

ENERGY AUDIT AND RECOMMENDATION TO THE REDUCE COST OF ELECTRICITY

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Abstract: India is now experiencing a significant electricity shortage. Transmission and distribution losses continue to rise as a result of demand and supply imbalances. The frequency of the grid has reduced, as has the plant load factor. Plant equipment is harmed by fluctuations in state grid frequency. Peak demand puts more strain on power generating and usage equipment, resulting in higher energy costs.

I INTRODUCTION

India's industrial sector is the country's largest energy consumer, accounting for over half of the country's total commercial energy. Obsolete technology, lower capacity, utilisation, causal metering and monitoring of energy usage, poorer automation, raw material quality, and poor handling are the primary causes of greater specific energy consumption in Indian businesses. The first stage in an energy conservation programme is to continuously analyse industrial energy usage and relate it to production.

To improve productivity and reduce energy expenditures, an energy audit entails effective planning, directing, and controlling of supply and the input-output ratio of energy use. According to the Energy Conservation Act of 2001, an energy audit is defined as the verification, monitoring, and analysis of energy use, as well as the submission of a technical report with recommendations for improving energy efficiency, a cost-benefit analysis, and a plan to reduce energy consumption. Energy audit is a systematic way of monitoring industrial energy use and pin pointing the cause of loss.

IMPORTANCE OF ENERGY SAVING & ENERGY CONSERVATION

- A. As per electricity Act 2001 Energy Audit Needed.
- B. As per demand in industrial sector we are not supplying electricity to fill demand gap.
- C. Wastage of electricity in commercial sectors as well in residential sector can be conserved.
- D. Indian industries are not adapting the new technology.
- E. In this way increasing bill in economical & social

Type of Energy Audit

Energy Audit can be classified into the following two types.

- 1) Preliminary Audit
- 2) Detailed Audit

The type of Energy Audit to be performed depends on:

- Function and type of industry
- Depth to which final audit is needed, and
- Potential and magnitude of cost reduction desired

II. AIM:

Energy audit and implementation of recommendations to reduce consumption and cost of electricity.

III. OBJECTIVE

- i) Carry out detailed energy audit.
- ii) Analyze the data from the energy audit.
- iii) Make suggestions based on the audit findings.
- iv) Suggestions for putting the suggestions into action.
- v) The cost of implementing the recommendation.
- vi) Complete the indicated projects' payback time.
- vii) Putting the finishing touches on the recommendations.
- viii) Data analysis after suggestions have been implemented.
- ix) Using a monthly energy bill to demonstrate cost-effective electricity use.
- x) Demonstrating the value of an energy audit and implementing recommendations that aren't limited to electricity.

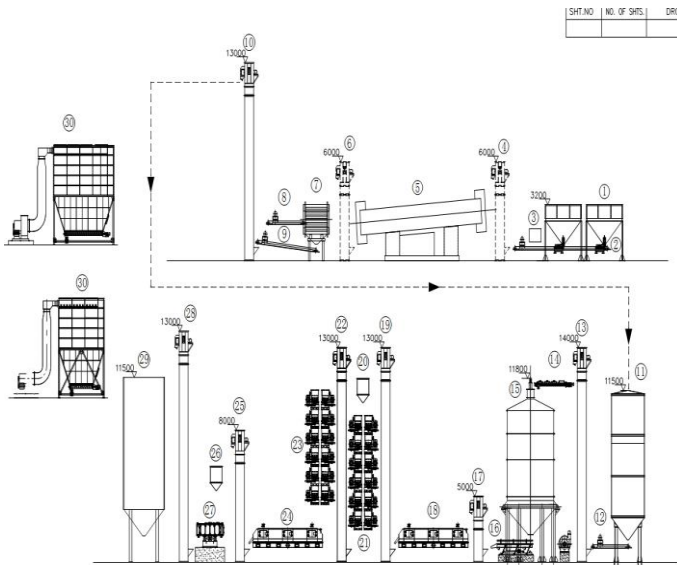
IV BLOCK DIAGRAM

1. 4 M.T. Hopper

There are two hoppers used to feed waste material to plant. Each hopper is of 4 MT. In that, one hopper used for crushed core sand and another one is used for waste raw black sand. Flow of sand can be maintained with the mechanical sliding dampers and VFD driven trolley under the hopper. This is also helpful to utilize proper mixing of waste crushed core sand and waste raw black sand. 4x4 Inches Screens are given to hopper for separation of big size of wastages from material Ex. Plastic, glass and paper waste.

2. Belt Conveyor No 1

This conveyor belt is used to transfer mixed waste material from 4 MT hoppers to Bucket elevator No 1



3. Magnetic separator

This unit is used to separate out iron metal particles from waste sand.

4. Bucket Elevator No 1

Bucket elevator is a machine which is only used to transfer sand from lower height to upper height. It transfers waste mixed sand from conveyor no 1 to dryer.

5. Dryer

It is necessary to process and remove moisture from foundry waste sand before reclamation process. As name suggests 10 M.T. capacity dryer does dry of mixed waste material. Removing moisture from waste material will help to reduce fuel consumption. For drying purpose hot air blower (ID fan) extract fumes and hot air from furnace top to dryer. This is very energy efficient process in which excess energy in the form of hot air and fumes reused.

6. Bucket Elevator No 2

It is used to transfer material from dryer to crusher.

7. Crusher

Due to the crusher's special vibrating movement, the sand lumps rub and collide with each other, ensuring homogeneous size and smooth surface. Meanwhile, the binder on the sand surface can also be removed by crushing. Also, inside mesh of crusher separates metal waste, paper waste, plastic waste and wooden waste.

8. Reject belt conveyor

It's a part of crusher which removes foreign waste and unwanted material from processed crushed sand. In specified frequency

reject belt conveyor goes inside of the crusher, collects waste and come to its discharge position.

9. Belt Conveyor No 2

It is used to convey crushed waste sand from crusher to bucket elevator No 3.

10. Bucket Elevator No 3

It is used to transfer material from belt conveyor no 2 to waste sand storage hopper.

11. Waste sand storage hopper

Waste sand storage hopper capacity is 160 M.T. which is required to neutralize any surge from incoming waste sand flow. Below the hopper there are two outlets to control the flow of sand.

12. Metering conveyor

This is belt conveyor driven by VFD. VFD helps to control the speed of sand flow to words furnace and speeds decides the per hour MT flow towards furnace.

13. Bucket Elevator No 4

It is used to transfer material from metering conveyor to augur conveyor.

14. Augur conveyor

It's a screw conveyor. The shaft of the rotating spiral rotates in the material tube to drive the material along. This type of conveyor is used for carry in horizontal way up to furnace top.

15. Furnace

This furnace is a type of energy-saving mobile furnace which is specially designed for foundry sand reclamation process. The main target of foundry sand reclamation process is to get rid of combustible substances such as clay. In terms of thermal energy consumption, most of heat is utilized for heating of sands. The outer coatings of waste sand particle are burned in the furnace and loosen too. Loss of ignition value and acid demand value get controlled here. Root blower is used to fluidize the sand bed inside the furnace. After burning of sand, fluidization effect separates out unburned clay from sand particle.

It can fully recycle and utilize substantial accumulation of heat left in the heated sand, using it as the heat source for the newly input sand. Moreover, it also improves the quality of the reclaimed sand through all kinds of optimization. Compared with the traditional furnaces, this furnace can not only reduce half of its fuel consumption, demonstrating obvious energy-saving effects, but also maintain the sand's high quality and its own reliable and excellent operation, etc. After furnace we get thermally reclaimed sand.

16. Vibrating Conveyor

This machine is working on the basis of forward and reverse vibration. Output of furnace i.e. thermally reclaimed sand gets

sieved on vibrating conveyor. Clay gets separated from sand. Also spraying water helps to reduce temperature of sand.

17. Chain bucket elevator

It is used to transfer thermally reclaimed sand from vibrating conveyor to Fluid bed cooler.

18. Fluid bed cooler

Fluid bed cooler is used for cooling and dust cleaning. Fluid bed cooler is composed of base, perforated plate, blower system and cooling system, etc. The hot and used sands fall into the perforated plate from chain bucket elevator. The blower system blows in cool air to take down temperature of heated sand. Then the cooling system sprays water to perform heat-exchange cooling. The air fully contacts with hot sands to take away the moisture of the hot sands. Newly-processed sands collide and rub with each other to bring forward reproducing function. During the movement, the rubbing effects between sand materials peel off the stuck micro-particles and discharge them through the dust collector system. Thus, the hot sands are cooled and the de-dusted. The sand materials move towards the outlet by the fluidized bed and air strike, and the cooled used sands are discharged through the sand outlet.

19. Bucket elevator No 5

It is used to transfer thermally reclaimed sand from fluid bed cooler to MMR machines (Granulators).

20. Surge Arrestor Tank No 1

Sand flow is not constant every time so that to achieve exact output surge arrestor tank is used. When tank get full then only its pneumatic valve allow sand to flow towards MMR.

21. MMR 1 to 12 (Granulators)

It's a granulator machine used for mechanical reclamation of thermally reclaimed sand. MMR centrifuge is composed of shell, base, motor, belt wheels and other devices. It raises the sands through the high-speed rotation of the shaft. Then the sands collide and rub with each other. Only particles with certain diameter can fall into the sand outlet through the gap and can be discharged, thus realizing the aim of granulation. Multiple machines are used together to obtain better result. As per requirement machines can be on/off.

22. Bucket elevator No 6

It is used to transfer thermally reclaimed sand from MMR machines 1 to 12 (Granulators) to MMR machines 13 to 24 (Granulators).

23. MMR 13 to 14 (Granulators)

Same operation and principle used from MMR 1 to 12 machines. As per requirement machines can be on or kept off.

24. Fluid bed de-duster

This machine is used for de-dusting i.e. dust removing process. During mechanical reclamation sands sharp corners gets break and came to circular shape which is good result, but it's also generated dust and its need to be removed from sand. Principle of operation is same as fluid bed cooler except only cooling system not used. Forced air created fluidization of sand and air flow convey dust from sand to dust collector point. It also removes foreign substances like clay particles which reduces sands total clay percentage.

25. Bucket elevator No 7

It is used to transfer reclaimed sand from Fluid bed de-duster to Surge arrestor tank.

26. Surge Arrestor Tank No 3

This tank absorbs surge of sand flow and maintain constant flow towards sieve shaker machines with 2 no's of outlets.

27. Sieve shaker machine

Sieve Shaker is composed of screen mesh, frame, base, eccentric shaft, motor and other parts. The motor rotates the eccentric shaft through belt and belt wheels. The frame rotates cyclonically a circle around the fixed point driven by the eccentric sleeve. The movement direction of the frame is vertical to the central line of the eccentric shaft. Due to the cyclical rotation of the frame, the materials on the screening surface move towards the discharge end at a fixed speed. Materials of different sizes go through the screen meshes so as to be sieved and separated. Selection of sieves depends upon needs and requirements. There are total 2 no's of sieve shaker machines.

28. Bucket elevator No 8 & 9

It is used to transfer reclaimed sand from sieve shaker 1 and 2 to reclaimed sand hopper 1 & 2 respectively.

29. Reclaimed sand hopper

Finished reclaimed sand product stored in the hopper. Total 2 no's of hoppers are used for different size of sand. Reclaimed sand is ready to transport from hopper to transportation vehicle.

30. Dust collectors

There are 2 no's of dust collector which are back filter type used for dust collection process.

After brief learning of plant and its utilities now the energy audit is started to carry out.

V EXPLANATION

Sand Reclamation

- Today two big question marks are in front of foundry.....
- i.e. availability of fresh sand...& disposition of waste sand....

- Sand Reclamation is proper answer for both the questions.
- Two plants will be installed at Gokul Shirgaon & Shirol.
- Plants are imported from China.
- The plant will protect environment by reducing pollution.
- Also less utilization of natural resources.
- 80 % waste sand will be reclaimed.
- Remaining 20 % waste can be used for making bricks.
- Processing cost will @ 60 to 70 % of fresh sand.
- Quality of the reclaim sand will be much better than fresh sand.

The Process

- Total plant capacity will be 240 tons per day.
- Green to Green sand by Mechanical process.
- Green to core sand by thermal process.
- Output of this plant will be 5 tons/ hr. per plant
- Plant design and layout is done such a way that lump breaking,
- Sand drying, Scrubbing will be common for another green to green
- Sand reclamation plant. There will be a diversion in between.
- Heat generated from furnace will be utilized for sand drying.
- Thermal plant will have sand gradation & sieving plant at the end

PROCESS FLOW OF RECLAIMED

SAND

PROCESS FLOW OF FOUNDRY

SAND

VI.BENEFITS OF RECLAIMED SAND

- Reduction in expansion rate
- Requires less resin binder
- Lower gas evolution
- Removal of fines
- Solves waste disposal problem

VII.CONCLUSION

Following the results given below which are seen yet from the audit and testing

4.1 There are total 23 machine are operating underload condition which means reactive power.

4.2 Testing phase of audit shows that those machines have reduced current requirement.i.e. from 281.06 A to 223.46 A Difference is 57.60 A

4.3 Also 11.43 Kw/Hr. is seen from the data analysis.

4.4 Feeder no 1 and 2 VFD installation is completed.

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4 Anupama Gupta, Pallavi Verma and Richa Priyadarshani presents, “A Review on Energy Management and Audit”, This paper discusses the common aspects of electrical energy management and various phase of Energy audit to reduce energy requirements and hence, the total cost spent towards energy consumption

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