Kg/Day]

3. Raw material charge = 75 x 1625 = 1,21,875 Qty/Day

4. Density of charge = $\frac{1.517 \text{ Kg/m3}}{M}$

5. Qty of Preheating charge = D= -----
V

M = 1.517 x 19.93 = 30.239 Kgs.

6. Power Required/Ton = 2877 Kwh/ton

Power Required/Kg. = 2.877, Kwh/Kg = 2.88

7. Power Required for 30.239 Kg = 30.239 Kg x 2.88 = 87.09 Kwh

8. No. of times for preheating the material in preheat zone = 87.09
= 87 Kwh/Day

9. Power saved/day = 87 Kwh

10. Power saved/month = 2610 Kwh

11. Power saved/year = 31320 Kwh

12. Power saved/year = **0.31** Lac KWH

13. Power saved in Lac = Rs. **1.25** Lac

(5) ENERGY CONSERVATION BY MONITORING THE QUALITY OF RAW MATERIAL

There were loss of electricity in the furnace due to use of inferior quality of raw material. By use of good quality of Manganese ore there is saving in electricity consumption.

Year	% of Mn Ore	% SiO2
2004-05	47-48	9-10
2005-06	47-48	9-10
2006-07	47-48	8-8.5

Reduction of % Sio2 in Mn ore in 2006 = 9-8 = 1 %

1 % of Si increase additional 26 Kwh for producing 1 MT of ferro manganese

Saving due to use of Mn ore having low silica =1 x 10200 x 26
In 2006-07
=**2.65** Lac Kwh

Saving in Rs = 2.65 x 4 = Rs.**10.60** Lac

(6) ENERGY CONSERVATION DUE TO MODIFICATION OF CONTACT CLAMP.

There were frequent breakdown of the plant due to failure of contact clamps provided for holding of electrode and giving power to the electrode. By means of Quality Circle the design of contact clamps has been changed as below

BEFORE

AFTER

The breakdown details contact clamps for last three years are as follows

Year	Breakdown due to failure of contact clamp in Hrs
2004-05	300.50
2005-06	44.00
2006-07	Nil

After modification of contact clamp

Reduction in Downtime due to reduction in
Failure of contact clamp in 2006-07 as compared = 44.00 – 00.00=44.00 Hrs
to 2005-06 in Hrs

Note: Failure of contact clamp causes complete breakdown of plant. It requires preheating of raw material which is the wastage of electricity.

Savings due to reduction in downtime = Breakdown time x KW per hour x unit rate/100000

In 2006-07 in Lac KWH =44 X 3800 /100000

=**1.67** Lac KWH

Savings due to reduction in downtime = Breakdown time x KW per hour x unit rate/100000
In 2006-07 in Rs in Lac =44 X 3800 X 4.0/100000
Rs =**6.68** Lac

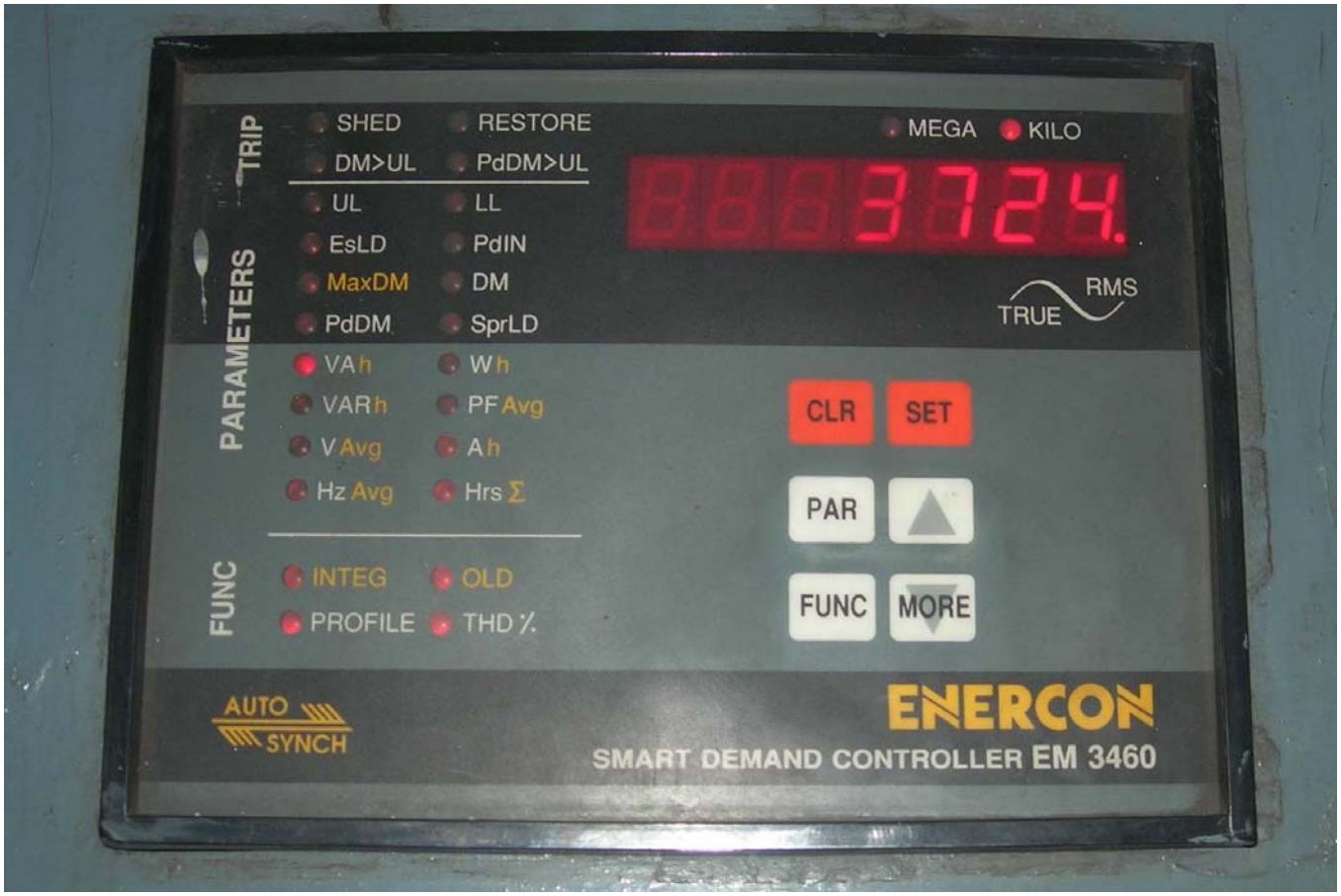
(7) ENERGY CONSERVATION DUE TO WIND MILL

The company has commissioned 4.8 MW capacity Wind Energy Generator at Dewas ,Indore Madhya Pradesh. The 5 nos, each of 0.8 MW capacity Wind Mill has been in working since July 2006. Against the produced Mwh by wind mill the Madhya Pradesh Purva Kshetra Vidut Vitran Co Ltd is giving the adjustment in the monthly unit consumption of the plant.

The total cost of installation and commissioning in Rs **1144.76** Lacs
KWH Wheeled to Ferro Manganese Plant : **33.92** Lac KWH
Total savings in Rs due to Generation from WEG : **75.82 Lac**
The total cost of installation is taken proportionately.

(8) M.D.METER:-

The Enercon Make EM 3460 Smart Demand Controller has been installed in the control room for indication of various instantaneous values.This digital Meter gives the instantaneous parameters with this we are able to know the instantaneous conditions of furnace and hence it enable us to use the power for optimum and minimum condition. This Digital meter also provides the checks on Maximum Demand and avoid the penaulty.



ENVIRONMENT AND SAFETY

Environment :- The environment around the Ferro Manganese Plant is maintained clean and green by regular plantation in the vicinity of Plant area and residential colonies. About 60% of total land is covered with the green trees and efforts are being made to increase it further every year. We have provided bag filters for filtration of dust generated from arc furnace. The filter is having 4 compartments . Each compartment have 250 filter bags to filter the dust generated from furnace to avoide air polution**.**

Safety :- In our plant safety comes first. The safety in the Plant is maintained as per the MMR 1961 & as per IER 1956 .Each and every Electricians and technicians are provided with well insulated tools,accessories and all the safety gadgets incluiding safety belts. “Saefty First” is always maintained .

HUMAN RESOURCES DEVOLPMENT FOR ENERGY EFFICIENCY IMPROVEMENT

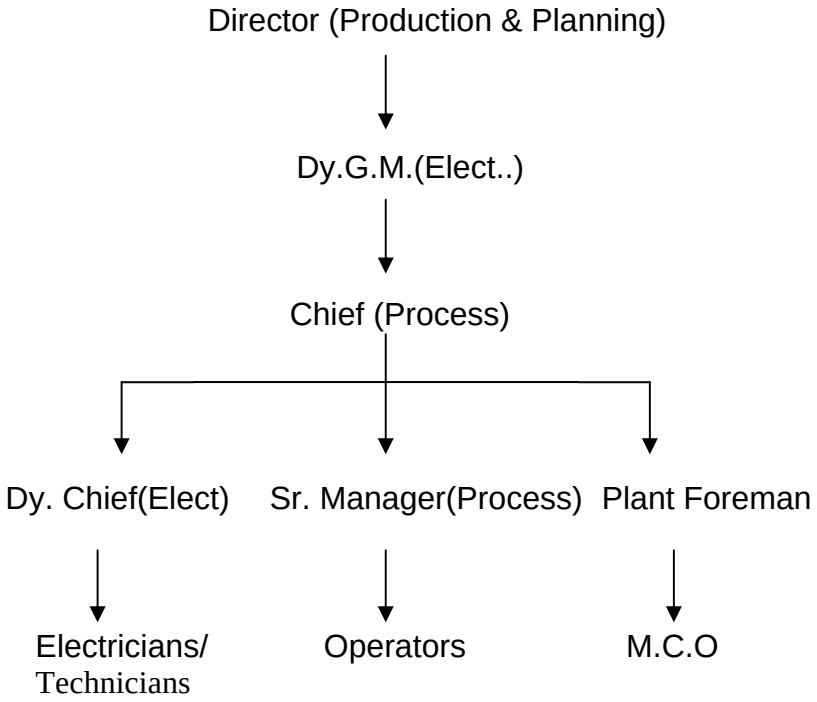
Manganese Ore (India) Limited is having well equipped in house training facility. Training Programme is being conducted weekly in training center of all the mines creating awareness for the energy conservation improving managerial skill, and operational skill resulting in energy conservation.

A separate central training center has been established in one of the mine to impart training with major thrust on energy conservation. Most of the training programmes organized in central traning center are by experts in their respective field. There has been special training programme organized for energy conservation in various field including Oil , fuel electricity etc.

Executives and staffs are being sent regularly in phased manner for training within India at OEM’s premises, training institutes to gain knowledge of equipments and to make them aware of proper operational skills, which will be helpful in conservation of energy. The energy savings methods, procedures and operational skills are circulated between the executives, staff and workers to generate awareness for energy conservation.

ORGANIZATIONAL SET-UP OF ENERGY CONSERVATION CELL

The energy conservation cell structure



MOIL has Energy Conservation Cell headed by Director (Prod. & Pln.) assisted by Sr. Dy.G.M.(Mech.) and Dy. Gen. Manager (Elect..) and supported by unit heads of mine, Plant and their subordinates. The working group deliberates on various energy consumption measures and possible energy saving in the working area. Technical forums and Quality Circle meetings are used for brain storming, bench marking, parato diagram analysis, 5'S techniques along with techno economical assesment.

The outcomes of the findings with financial implecation are sent to head office for implemention. The team at our plant is committed for energy conservation by means of technical upgradation, innovation and simple techniques normally unnoticed. Energy conservation is continuous effort maintenance and replacement of equipment where ever necessary. Modification of contact clamps is one of the good example achieved by Quality Circle Team. The energy conservation cell at plant is committed to adopt all ways and means for reduction in electricity consumption. The Quality Circle team has done excellent job by maintaining statistical data on process control to enable analysis of all process parameters and find loop hole to plug the drain of energy.