WRITE UP ON UNIT PROFILE AND ENERGY CONSERVATION MEASURES

Very important :

For the year 2006-2007 only, a two paragraph write-up to be enclosed (as well as to be sent on CD) for each project giving in brief,(i) background of the project,(ii) observations made,(iii) technical & financial analysis made and (iv) impact of implementation. If any project which has been implemented by the unit in 2005-06 for the first time in India and can prove to be a "Trend Setter" in your opinion, should be highlighted in the write-up with salient details.

The unit not submitting the above information is likely to loose certain weight age during evaluation.

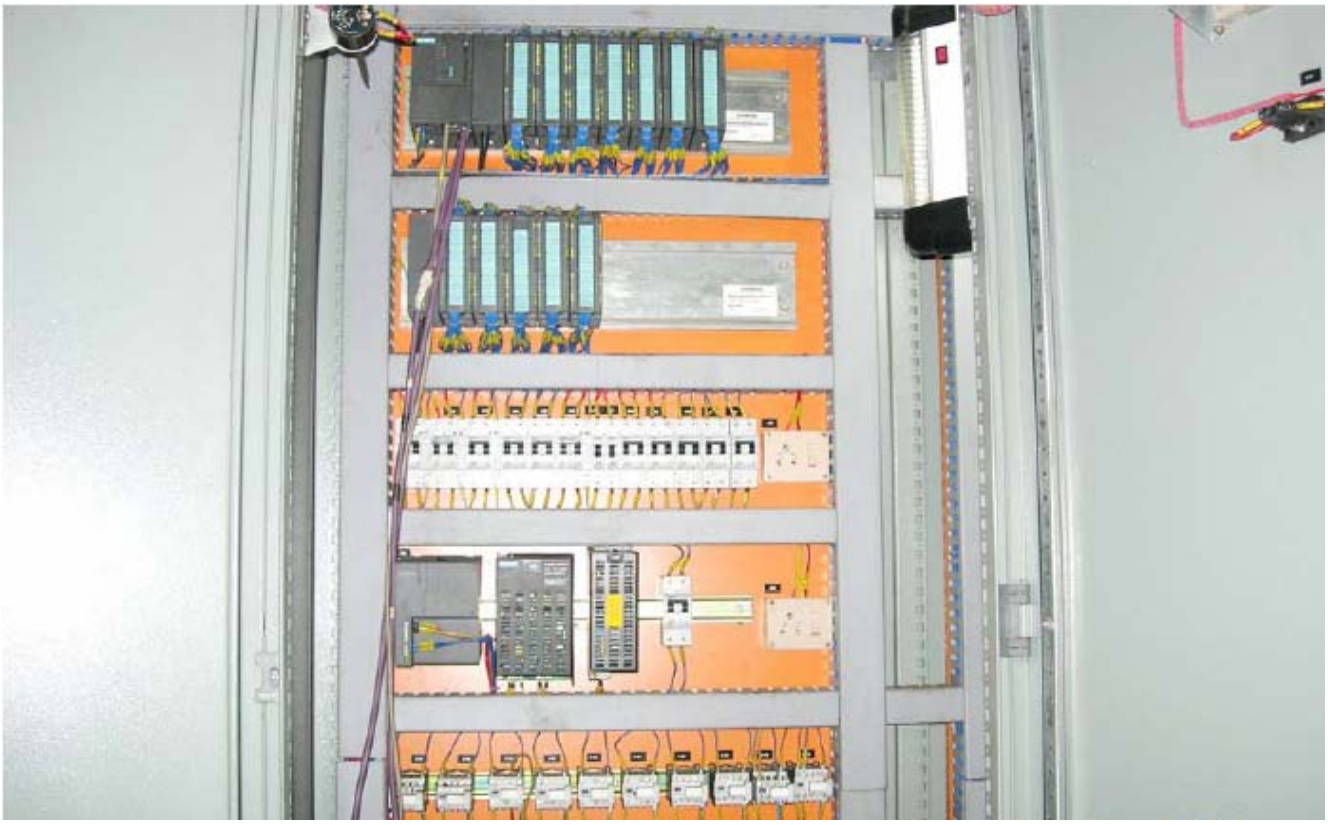
UNIT PROFILE

Balaghat Mine is a flagship mine of Manganese Ore (India) Limited, a Govt. Undertaking. It is situated 203 Kms away from Nagpur in northwest direction. It is well connected with all weather road as well as broad gauge Railway line. Balaghat Mine is one of the oldest, largest and deepest Manganese mine in Asia. The Balaghat mine is 100 year old , taken over from CPMO a British company in 1962.

It is basically an under ground mine and presently the mining is being done at 300 meter depth. There are 2080 employees including workers, staff and executives. There are four winding engines in mine for transportation of workers to under ground and hauling run of mine from under ground. The run of mine is transported to surface and cleaning and sorting is carried out on surface to recover ore.

LT PANEL WITH ENERGY ANALYSER AND MD CONTROLLER FOR COMPRESSORS

The average recovery of ore from run of mine is 52%. The average production of run of mine is 3.60 Lacs Ton per annum. Considering the hard strata of mine it is not possible to use electrically operated drill machines. Drilling and blasting are one of the basic activities of mine. To achieve drilling at a faster rate for production, development as wells roof bolting and rock bolting it is necessary to use pneumatic power for drill machine. Balaghat Mine has very high level of automation for operation of winders, ventilation fans. Balaghat Mine is highly mechanized mines and we are using Side Discharge Loader and battery operated Locomotives for loading and Transportation of ROM in mines.



THYRISTOR BASED DC DIGITAL FOUR QUADRANT DRIVE FOR WINDER

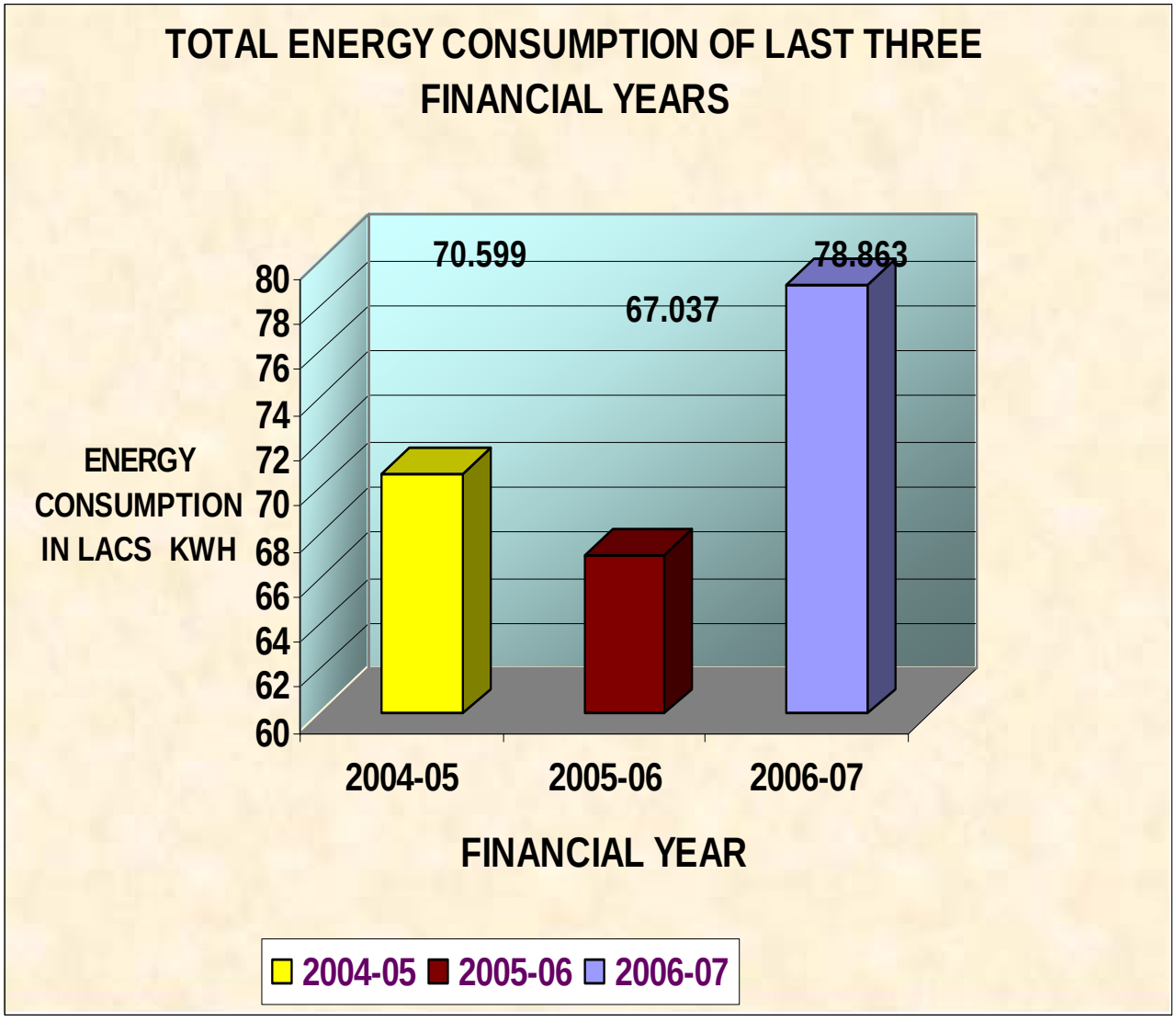
To meet ever increasing demand of Manganese Ore MOIL has already undertaken deepening of Holms shaft and Production shaft to increase the production from under ground mines. As we descend deeper in mine the energy consumption required for dewatering from different levels of under ground, loss of pneumatic pressure as the air travels from surface to under ground and cooling of air, hauling of ore and rock from deeper levels, higher amount of energy required to maintain sufficient quantity of air in under ground as the length of air circuit increases, contributes to increase in specific energy consumption.

In view of gradual increase of energy consumption with higher depth of mining a policy has been adopted by company to carry out in house energy audit quarterly at mine level every year to check wastages of energy and suggest areas to plug the drain of energy in under ground. A new Beneficiation plant is also coming up which will be in operation in coming months and will improve recovery of ore to a great extent and will be helpful in energy conservation.

20(II) ENERGY CONSUMPTION : The energy consumption pattern of the mine is given below year wise

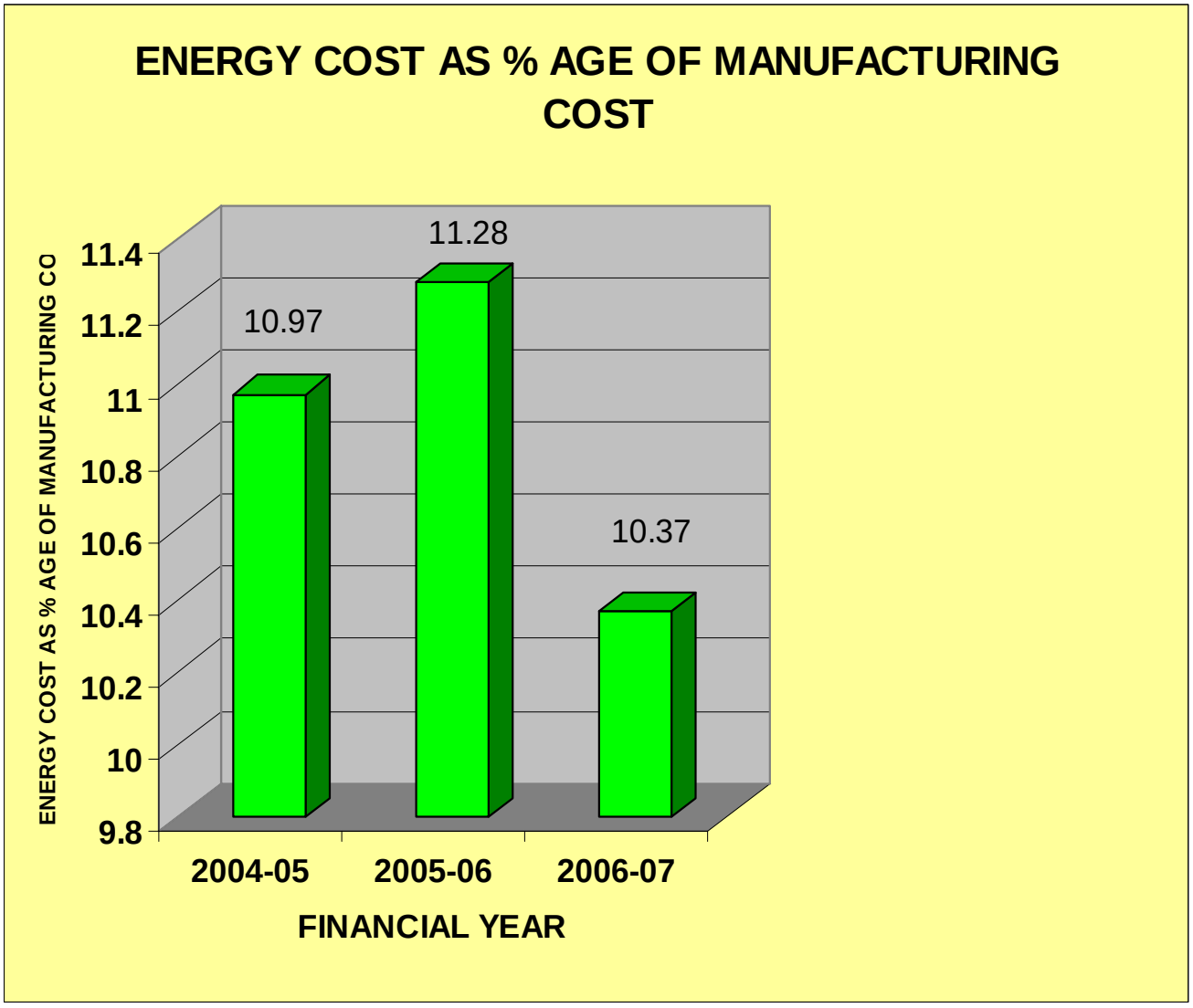
S.N.	FINANCIAL YEAR	TOTAL UNITS PURCHASED & GENERATED LACS OF KWH	TOTAL EXPENDITURE PURCHASED & GENERATED LACS IN RS.
1	2004-05	70.599	438.95
2	2005-06	67.037	439.81
3	2006-07	78.863	429.725

The Graphical representation of above consumption pattern.



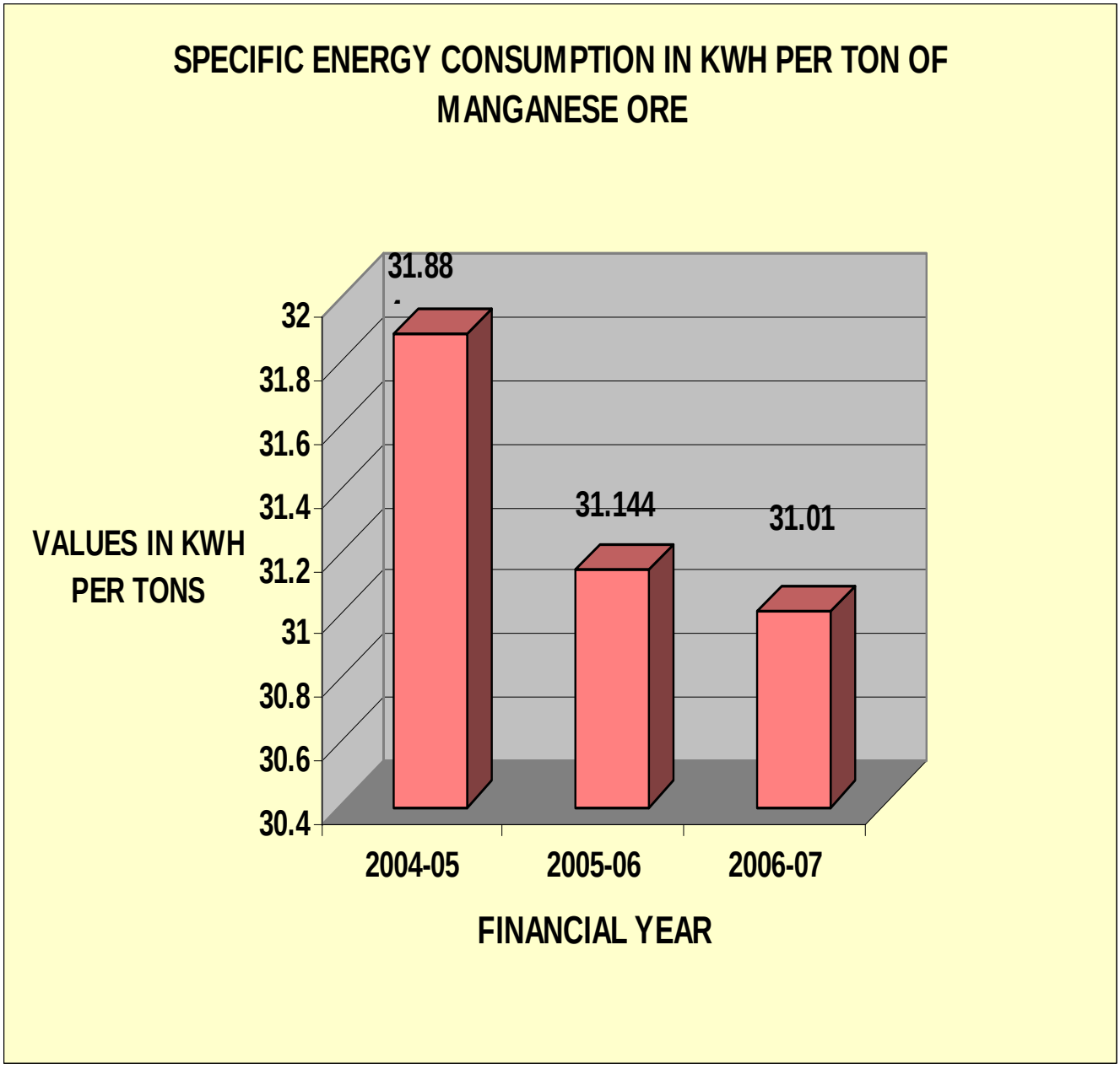
The information on energy consumption in terms of percentage of manufacturing cost has been presented below in tabular as well as graphical forms.

S.N.	FINANCIAL YEAR	TOTAL COST OF ELECTRICITY IN LACS OF RS.	ENERGY CONSUMPTION IN TERMS OF % AGE OF MANUFACTURING COST
1	2004-05	449.204	10.97
2	2005-06	456.978	11.28
3	2006-07	429.725	10.37



The tabular and graphical representation of specific energy consumption for past three years i.e. 2004-05, 2005-06, 2006-07 has been shown below.

S.N..	FINANCIAL YEAR	TOTAL PRODUCTION IN LACS OF TONS	ENERGY CONSUMPTION IN LACS OF KWH	SPECIFIC ENERGY CONSUMPTION IN KWH PER TON
1	2004-05	2.214	70.599	31.884
2	2005-06	2.152	67.037	31.144
3	2006-07	2.543	78.863	31.01



4.8 MW WIND ENERGY GENERATOR

Back ground of the Project : Manganese Ore (India) Limited is Public sector unit primarily engaged in mining Manganese in various mines situated in Maharshtra and Madhya Pradesh . MOIL is the only Public sector unit engaged in mining Manganese. MOIL faces stiff competition from various private sectors engaged in mining Manganese. With the ever increasing cost of all the input for mining activities it was necessary to take appropriate step to reduce the cost of production. Market analysis also suggested that increase in cost of Manganese Ore may result in import from out side , which will adversely affect sales of Manganese Ore produced by MOIL. It was necessary to reduce the cost of production of Manganese Ore for survival of the MOIL.

Wind Energy generator was envisaged as a cost reduction measure in September 2005 and WEG of 4.8 MW was commissioned in a record time of 3 months after placement of order on M/s Enercon India Limited at a cost of Rs. 2200 Lacs. There are 6 such units each of 0.800 MW installed at Dewas district, M.P. MOIL has made arrangement of wheeling power from Western Distribution Company in M.P. to Eastern Distribution company in M.P. The wheeled power is being utilized in Balaghat Mine and Ferro Manganese Plant.

Observations Made : Wind energy generators operates on wind. It is one of the cleanest source of Generation of energy where no fuel and particularly fossil fuel is required. Its operation and maintenance cost is also very low. Since no fossil fuel is used for generation of energy the biggest advantage is reduction in generation of GHG (Green House Gases) and thereby saving equivalent amount of coal, a conventional fossil fuel used in power plants of Electricity Boards. According to CDM (Clean Development Mechanism) generation of one unit i.e. 1 KWH, causes emission of 0.9 Kg of Carbon Dioxide. Generating power through 4.8 MW WEG, MOIL has been able to save emission of more than 2814 Tons of Green House gases in to atmosphere for energy supplied to Balaghat Mine during 2006-07. India is not covered under the host of nations where it is mandatory to reduce its GHG (Green House Gases emission). However by installing WEG MOIL has contributed to clean and green environment.

Technical & Financial Analysis : Total cost of project is Rs. 2200 Lacs. This is inclusive of cost of operation and maintenance of WEGs for three years. The average life of WEG is 20 years. The guaranteed power generation from 4.8 MW WEG is 96 Lacs Units. Total units generation from July 2006 to June 2007 is 99.65 Lacs units, The units generated during last year is 3.80% more than guaranteed generation. Total savings in energy bill due to WEG for one year was Rs. 43.33 Million. Balaghat Mine was allocated 3.126 Million Units and there was a savings of Rs. 17.57 Million in energy bill of Balaghat Mine after installation of WEG.

MOIL has already taken action to register its 4.8 MW, WEG project under CDM (Clean Development mechanism) with UNFCCC (United Nations Framework Convention on Climate Change) through Ministry of Environment & Forest, a nodal agency in India to approve project. Sales of CERs (Certified Emission Reduction) in international market is also expected to generate revenue of Rs. 2.6 Million per annum considering a moderate cost one CER equal to 6 Euros. According to information from UNFCCC the sales of CERs may be continued beyond 2012 generating additional revenue. There are other numerous benefits such as benefits accrued due to depreciation , reduction in income tax etc. It also contributes to society, our country and the whole world by way of conservation of fossil fuel and reduction in GHG.

Impact of Implementation : In last financial year i.e. 2006-2007, 6 units of WEG have generated and wheeled 6519068 units (more than 6.5 Million Units) and 3.126 Million Units were used by Balaghat Mine. This means 3.126 Million Units less were purchased from the grid of electricity Board. There was a total saving of Rs. 17.57 Million during last fiscal year in the energy bill of Balaghat Mine.

33 KV SUB STATION

Back ground of the Project : Balaghat Mine is a unit of Manganese Ore (India) Limited a Govt. Undertaking. Balaghat Mine is one of the oldest and deepest Manganese Mine of India. The power supply to mine was through 11 KV system voltage. The supply voltage was very low, leading to low power factor and low efficiency of electrical equipments. In spite of repeated requests Electricity Board did not yield to our requests to supply power through 33 KV system voltage.

Observations Made : Our Mine operate 3 shifts six days a week. However during off days maintenance and ancillary works are carried out along with dewatering of mine. Earlier the company had taken an express feeder for the mine, how ever during the course of period electricity Board started loading the express feeder to rural area located in forests. This lead to over loading of line and frequent trippings.. Under ground mine requires a reliable source of power supply

11 KV MOTORIZED PANEL AT 33 KV SUB STATION, BALAGHAT MINE, MOIL

33 KV OUT DOOR SUB STATION AT BALAGHAT MINE , MOIL

to keep miners properly ventilated and keep them in safe condition during monsoon season from inundation of mine apart from loss of wages to workers.

Technical & Financial Analysis : The supply voltage in mine during summer season plummeted to 9.5 KV coupled with frequent power failure. It had become essential to shift to a reliable power supply system. It was not difficult to convince Management to construct a 33 KV substation for reliable source of power supply. The mine's major input is pneumatic Air required for drilling. Considering 4 to 5 interruptions per day a lot of power was wasted as after each power failure Air pipe line had to be drained to restart the compressor. Recharging air pipe line a afresh was a costly affair apart from loss of production. During monsoon invariably we had to use Generators as back up power, which was very costly. Efficiency of equipments were low with lot of failure due to low voltage**.**

Impact of Implementation : Within 9 months of commissioning of substation we have saved 5.25 Lacs KWH as the average current drawn by the system has reduced due to higher system voltage .This is equivalent to Rs. 31.51 Lacs.

(Earlier during 2005-06 we had projected total savings of 2.3 Lacs equivalent to Rs. 13.80 Lacs for only three months i.e. from January 2006 to March 2006. This year i.e. during 2006-07 we are projecting benefits for rest of nine month i.e. from April 2006 to December 2006 without any financial expenditure incurred by company)

There are other innumerable savings which can not be quantified.

APFC PANEL

Back ground of the Project : The Balaghat Mine has a contract demand of 2400 KVA. We are operating 7 nos. of compressors each having a prime mover of 250 HP. The load fluctuates from 50 KVA in morning hours to 2200 KVA during peak load hours. There are two old compressors coupled with Auto synchronous motors, operating at over excitation to improve the power factor. These are more than are 50 years old compressors and have gone in obsolescence. Under these conditions it was necessary to provide an alternative arrangement for improvement of power factor. Further with numerous motors operating in mine it was not possible to provide individual capacitors for small motors.

APFC PANEL AT BALAGHAT MINE

Observations Made : It was observed that if the old auto synchronous machines are discarded after installation of new generation of compressors the power factor will reduce drastically, and we will be panelized for low power factor . It will also increase the maximum demand necessitating higher payments towards contract demand. During our survey it was also observed that harmonic contents in supply was as high as 21% due to Thyristor drives, . distorting the sinusoidal pattern of wave form of supply. We were unable to operate Thyristor drives through DG sets due to high harmonics. Hence it was necessary to provide filters along with capacitors to reduce the level of harmonics within a tolerable limits.

Technical & Financial Analysis : It was observed that a 250 HP Thyristor drive was not operating through a synchronized DG set of 2 x 500 KVA. Further the capacitors, motors use to fail frequently due to fluctuation in load current. With higher cost of switch gear it was uneconomical to provide individual capacitors and switchgears for each equipments. Hence a survey was carried out to plot KVA requirement round the clock and harmonic contents due to switching surges. Considering the harsh condition in under ground, nitrogen filled capacitors were selected.

Impact of Implementation : The over all result after installation of APFC was found very satisfactory as the power factor has gone up to 0983 and the maximum demand has decreased by 150 KVA. According to the statistics, there is a saving of about 2.57 Lacs units, amounting to Rs. 15.43 Lacs within a period of 11 months. We are also able to operate our Thyristor drives smoothly and the harmonics have been reduced within a tolerable limits.

(Earlier during 2005-06 we had projected total savings of 29950 units equivalent to Rs. 2.54 Lacs for only one month i.e. for March 2006 . This year i.e. during 2006-07 we are projecting benefits for rest of nine month i.e. from April 2006 to December 2006 without any financial expenditure incurred by company)

There are other innumerable savings which can be quantified .

ENERGY SAVINGS DUE TO UTILISATION OF NEW GENERATION PNEUMATIC DRILL MACHINE

Background of the Project: We are using conventional pneumatically operated rock drill machine in underground mine at Balaghat Mine. It consumes 100 CFM of compressed air at 80 PSi. These drill machines are inefficient and having obsolete design. The penetration rate of old drill machine is also very low. It was decided to use a new generation of pneumatic rock drill machine having better penetration rate operating at 80 PSi and consuming 120 CFM of compressed air, having better penetration rate. The new generation drill machine can drill up to a depth of 3 meter as compared to 1.5 meter drill holes by old machine. The new generation machine requires much lesser time for required number of drill holes thereby reducing operating hours of machine. It has resulted in lesser maintenance of drill machine and higher drilling meterge required for production purposes.

It was observed that conventional 3 drill machines to be achieved production of 29,376 MT of ROM (Run of Mine from Underground mine).

Observation Made: 3 nos. of new generation pneumatic drill machines were utilized in underground mine operating at same pneumatic pressure and consuming 120 CFM for new machine as compared to 100 CFM by old machine throughout the year. These machines were found much efficient and we achieved a production 44064 MT of ROM (Run of Mine) from underground mine as compared 29376 MT ROM produced from old drilling machine. After utilization of new generation machine we achieved additional ROM of 14688 MT from underground mine for slightly higher volume of compressed air supplied to new drilling machine.

Technical and financial analysis: The cost of new generation pneumatic drill machine was Rs. 1.1 Lacs as compared to old pneumatic drill machine costing Rs. 0.3 Lacs. The investment made for new drilling machine was not much as compared to higher production achieved through 3 nos. of new generation drill machine. There was saving in terms of lesser maintenance as well as less operating time for drilling. It was possible to drill longer depth resulting in higher amount of muck generation.

Impact of Implementation: It was observed that we could achieve 44064 MT of ROM through new generation drill machine as compared to 29376 MT of ROM achieved by old pneumatic drill machine. There was total additional generation of 14688 MT. The total consumption of pneumatic air for old generation drill machine was 345.60 Lacs cubic feet and 413 Lacs cubic feet by new generation pneumatic drill machine, which was higher by 20%. However it resulted in energy saving of 9668 KWH amounting to Rs. 58009/-.

ENERGY SAVINGS DUE TO UTILISATION OF LARGE DIAMETER PIPE IN UNDER GROUND FOR CONVEYING COMPRESSED AIR REQUIRED FOR DRILLING OPERATIONB

Background of the Project: Balaghat Mine is the largest and deepest mine in Asia. It's flagship mine of Manganese Ore (India) Limited. Manganese Ore body is much harder and abrasive. We are operating seven nos. of compressors each having rated capacity of 1000 CFM of compressed air. In addition to electrically operated air compressor we are also using diseal operated air compressor to meet the demand of compressed air in peak load hours. The total installed capacity in terms of CFM is 8000 CFM at 100 PSi. Supply of Compressed air forms approximately 55% of the total energy consumption of mine. MOIL has initiated various measures to reduce cost of compressed air exclusively required for drilling purposes. Earlier we had been using 6' diameter pipe for conveying compressed air in various section of the mine which was insufficient for conveying required volume of compressed air.

Observation Made: With the increase of requirement of compressed air to the tune of 7000 cubic feet at peak load hours, it was observed that the air pressure available in various section of the mine plummeted to 50 to 60 PSi. A comprehensive study was conducted in mine to record drop in compressed air pressure at various sections in underground mine. After observation it was decided that 10 inch compressed air pipeline will be economical for conveying compressed air at various section of the mine. After installation of 10 inch pipeline through a newly constructed vertical shaft, the length of the pipe reduced as well as due to higher diameter of pipe the pressure loss reduced within acceptable norms. It was observed that the pressure available in various sections increased to 75 to 80 PSi. Earlier with 6 inch diameter pipe the drilling machines operating efficiency was very poor due to lesser pressure

available for drilling machine with the installation of new compressed air pipeline the efficiency of the drilling machine improved and penetration rate was much higher as well as required time for drilling also reduced.

Technical and financial analysis: Maintenance of compressed air pipeline particularly in underground mines laid all over the mine in underground is a tedious task. Layout and size of main compressed air pipeline is very important to reduce loss of pressure in pipeline due to lesser diameter of pipe as well as circuitous route used for main pipeline. Use of lesser diameter of pipe causes pressure drops and at sections in underground insufficient pressure of compressed air results in longer drilling time as well as numerous break downs of drill machine. Total cost of 10" pneumatic pipe line with accessories was Rs. 5.3 Lacs only.

Impact of Implementation: After installation of 10" diameter pipe the air pressure improved and the rate of drilling was much faster. The air pressure available in underground mine increased from 50 to 60 PSi to 75 to 80 PSi. Total annual saving in energy consumption of compressor was 2,92,975 units amounting to Rs. 17,57,847/-. This saving could be achieved only due to lesser drop in compressed air pressure after using large diameter of air pipeline for underground mine.

20(vi) : **Environment and Safety**

Manganese Ore (India) Limited being a public sector unit and an mining organization, thrust in this areas are equally, as important as production and welfare of employees. The management had long back taken a policy decision to employ state Govt.'s forest division for afforestation. Tree plantation around the lease hold area and barren hills had been initiated long back. It has changed the topography to a large extent attracting wild habitat also. Company is having its own environment policy which is being enclosed.

Safety :

Safety is one of the major concern in mining activities as mine comes under Mines act 1952, and is being regulated under MMR 1961. Officials of Director General Mines Safety are visiting our mines regularly and periodically to check the safety measures and guide lines given by them is implemented strictly. . Mine is already having a safety committee consisting of executives, staff, workers and union representatives. A monthly meeting is being conducted and various issues of safety are discussed in length and minutes are being recorded. Accidents, if happens are being analyzed in details to eliminate the route cause. Safety policy Of the company is enclosed here with . MOIL has won several safety awards in past national level . Our mine also participates in annual safety competition organized by DGMS at western zone and has won several prizes for under ground mines, engineering activities, maintenance of equipment and in particular maintenance of winders.

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