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ENERGY AUDIT OF INSTITUTION WITH LOAD 430kW

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Abstract: The objective of this paper is to demonstrate the findings of the Energy Audit done at the Campus of Sanjivani College of Engineering, Kopargaon. An energy audit is a study of plant or facility to determine how and where energy is used and to identify methods for energy savings. There is now a universal recognition of the fact that new technologies and much greater use of some that already exist provide the most hopeful prospects for the future. The opportunities lie in the use of existing renewable energy technologies, greater efforts at energy efficiency and the dissemination of these technologies and options. Our objective of doing energy audit at, Sanjivani College of Engineering Campus, Kopargaon is to identify and arrest the wastage of electricity and to make effective use of electricity in college campus and thus reducing electricity bill of college campuses. It is aimed at obtaining a detailed idea about various end use energy consumption activities at various departments in the campus and comparing it to the actual consumption of electricity.

I INTRODUCTION

The prime input of energy in Sanjivani College of Engineering Campus is electricity i.e. electrical energy. Our main focus is conservation and management of electricity. We will be mainly covering the electrical appliances for energy audit. These electrical appliances consume lot of electrical energy which gives us a chance to save and manage it up to certain extent. Electrical energy losses occur due to improper management, human errors etc. We have confined our project level for domestic appliances like tube lights, bulbs, fan, air conditioners, switches, computers, servers, etc. After going through detail observations and calculations, in this paper, we have put the findings of the loadings in various departments of Sanjivani College of Engineering Campus, Kopargaon.

II.DATA COLLECTION-

In preliminary data collection phase, exhaustive data collection was made using different methods such as observations, interviewing key persons, and measurements. During we visited each department, center, laboratories, solar shed and other entities of the institution. Information about the general electrical appliances was collected by observation and interviewing. We also collected information of Electricity bill from the in-charge personnel. The power consumption of appliances was measured using power analyzer in some cases (such as fans) while in other cases, rated power was used (light for example). We also collected information on redundant / non-operational energy systems. The details of usage of the appliances were collected by interviewing key persons e.g. electrician, caretaker (in case of departments) etc. Approximations and generalizations were done at places with lack of information.

III.ANALYSIS-

A. Analysis of Area of Use -

Identifying where energy is used is useful because it identifies which areas the audit should be focused on and raises awareness of energy use and cost. We have found that the Electrical Energy used is primarily in departments on tube lights, bulbs, fan, air conditioners, switches, computers, servers, swtichboards etc. After collecting data, we made calculations to find out the difference between our calculated total energy concumption and the energy consumption recorded in the Electricity bill of the college.

B. Mathematical Formulae-

During the calculations in electrical audit of Sanjivani College of Engg. Campus, Kopargaon, we used the following formulas to obtain values of energy consumption.

i) Diversity Factor =

$$\frac{\text{Total Connected Load}}{\text{Maximum Load}}$$

ii) Demand Factor =

$$\frac{\text{Maximum Demand}}{\text{Connected Load}}$$

iii) Load Factor =

$$\frac{\text{Average Load}}{\text{Connected Load}}$$

iv) Maximum Demand =

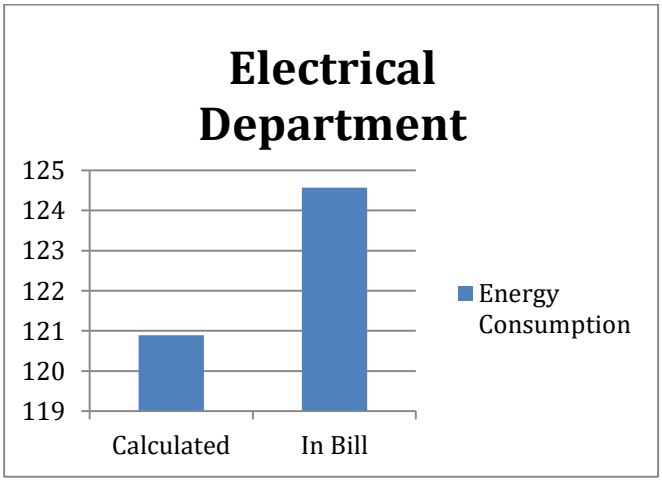
$$\frac{\text{Connected Load}}{\text{Diversity Factor}}$$

C. Calculations-

The calculation of various departments is made as follows-

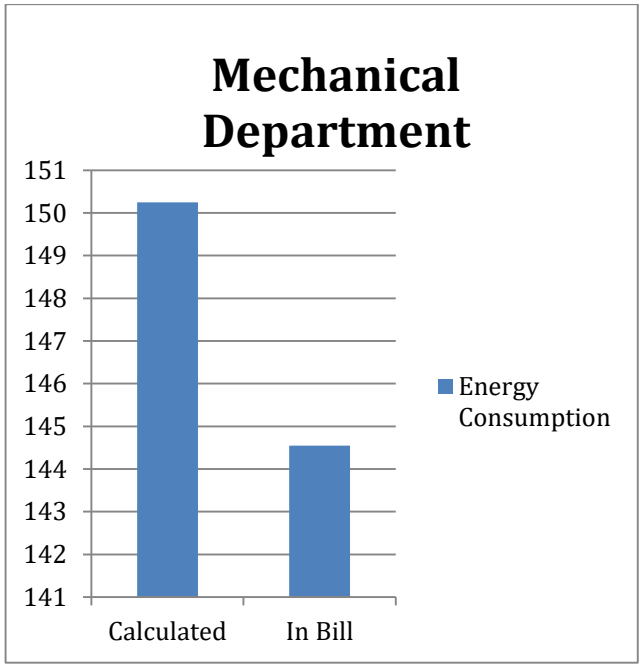
i.*Electrical Department-*

Equipment Name (Rating in Watts)	**Qty.**	**Total Consumption**
Fan(40)	50	2000
Tubelight(LED)(18)	44	792
Tubelight(Fluroscent)(40)	26	1040
DC Motor(Shunt)(2200)	15	33000
1 Phase IM(370)	3	1110
DC Motor(Series)(2200)	2	4400
Socket(80)	67	5360
Computer-CPU(Lenovo)(360)	33	11880
Resistive Load Bank(2200)	5	11000
Slipring IM(3700)	1	3700
3ph IM(2200)	5	11000
Synchronous Motor(3720)	1	3720
DC Rectifier(11500)	1	11500
DC Generator(2500)	2	5000
DC Genrerator(1600)	4	6400
Alternator(1491)	3	4473
Alternator(2237)	2	4474
Total Connected Load		**120849W** **120.849kW**



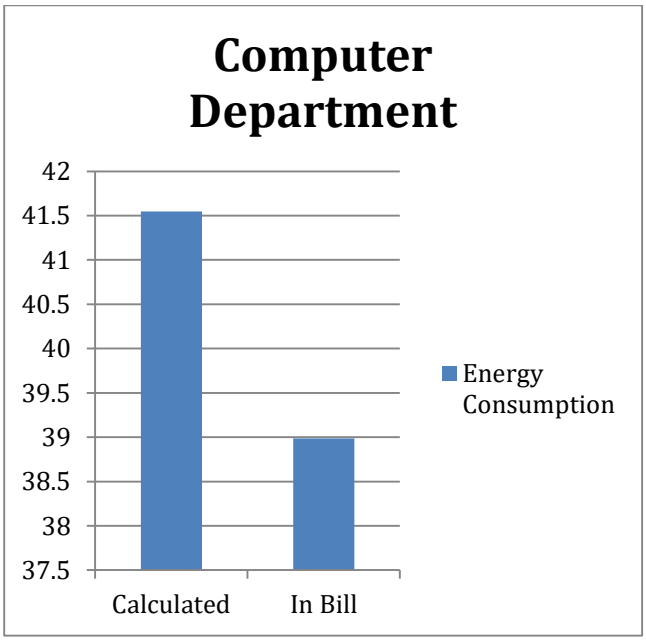
ii*. Mechanical Department-*

Equipment Name (Rating in Watts)	**Qty.**	**Total Consumption**
Fan(40)	88	3500
Tubelight(LED)(18)	12	216
Tubelight(Fluroscent)(40)	133	5320
Exhaust Fan(40)	2	140
Table Fan(40)	9	360
Computer(100)	213	21300
Socket(80)	150	12160
Printer(Canon)(50)	5	250
Projector(Dell)(300)	10	3000
Water Purifier(180)	1	180
Air Conditioner(1440)	4	5760
Exhaust Fan(70)	2	140
Scanner(10)	2	20
Wifi Router(80)	3	240
Total Connected Load		**150251W** **150.251kW**



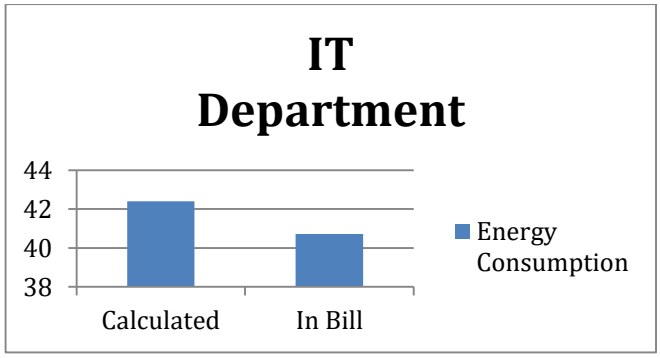
iii. Computer Department-

Equipment Name (Rating in Watts)	**Qty.**	**Total Consumption**
Fan(40)	57	2280
Tubelight(LED)(18)	12	216
Tubelight(Fluroscent)(40)	83	3320
Computer(100)	125	12500
Printer(50)	9	450
Projector(300)	4	1200
Water Purifier(180)	1	180
Sockets(80)	86	6880
Wifi Router(80)	2	160
UPS(300)	2	600
Server(2000)	4	8000
AC(1440)	4	5760
Total Connected Load		**41546W** **41.546kW**



iv.IT Department-

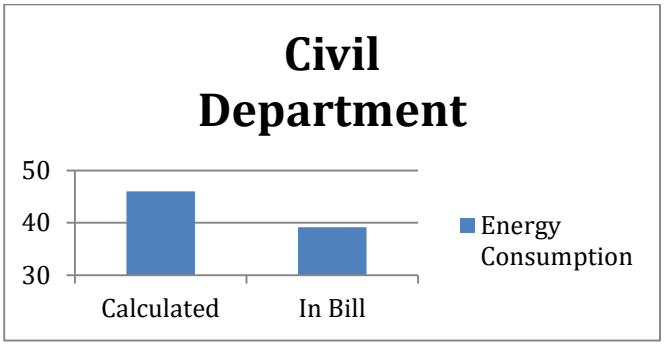
Equipment Name (Rating in Watts)	**Qty.**	**Total Consumption**
Fan(40)	63	2520
Tubelight(LED)(18)	9	162
Tubelight(Fluroscent)(40)	87	3440
Computer(100)	137	13700
Printer(50)	12	600
Projector(300)	4	1200
Water Purifier(180)	1	180
Sockets(80)	93	7440
Wifi Router(80)	3	240
UPS(300)	2	600
Server(2000)	4	8000
AC(1440)	3	4320
Total Connected Load		**42402W** **42.402W**



v.Civil Department-

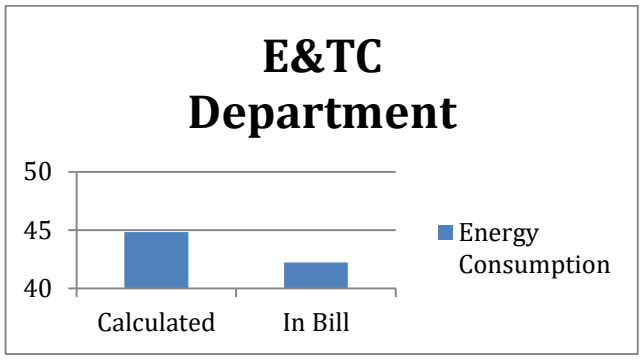
Equipment Name (Rating in Watts)	**Qty.**	**Total Consumption**
Fan(40)	65	2600
Computer(100)	55	5500
Tubelight(Fluroscent)(40)	81	3240
Printer(50)	6	300
Projector(300)	12	3600
Inductive Load Bank(2300)	2	4600
Socket(80)	102	8160
Capacitive Load Bank(3680)	2	7360
Resistive Load Bank(2200)	2	4400

1ph IM(872)	1	872
3ph IM(2200)	5	11000
Water Purifier(180)	2	360
Wifi Router(80)	7	560
Exhaust Fan(70)	3	210
Bell(16)	2	32
Total Connected Load		**45988W** **45.988kW**



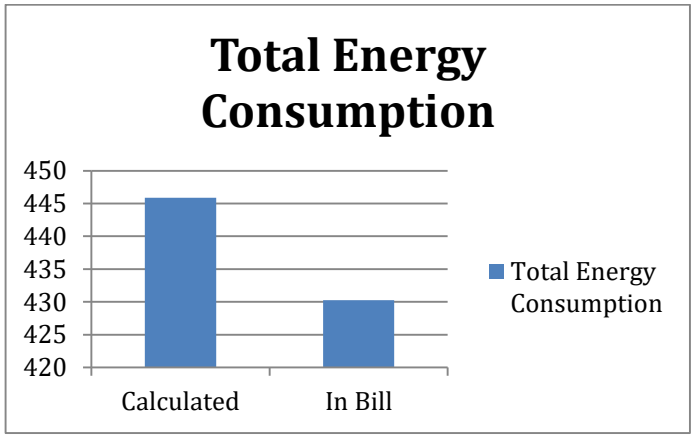
vi.E&TC Department-

Equipment Name (Rating in Watts)	**Qty.**	**Total Consumption**
Fan(40)	82	3280
Halogen(45)	12	540
Tubelight(Fluroscent)(40)	130	3280
Printer(35)	11	385
Projector(300)	11	3300
Scanner(11)	2	22
Sockets(80)	184	14720
Computer(100)	133	13300
Water Purifier(180)	2	360
Xerox Machine(1500)	1	1500
Wifi Router(80)	3	240
Total Connected Load		**44847W** **44.847kW**



D. Final Analysis-

After the final calculations, we have found that the total energy consumption of the Institution is 445.883kW and the total energy consumption in the electricity bill is 430.231kW.



IV CONCLUSION-

Energy audits provide a unique pathway for customers to save money. Energy conservation and cutting utility costs are extremely important as energy prices rise. Energy auditing is not an exact science, but a number of opportunities are available for improving the accuracy of the recommendations. Techniques which may be appropriate for small-scale energy audits can introduce significant errors into the analyses for large complex facilities. We found the difference between our calculated total energy consumption and the total energy consumption in the campus electricity bill. We also addressed several problem areas which can result in over-optimistic savings projections, and suggested ways to prevent mistakes. Finally, several areas where additional research, analysis, and data collection are needed were identified. Once this additional information is obtained, we can all produce better and more accurate energy audit results.

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