Energy Audit and Energy Conservation Opportunity in a Institute of Technology, Ajmer

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Abstract: Energy management includes planning and operation of energy-related production and consumption units or the term energy management means many things to many people. One definition of energy management is:"The judicious and effective use of energy to maximize profits (minimize costs) and enhance competitive positions (Cape Hart, Turner and Kennedy, Guide to Energy Management Fairmont press inc. 1997). The main fundamental goal of energy management is to produce goods and provide services with the least cost with least environmental effect.

The objective of Energy Management is to achieve and maintain optimum energy Procurement and utilization, throughout the organization and: To minimize energy costs / waste without affecting production & quality and to minimize environmental effects.
Energy Audit is the key to a systematic approach for decision-making in the area of energy management. It attempts to balance the total energy inputs with its use, and serves to identify all the energy streams in a facility. An energy audit seeks to that document that are sometimes ignored, such as the energy being used on site per year, which processes use the energy, and the opportunities for savings. In so doing, it assesses the effectiveness of management structure for controlling energy use and implementing changes.

Keywords: Energy conservation, audit report, energy management

1. INTRODUCTION

First of all we have to know what is energy audit, An energy audit is an inspection, survey and analysis of energy flow for energy conservation in an sector, process to reduce the amount of energy input into the system without negatively affecting the output. Energy audit is a testing and analysis of how the enterprises and other organizations use energyEnergy Conservation and its Management has become a prime factor for the nation, society and individual due to high cost and non availability of energy. Non awareness of latest technologies and methods, non-conventional energy sources and renewable energy sources and how to run the plant and equipment in an energy efficient manner

The Energy Audit is carried out to critically examine each of the major energy consuming units to determine whether there exists any unwanted use of energy, losses, idle/redundant running etc. All efforts should be made to run the machine at full/optimum capacity.

Energy Audit is the key to a systematic approach for decision-making in the area of energy management and to attempts to balance the total energy inputs with its use, and serves to identify all the energy streams in a facility. It quantifies energy usage according to its discrete functions. Industrial energy audit is an effective tool in defining and pursuing comprehensive energy management programme.

1.1 Need for Energy Audit

In any institute /industry, the three top operating expenses are often found to be energy (both electrical and thermal), labour and materials. If one were to relate to the manageability of the cost or potential cost savings in each of the above components, energy would invariably emerge as a top ranker. Energy Audit will help to understand more about the ways energy are used in any institute, and help in identifying the areas where waste can occur and where scope for improvement exists.

The present investigation deal with energy conservation technique through energy audit in the various utility, service maintance and production system. These technique found so worthy that not only energy saving but also reduction in emission environmental pollution and saving of natural resource can be achieved. The present research work will be worthy for accommodation, industrial person, and energy in understanding conservation method through audit.

1.2 Types of energy audits

The energy audit orientation would provide positive results in reduction energy billing for which suitable preventive and cost effective maintenance and quality control programmes. The type of

energy audit to be performed depends upon the function or type of industry. There can be three types of energy audit

i) Preliminary energy audit : The preliminary energy audit alternatively called a simple audit screening audit or walk through audit, is the simplest and quickest type of audit. It is carried out in a limited span of times and it focuses on major energy supplies and demands.

ii) General energy audit : The general energy audit is also called a mini audit or site energy audit or complete site energy audit. It expands on the preliminary audit by collecting more detailed information about facility operation and performing a more detailed evaluation of energy conservation measures identified. Utility bills are collected for a 12 to 36 months period to allow the auditor to evaluate the facility energy/demand rate structure and energy usage profiles.

iii) Detailed energy audit : Detailed energy audit is also called comprehensive audit or investment grader audit. It expands on the general energy audit. It covers estimation of energy input for different processes, collection of past data on production levels and specific energy consumption.

2. ENERGY CONSERVATION PLAN

Specific energy consumption value is the index to determine how effectively the plant and machinery are utilized in any industrial process. The kWh/ton or kWh/unit of production is calculated in each month and energy consumption indices are worked out separately for major equipment and process. These are then compared on a monthly and yearly basis regularly to detect any deviation from the norm (targeted value) and to take necessary correcting steps.On identification of areas where electrical energy is not efficiently utilized, remedial measures are to be taken to either replace the old equipment with energy efficient or to implement with energy efficient equipment or to implement modifications to make them more energy – efficient.

3. EXECUTIVE SUMMARY OF AIT AJMER

The following table (no. T-01) shows the annual savings, investments and simple pay period in months. Last row shows that by applying following energy conservation opportunities total savings will be Rs.1181931 with the total investment of Rs.665900 and for that simple payback period is 7 months. **Table –T-01**

S.no.	Energy conservation opportunities	Annual monetary Savings Rs.(S)	Investment Rs.(I)	Simple Payback in Months(I/S)
01	Use of Electronic Fan regulator	109350	45000	5

	in place of resistance type fan regulator			
02	Reduction of Operating time of A.C. by 1 hour	833490	---	Immediate
03	Replacement of Incandescent lamps by fluorescent tube lights with Electronic Ballast	146674	620000	50 (4.2 years)
04	Optimizing lighting feeder voltage by installing an automatic voltage regulator	92417	900	4 Days
05	Use energy efficient motors	----------	----------	Immediate
06	Total	1181931	665900	7

4. ELECTRICITY CONSUMPTION PATTERN

The following table shows all connected equipments i.e. the total no. of appliances with their rating and at last row the total wattage. Connected Load :-

(Table : T-A-01)

S.no.	Equipment	Numbers	Rating(W)	Total wattage
1.	Tube lights	1550	40	62000
2.	CFLs	275	15	4125
3.	U-Tube CFLs	660	37	24420
4.	Ceiling Fans	900	100	90000
5.	Exhaust Fans	4	500	2000
6.	Halogens	38	85	3230
7.	Refrigerators	2	210 & 500	710
8.	Water coolers	6	575	3450
9.	Air Conditioners (5.5 & 8.5 tons)	49	25200	1234800
10.	Computers	400	100	40000
11.	Photo Copy Mach.	2	1200	2400
12.	Motors	-	Different Ratings	60000
13.	Geysers	38	2000	76000

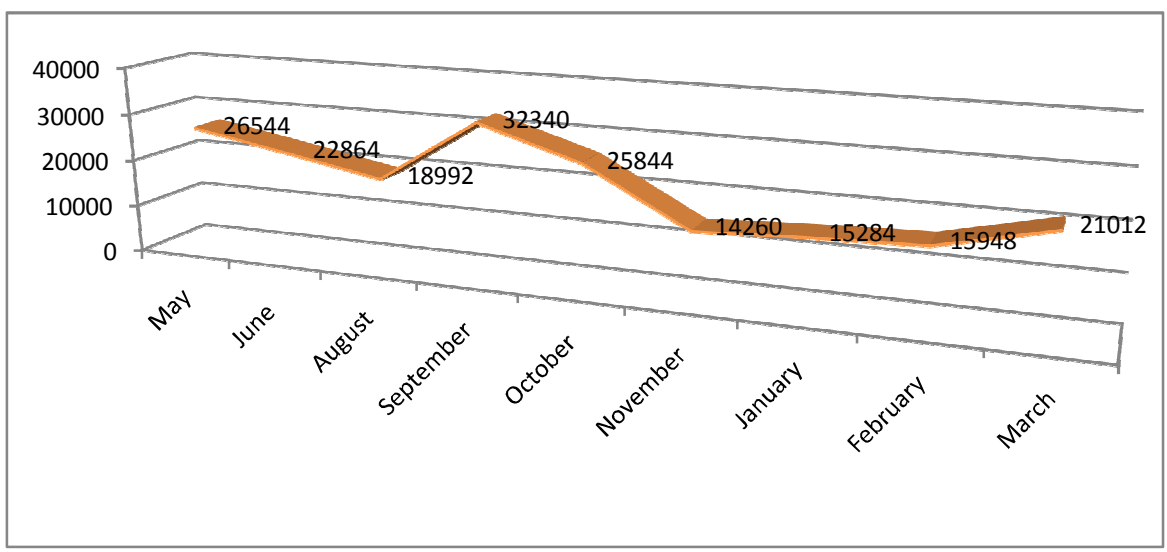
Table-T-A-02

S.no.	Equipment	Total kW	Approx.Running days	Approx.Running hours	Total kWh Energy Consump.
Lighting Consumption					
01	Tube lights	62.000	300	06	111600
02	CFLs	4.125	300	06	7425
03	U-CFLs	24.420	300	06	43956
04	Halogens	3.230	365	10	117896
Total Lighting Consumption					280877
Cooling Consumption					
01	Ceiling Fan	90.000	300	06	162000
02	Exhaust Fan	2.000	275	06	3300
03	Refrigerators	0.710	300	24	5112
04	Air conditioners	1234.800	150	06	1111320
05	Water cooler	3.450	300	24	24840
Total Cooling Consumption					1141272
Heating Consumption					
01	Geysers	76.000	120	04	36480
Total Heating Consumption					36480
Computer Labs Consumption					
01	Computer	40.000	300	10	120000
Total Computer Labs Consumption					120000
Motor Consumption					
01	Workshop	10.00	80	04	4800
02	Other labs(Physics,Chemisty etc.)	05.00			
Total Other Consumption					4320
Total electrical energy Consumption per annum					1587749

5. AVERAGE ELECTRICAL ENERGY CONSUMPTION PER MONTH (BY A-IT BILL)

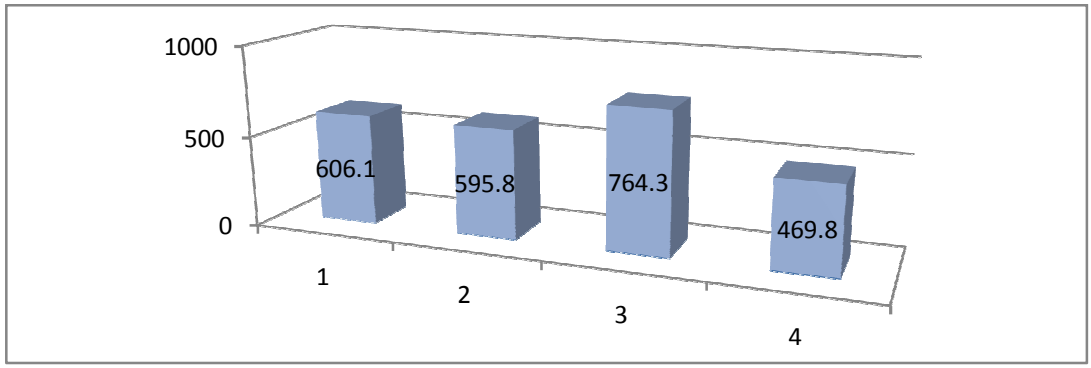
Difference is due to :A)To others electrical energy consumption like cultural programs functions at night.B)These calculations are based on approximate time of running hours.

Data Sheet of electricity bills of one year of A-IT(Ajmer)					
Month	**Net Max demand**	**Billing demand**	**Total energy consumed**	**Average P.F.**	**Net bill payable**
	KVA	KVA	KWH		Rs.
Apr 12	42.6	48	_	0.99	82589
May 12	45.9	49	26544	0.99	172977
Jun 12	48.0	50	22864	0.97	153483
Jul 12	37.9	51	_	0.97	165652
Aug 12	50.3	52	18992	0.98	130571
Sep 12	52.6	58	32340	0.99	215775
Oct 12	50.7	54	25844	0.99	171780
Nov 12	21.5	55	14260	0.97	147249
Dec 12	34.0	44	_	0.98	186550
Jan 13	33.8	45	15284	0.98	143309
Feb 13	16.11	58	15948	0.99	147658
Mar 13	29.7	59	21012	0.99	180221

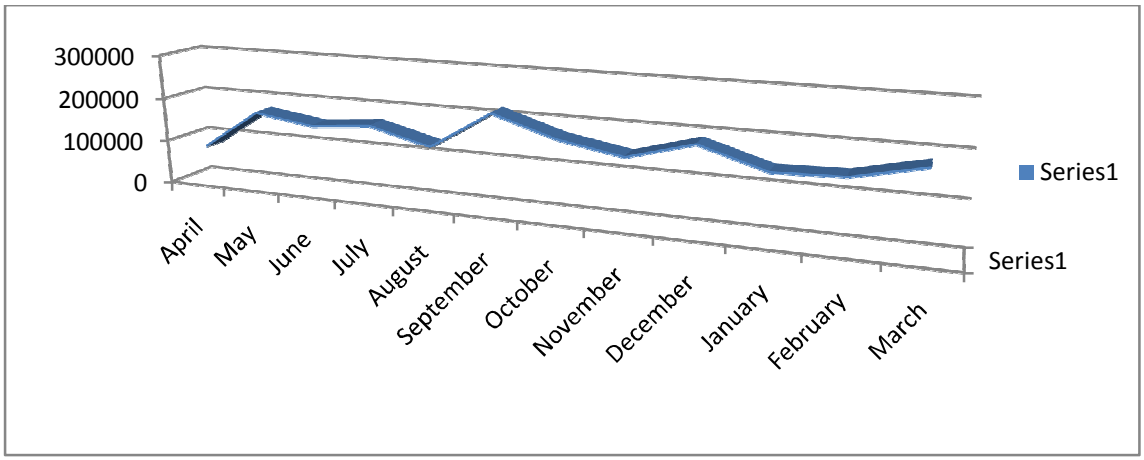


Energy Consumption (kWh) Pattern Of A- IT (April 2012 – March 2013)

Energy consumption pattern of A-IT in kvah weekly wise march-2013



Graph shows that energy consumption was high in third week of march i.e. is 764.3 k



Graph- Net Payable Bill From April 2012- March 2013

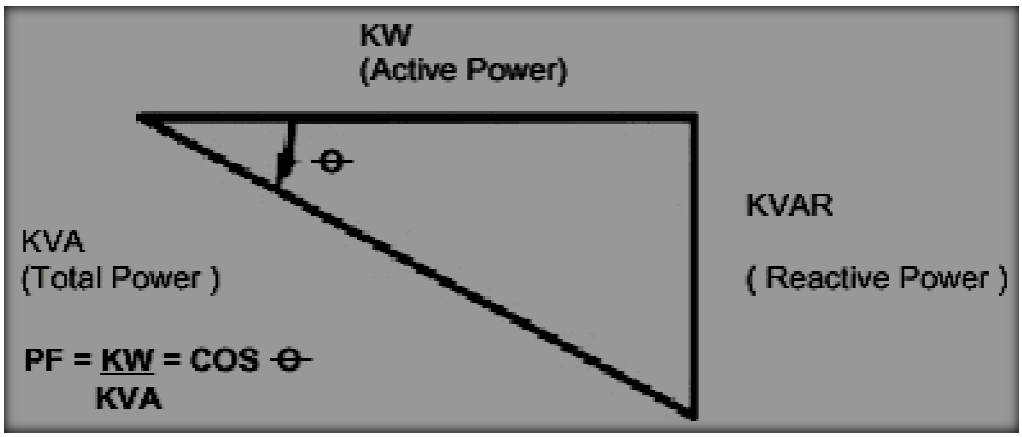
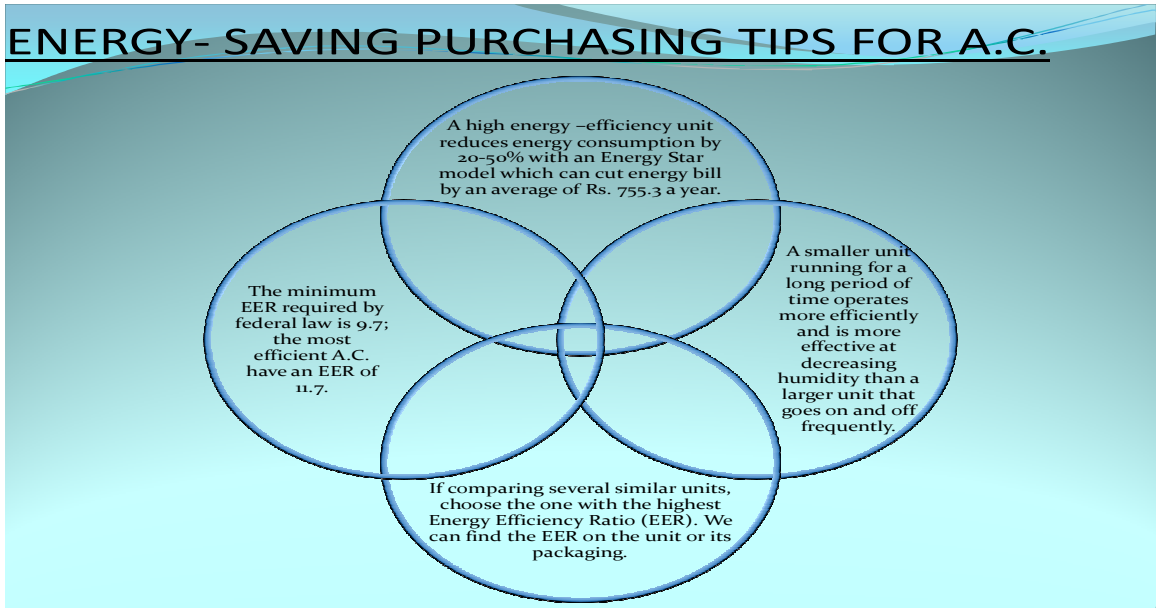


fig2: power triangle

6. IMPLEMENTATION OF ENERGY CONSERVATION MEASURES

The energy conservation measures include ***1***. Method of installation i.e. recycling (i.e. using scrap), retrofitting and changing process (from existing to more efficient one) ;**2**.Method of heat use (i.e. installation of equipment for waste heat recovery and utilization, waste material utilization and process efficiency improvement); **3**. Changing the equipments with energy efficient i.e. energy efficient motors and drives; **4**.Improving the power factor of the system; **5**.Utilizing the energy during off peak period;



7. CONCLUSION

A well-managed energy program can be a successful method to reduce energy consumption. By investing rs. 665900 on energy saving with energy efficient appliances and adopting energy habit with appropriate means can save rs. 1181931 with simple payback period of 7 months in A-it and this can be saved by adopting nano solar plant.

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