Swami Keshvanand Instituteof Technology,
Management & Gramothan

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Quality Audit:

7.1.6: Quality audits on environment and energy are regularly undertaken by the institution:
(Any other relevant information)

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Report on Energy Audit

Conducted

At

The Swami Keshvanand Institute of Technology, M& G

Ramnagariya, Jagatpura, Jaipur-302025

(Rajasthan) India

In Technical Guidance with

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PREFACE

Data collection for energy audit of the SKIT campus was carried out during March 2016. This audit was conducted to seek opportunities to improve the energy efficiency of the campus. Reduction of energy consumption while maintaining or improving human comfort, health and safety was of primary concern. Besides simply identifying the energy consumption pattern, this audit seeks to identify the most energy efficient appliances. Moreover, some daily practices relating common appliances have been provided which may help reducing the energy consumption. The report accounts for the energy consumption patterns of the academic area, central facilities and hostels based on actual survey and detailed analysis during the audit. The work encompasses the area wise consumption traced using suitable equipments. The report compiles a list of possible actions to conserve and efficiently access the available scarce resources and their saving potential has been also identified. We look forward to optimum so that the authorities, students and staff would follow the recommendations in the best possible way. The report is based on certain generalizations and approximations wherever necessary. The views expressed may not reflect the general opinion. They merely represent the opinion of the team guided by the opinions of consumers.

ACKNOWLEDGEMENTS

We are thankful to:

Mr. Jaipal Meel, Director, SKIT, Dr. S.K Calla, Director (D &W), SKIT, for giving us this opportunity to contribute in the noble mission of efficient energy management.

We are thankful to Capt. Deepak Gupta, PCRA & Mr Reetesh Kocheta, PCRA for guiding our faculty members and students by conducting seminars and training sessions on energy conservation & the process on how to do energy audit. The training provided to faculty members was really very beneficial in the study of energy consumption patterns and generating this audit report. The scientific and analytical approaches towards new energy solutions, wide knowledge and discerning remarks given by PCRA members really helped us throughout our work.

We are immensely grateful to Mr.Satyan Vijavargiya, Dean (R & D), SKIT Jaipur, for his keenness and undivided attention to this work.

ASHISH SAINI

Convener – Energy Audit

SUMMARY

We have carried out the field work for detailed energy audit, during March 2016. We carried out elaborated measurements as guided by team of PCRA for the various areas like air-conditioning and air-cooling system, lighting, computer equipments, etc. We measured lux level at various locations like office rooms, library, and labs. We analyzed effectiveness of energy consumption, critically in each area.

Energy Audit Team:

1 Mr. Ashish Saini
2 All team members
3 Selected students from the SKIT

Audit Location:

SKIT campus - Ramnagaria, Jagatpura, Jaipur 302025, (Rajasthan), India.

Scope of Work:

The scope of work includes detailed study for energy conservation option of various energy sources like electricity and fuel oil in the building and to recommend action for reducing the same. The broad scope of work will be as per the following:

- **Review of the System**: Review the present electricity consumption, fuel oil estimation of energy consumption in various load centers such as lighting, air conditioning, and other electrical load.
- **Electrical Distribution System**: Review of electrical distribution system like loading, and distributions of electricity in different areas/floors. Exploring the option for energy saving in electrical distribution system.
- **Lighting System**: Review the present lighting system used in the building and condition of lighting. Estimation of lighting load at various locations like major floor, computer lab and library. Detail lux level at different location and its comparison with standard level. Exploring the option for energy saving in lighting system

- **Heating Ventilation and Air Conditioning System (HVAC System):** Review of present HVAC system like central AC, Window AC, Split AC. Find out the total cooling load of building and maximum cooling load of building analysis of HVAC performance like estimation of energy efficiency ratio (EER), specific energy consumption in chiller and AHU exploring the option for energy saving in HVAC system.

- **Diesel Generator (DG) Set**: Review the present DG set operation such as average number of operating hour per day and load on it. Performance assessment of DG set in term of specific oil consumption (kWh/litre). Exploring the option for fuel saving in DG set.

- **Hot Water Generation**: Review the present source of hot water generation such as boiler, thermal fluid heater. Performance assessment of hot water generation system. Exploring the option for energy saving in hot water generation system

- **Other Electrical Load**: Review of other electrical load such as computer and electrical fan etc. Exploring the option for electricity conservation in these section

- **Cost Benefit Analysis**: Cost benefit analysis of retrofitting for getting energy saving in buildings. Cost benefit analysis include simple payback period, internal rate of return (IRR) and Rate of return (ROI).

- **Preparation of Details Energy Audit Report** : Finally, preparation of the detail energy audit report

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1. INTRODUCTION

The Swami Keshvanand Institute of Technology, M & G (SKIT) is a premier institute imparting technical education. It was set-up in 2000. The institute offers six branches at undergraduate level & at post graduate level. It has recognized research centre in electrical engineering leading to PhD degree.

Besides technical education it also offers business administration course. Its pharmacy course is affiliated to Rajasthan University of health science RUHS

1.1 Objective of Energy Audit Exercise

The objective of Energy Audit is to promote the idea of energy conservation in the campus of SKIT Jaipur. The purpose of the energy audit is to identify, quantify, describe and prioritize cost saving measures relating to energy use in hostels, administrative area and academic area etc.

The work eligible for Energy Audit study is directed towards: Identification of energy consumption area and estimation of energy saving potential in campus. The objectives are:

- Suggesting cost-effective measures to improve the efficiency of energy use.
- Estimation of implementation costs and payback periods for each recommended action.
- Documenting results and vital information generated through these activities.
- Identification of possible usages of co-generation, renewable sources of energy (say solar energy) and recommendations for implementation, wherever possible, with cost benefit analysis.

1.2 Analysis of Area of Use

Identifying the places where energy is used is vital and hence the audit should focus on and raise awareness of energy use and cost. The results of the analysis can be used in the review of management structures and procedures for controlling energy use.

Important points to consider when collecting load data are:

- Usage: The usage of the equipments in terms of hours per day and days per year can be collected from key persons in hostels, departments etc. It is important to ensure the accuracy of this data because the potential for energy savings lies with wise allocation of the equipments operating hours.

- Actual power consumed: Actual power consumption is measured by watt-meter or power analyzer.
- Supplementary Information: Some other supplementary information is also collected such as state of insulation in case of ACs or availability of natural light etc.

1.3 Identification of Target Areas

Opportunities for energy savings can range from the simplest, such as lighting retrofits, to the most complex such as the installation of a co-generation plant. After the preliminary identification of opportunities, more time should be spent on those which have shorter payback periods.

1.4 Cost Benefit Analysis

The identified energy conservation opportunities should be analyzed in terms of the costs of implementing the project versus the benefits that can be gained. Say for example, if we wish to install a heat plate exchanger to recover waste heat, we must calculate the total cost of installation and compare that with the savings derived from recovering waste heat.

1.5 Action Plan to Set Implementation Priority

After passing the cost benefit analysis, an action plan should be developed to ensure that the opportunities identified are implemented. The action plan should include all the major steps for implementing the opportunity as well as making the people responsible. Furthermore, there should be a plan for monitoring the results.

1.6 Benefits of Energy Audit

An energy audit is a detailed assessment of where and how energy is used within your business. Energy audit helps us to discover appropriate usage of electricity and in case of any faults the corresponding measures can be taken up. The benefits of energy audit:

1. Lowering energy Bills
2. Reducing connected Load
3. Increasing the comfort Level
4. Protect the environment

2. EXISTING ELECTRICAL LOAD PATTERN

Electric load pattern gives us the information about the distribution of load. Electric load data are collected by equipment, application as well as location wise.

2.1 Overall Campus Building Details

There is one vikram sarabhai block, one m. visvesvaraya block, one vishvakarma block, and one dhanwantri block in the campus. Besides them one nirwana boy's hostel one nooran girl's hostel and supporting infrastructure like library, computer labs & temple exist in SKIT Jaipur campus.

Presently institute has 400 kW solar roof top generations. In addition to that capacity of DG set for power back up is 320 KVA/256 kW. Total connected equipment load of the institute 811.748 kW.

2.2 Location Wise Load Pattern

Table: 2.2.1 Dhanwantri Block

S.N	Equipment	Type	Quantity	Load (kW)
1	Ceiling fan	80 W	205	16.4
2	Wall fan	50 W	6	0.3
3	Lighting	T-12 (40 W)	380	15.2
4	Corridor light	T-12 (40 W)	59	2.36
5	Air conditioner	Without star (1200 W)	17	20.4
6	Cooler	Ordinary water pump	2	0.6
7	Ducting	1 HP	3	2.238
8	Monitor	CRT (80 W)	105	8.4
9	Printer	Standby load=30 W Running load=300 W	15	0.45
Total connected load (kW)				**66.348**

Table: 2.2.2 Vikram Sarabhai Block

S.N	Equipment	Type	Quantity	Load (kW)
1	Ceiling fan	80 W	420	33.6
2	Exhaust fan	50 W	8	0.4
3	Lighting	T-12 (40 W)	229	9.16
4	Corridor light	T-12 (40 W)	29	1.16
5	CFL	20 W	167	3.34
6	Air conditioner	Without star (1200 W)	61	73.2
7	Monitor	CRT (80 W)	706	56.48
8	Printer	Standby load=30 W	30	0.9
		Running load=300 W		
Total connected load (kW)				**178.24**

Table: 2.2.3 M. Visvesvaraya Block

S.N	Equipment	Type	Quantity	Load (kW)
1	Ceiling fan	80 W	661	52.88
2	Lighting	T-12 (40 W)	466	18.64
3	Corridor light	T-12 (40 W)	106	4.24
4	Air conditioner	Without star (1200 W)	5	6
5	Cooler	300 W	5	3
6	Lift		2	12.6
7	Monitor	CRT (80 W)	317	25.36
8	Printer	Standby load=30 W	14	0.42
		Running load=300 W		
Total connected load (kW)				**123.34**

Table: 2.2.4 Vishvakarma Block

S.N	Equipment	Type	Quantity	Load (kW)
1	Ceiling fan	80 W	293	23.44
2	Lighting	T-12 (40 W)	243	9.72
3	Corridor light	T-12 (40W)	15	0.6
4	Air conditioner	Without star (1200 W)	10	12
5	Monitor	CRT (80 W)	82	6.56
6	Printer	Standby load=30 W	58	1.74
		Running load=300 W		
Total connected load (kW)				**54.06**

Table: 2.2.5 Nooran Girls Hostel

S.N	Equipment	Type	Quantity	Load (kW)
1	Ceiling fan	80 W	158	12.64
2	Lighting	T-12 (40 W)	190	7.6
3	Corridor light	T-12 (40 W)	25	1
4	Geyser	2 kW	23	46
5	Ducting	8 HP	11	65.64
Total connected load (kW)				**132.88**

Table: 2.2.6 Nirwana Boys Hostel

S.N	Equipment	Type	Quantity	Load (kW)
1	Ceiling fan	80 W	460	36.8
2	Lighting	T-12 (40 W)	460	18.4
3	Corridor light	T-12 (40 W)	60	2.4
4	Geyser	2 kW	12	24
5	Ducting	8 HP	23	137.26
Total connected load (kW)				**218.86**

Table: 2.2.7 Mess/Food Court

S.N	Equipment	Type	Quantity	Load (kW)
1	Ceiling fan	80 W	67	5.36
2	Lighting	T-12	30	1.2
3	CFL			2
4	Refrigerator & freeze			10
Total connected load (kW)				**18.56**

2.3 Summary of Location Wise Load

The table shows the summary of load of SKIT campus. It shows that highest load is of vikram sarabhai block while the least load is of pump load.

Table 2.3 Summary of Location wise Load

S.N	Area	Present Load (kW)
1	Dhanwantri block	66.348
2	Vikram Sarabhai block	178.24
3	M. Visvesvaraya block	123.34
4	Vishvakarma block	54.06
5	Nooran Girls hostel	132.88
6	Nirwana Boys hostel	218.86
7	Mess/Food court	18.56
8	Street light	12
9	Pump load	7.46
Total connected load (kW)		**811.748**

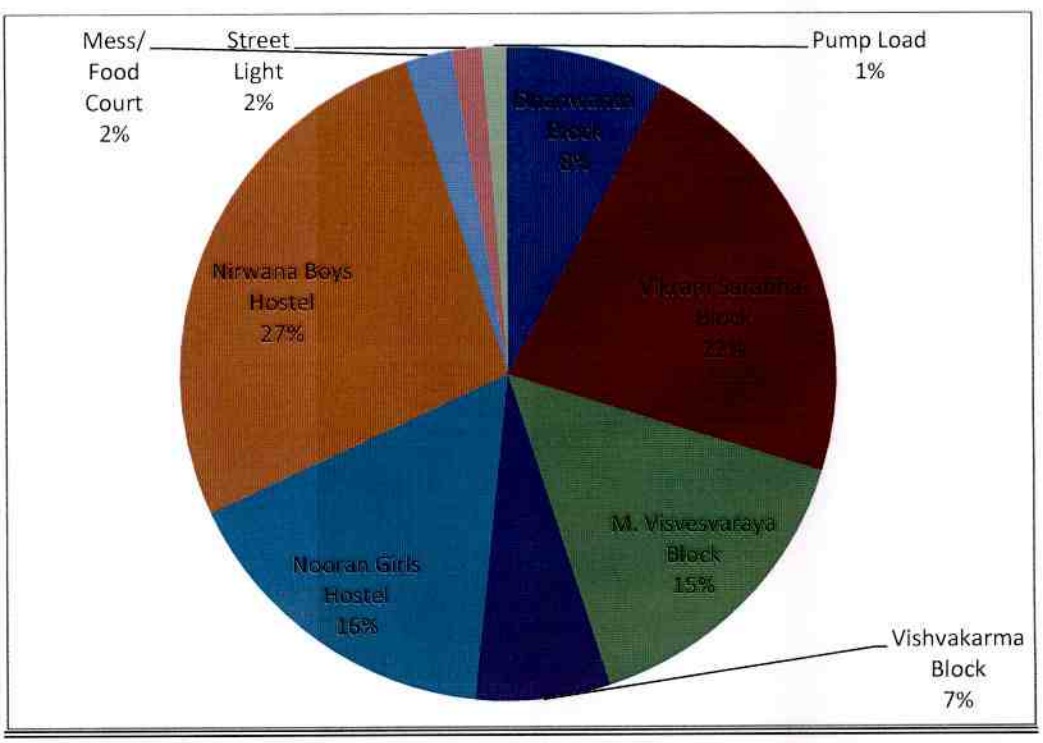


Figure 2.3 Percentage representation of SKIT load

The load of Nirwana boys hostel is 27%, which is highest among all shares. Pumping load takes the least load i.e 1%. The major concern is boy's hostel and girl's hostel which takes 27% & 16% respectively. These load of hostels run throughout the year from the evening to night.

2.4 Equipment Wise Load Pattern

Equipment wise load analysis has been performed in order to identify the equipments, with same application area, which consume more power as compared to others. During equipment wise analysis of the overall campus, the equipments with load less than 1% of the total load of the campus were ignored so as to make the analysis results simple and easy to comprehend. Following table summarizes the result of equipment wise analysis of load of SKIT campus.

Table 2.4 Equipment Wise Load Pattern

S.N	Equipment	Type	Quantity	Load (kW)
1	Ceiling fan	80 W	2264	181.12
2	Wall fan	50 W	6	0.3
3	Lighting	T-12 (40 W)	1998	79.92
4	Corridor light	T-12 (40 W)	294	11.76
5	CFL			5.34
6	Air conditioner	Without star AC	93	111.6
7	Cooler	Ordinary water pump	7	3.6
8	Geyser	2 kW	35	70
9	Refrigerator & Freeze			10
10	Street light			12
11	Lift		2	12.6
12	Ducting		37	205.138
13	Pump			7.46
14	Monitor	(80 W)	1210	96.8
15	Printer	Standby load=30 W	117	3.51
		Running load=300 W		
Total connected load				**811.14 kW**

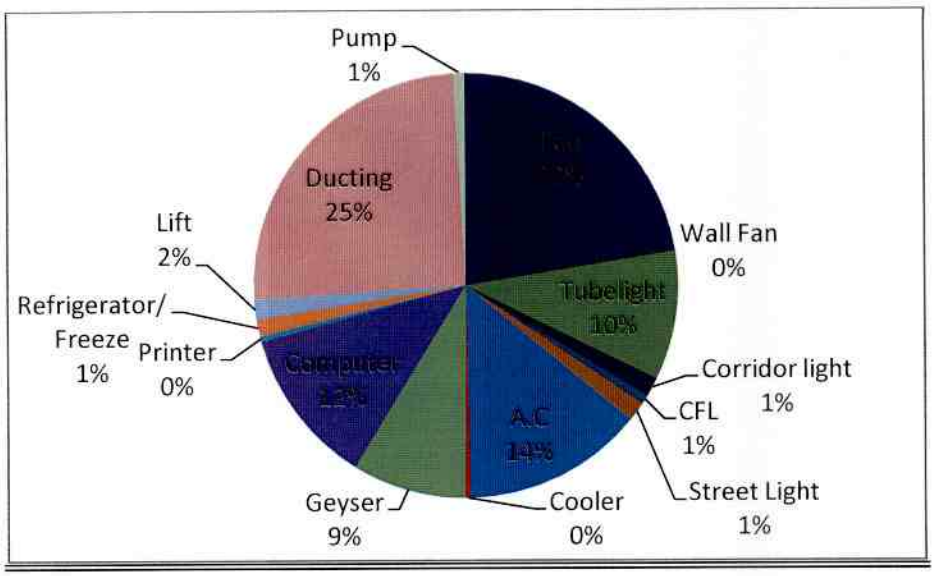


Figure: 2.4 Load sharing by different equipments

According to the above fig, the maximum power is consumed by ducting (25%), followed by fan (22%). In the comfort application geyser consumed only 9%.

Tube light takes (10%), it consists of study area & office rooms. The other lighting load is 3%.

2.5 Electricity Units Analysis

2.5.1 Consumption of Electricity Units from Grid

Table 2.5.1 Monthly Electricity Units

	Units		
	Year 2014	Year 2015	Year 2016
January		63480	126000
February		62480	49000
March		60080	46000
April		75220	58000
May		119890	244000
June		152710	
July	49608	119570	
August	52948	108360	
September	56808	158000	
October	55392	169070	
November	83500	76470/141316	
December	72620	125354	

As seen in the table the consumption of the electricity is increasing every year. The consumption of units is more in summer due to the use of AC and ducting. The units shown in the year 2016 is less because of the generation by roof top solar plant. These are not the final units, as export units to state electricity board (RSEB) have not been reimbursed.

2.5.2 Generation by Roof Top Solar Plant

As seen in the given table the units generated by solar plant are less in winter as compared to summer. It is due to the fact the duration of sun time has been increased in summer. The maximum units generated in summer in a day are 2287 which are highest till yet.

Table 2.5.2 Units Generated by Solar Plant

Months	Units
December	31041
January	36902
February	37094
March	48851
April	53878

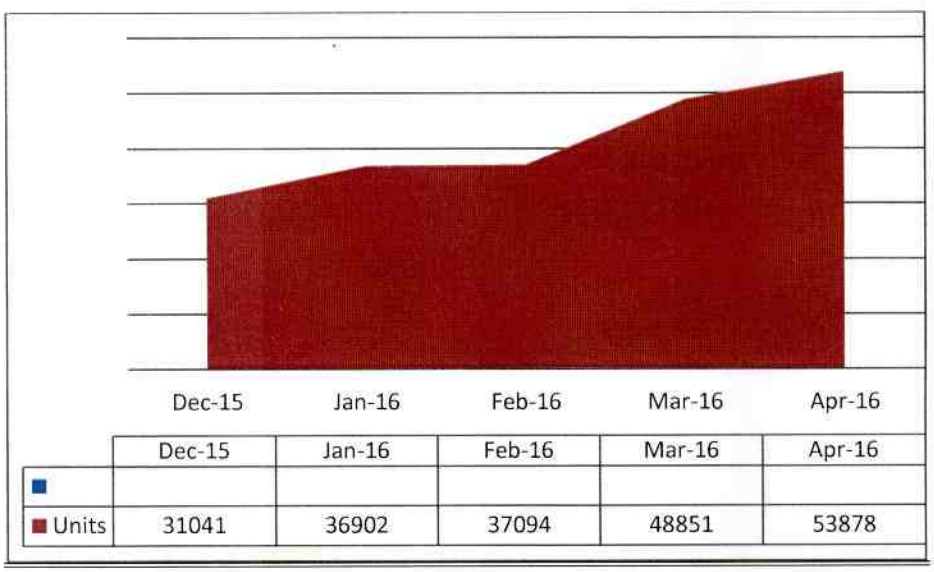


Fig.2.5.2 variation in solar generation in a time interval

3 ENERGY AUDIT METHODOLOGY

The methodology adopted for this energy audit was a three step process comprising of:

- Data collection: In preliminary data collection phase, exhaustive data collection was performed using different tools such as observation, interviewing key persons, and measurements.
- Data analysis: Collected data were analyzed using MS Excel. The database generated by MS Excel was used for producing graphical representations.
- Recommendation: On the basis of results of data analysis and observations, some steps for reducing power consumption, without affecting the comfort and satisfaction, were recommended along with their cost analysis.

3.1 Data Collection

For suggesting any corrective measures to reduce power consumption, it is first necessary to know the power consumption pattern in detail. For this, the exhaustive data collection exercise has been performed at all the departments, academic area, hostels, and other supporting entities such as library, computer labs etc. Following steps have been taken for data collection:

- The team visited to academic area, administrative area, labs, hostels etc.
- Information about the general electrical appliances is collected by observation and interviewing.
- The power consumption of appliances is measured using power analyzer in some cases (such as monitors) while in other cases, rated power was used like CFL, AC, Fan etc.
- The details of usage of the appliances were collected by interviewing key persons e.g. warden care taker (in case of hostels), personnel of institute maintenance and project department etc.
- Intensity of light was measured using lux meter at administrative area, academic area, hostels, corridors etc.
- In case of air conditioning, insulation is checked by visual inspection.
- Approximations and generalizations were done at places with lack of information available

3.2 Data Analysis

In data analysis, the data collected is processed to draw significant conclusions to pinpoint loopholes and identify the areas to focus upon. Analysis of the power consumption data is used to obtain the power consumption pattern and to get the information about the areas where electric power is wasted.

3.3 Recommendation

Energy as well as cost benefits analysis of different appliances are performed and recommendations are made based on the capital cost recovery time (simple payback period). Following steps are involved in this process:

The capital cost involved in replacement of an appliance and/or retrofit is estimated.

- Energy saving by the recommendation is calculated in terms of price of energy per year.
- These two costs were compared to calculate the capital cost recovery time.
- If capital cost recovery time is less than the product life, the recommendation can be implemented.

Some other recommendations are also made which are based on lighting intensity, AC insulation etc.

4 RECOMMENDATIONS

Based on the analysis of the power consumption data, certain steps have been recommended for improving energy efficiency of the campus. Complete cost benefit analysis of implementation of recommended measures has been performed wherever necessary. Also, a number of general measures for energy efficiency have been listed. Some important recommendations for better energy efficiency are described below:

4.1 Lighting

For lighting there is an option available

- LED lighting system

LED Lighting is 4 to 5 times costly then T-5/T12 FTL, but this is compensated by saving in units and by saving in fix charge by reduction of load

4.1.1 Replacing T-12 Tube Lights with Energy Efficient LED Tube Lights (15W)

Dominant light source at most places in the campus is T-12 (36 watts) FTLs with electronic Ballast which consumes 40 W. As per our data collection, the campus has in total 1998 T-12 FTLs. If this T-12 electronic Ballast [Choke] is replaced by LED tube light, 25W power can be saved per FTL.

4.1.1.1 Cost Benefit Analysis of Replacing T-12 FTL with Energy Efficient LED Tube Lights (15 W)

- Total No. of T-12 tube lights in campus = 1998
- Average power of T-12 electronic ballast [choke] FTL = 40W
- Average power LED light (15 W) = 15W
- Power saved per FTL = (40-15) W =25W
- Total power saving = 1998*25W = 49950 W = 49.95 kW
- Working hours 6 hrs, then total units = 299 units/day
- Units saved in one year = 299*30*12= 107640
- Savings in Rs per year = 107640*6.74 = Rs 725493
- Average cost of replacing each FTL = Rs 1500
- Total cost of replacing all FTLs = 1998*1500 = 2997000
- Capital cost recovery time = 2997000/725493 = 4.13

Hence, the capital cost recovery time for replacing all T-12 FTLs of the campus is around 4.13 years.

4.1.2 Replacement of T-12 (36W) Tube Light with Energy Efficient LED Light (8 W) in Hostel Corridor

Presently lightening system in the hostels corridor provide more lux level than required so these lightening source can be replaced by the less power consuming (8 W) LED Lighting. A saving of 32 W per tube light can be achieved in the hostel corridors.

4.1.2.1 Cost Analysis of Replacing T-12 (36W) Tube Lights with Energy Efficient LED Light (8 W)

- Total No. of T-12 in the hostel corridors = 85
- Average power of T-12 (36W) = 40W
- Average power of LED Light (8W) = 8W
- Power saved per tube light = (40-8) W = 32W
- Total power saving = 32*85 = 2.720 = 2.72 kW
- Working hours is 12 hrs, then total units saved = 2.72*12 = 32 unit/day
- Units saving in one year = 32*30*12 = 11520
- Savings in Rs per year = 11520*6.74 = 77644
- Average cost of replacement of T-12 tube light = Rs. 500
- Total cost of replacing all T-12 (36W) = Rs. 500*85 = 42500
- Capital cost recovery time = (42500)/ (77644) = 0.54 yr

Hence, the capital cost recovery time for replacing all T-12 with energy efficient LED tube light (8 W) is around 0.54 years.

4.1.3 Replacement of Sodium Lamp and Bulb with LED Lighting

There is appx 100 sodium bulb in street light in the campus. This method of lighting is very inefficient as compared to LED street lighting.

4.1.3.1 Cost Benefit Analysis of Replacing Sodium Lamp with LED Lighting

- Total no. of sodium lamps in campus = 100
- Average power of sodium lamps = 150 W
- Average power of LED lighting = 40 W
- Power saved per sodium lamp = (150-40) W = 110 W
- Total power saving = 110*100 = 11000= 11 kW
- Working units in 10 hrs, then total units saved = 110 per day
- Units saved in a year = 110*30*12 = 39600
- Saving in Rs per year = 39600*6.74 = 266904
- Total cost of replacing all sodium lamp = 100*3000 = Rs 300000

- Capital cost recovery time = (300000/266904) = 1.12 year

Hence, the capital cost recovery time for replacing all sodium lamps of the campus is around 1.12 years

4.2 Fans

4.2.1 Replacing Existing Ceiling Fans by Energy Efficient BLDC Fans

Most of the buildings in SKIT Jaipur campus are 10 years old and so are the fans. Most of the fans here are not energy efficient fans. According to the data collected, there are a total of 2264 regular fans. A saving of 45W per fan can be obtained by replacing these fans by energy efficient fans.

4.2.1.1 Cost Benefit Analysis of Replacing Existing Fans by Energy Efficient BLDC Fans

- Total No. of existing fans in campus = 2264
- Average power saved per fan = 45W
- Total power saving = 2264*45W = 101880 W = 101.88 kW
- Working hours = 8 hrs, then total units saved in a day = 815
- Total Rs saving in a year = 6.74* 815*250 =1373275
- Average cost of replacing per fan = Rs. 3000
- Total cost of replacing all fans = 2264*3000 = Rs 6792000
- Capital cost recovery time = (6792000)/ (1373275) = 4.94 yr

Hence, the capital cost recovery time for replacing all existing fans of the campus is around 4.94 years.

4.3 Computer Equipments

4.3.1 Replacement of the CRT Monitors with LED Monitors

There are 1210 computers with CRT monitor. On an average, CRT monitors consume 90 W while LED monitors consume only 10 W. There is saving of 80W per monitor. LED monitors costs Rs 4700 per monitor. Scrape cost of old CRT monitors is assumed Rs 700 per piece.

4.3.1.1 Cost Benefit Analysis of Replacement of CRT Monitors with LED Monitors

- Total No. of computers with CRT monitors in campus = 1210
- Power saved per monitor = 80W
- Total power saving = 1210*80 W = 96800 W = 96.8 kW
- Working hours = 5 hrs, units saved in a day = 484 kWh
- Units saved in per year = Rs. 484*300 = 145200
- Saving in Rs per year = 145200*6.74 = 978648
- Average cost of replacing each monitor = Rs. 4000
- Total cost of replacing all monitors = 1210*4000 = Rs. 4840000
- Capital cost recovery time = (4840000)/ (978648) = 4.94 yr

Hence, the capital cost recovery time for replacing CRT monitors by LED monitors is 4.94 years. Since the product life is much more than that, the move is economically beneficial.

4.4. Air Conditioner

4.4.1 Replacement of Existing ACs with Energy Efficient Five Star Rated ACs

Most of the ACs in the buildings are existing with zero star rating. These are not energy efficient as COP of these is less than two while the COP of five stars AC is 3.4. As the energy consumption of AC is very large as compared to any other electrical device used in the campus so the efficiency and proper functioning is very important for the energy saving. According to the data collected there are 89 ACs in the campus. A saving of 0.75kW/ton can be obtained by replacing existing non rated ACs with five stars ACs. We can replace 89 zero star ACs with five stars ACs on the basis of financial analysis.

4.4.1.1 Cost Benefit Analysis of Replacement of Existing ACs with Five Stars ACs

- Total No. of ACs to be replaced in campus = 89
- Total power saved in = 89*0.75= 66.75 kW
- Operating hours 6 hrs in a day, units saving = 400
- Rs saving in year (for 200 days) = 6.74*400*200(days) = 539200

- Total cost of replacing all ACs with five star ACs = Rs. 30000*89 = 2670000
- Capital cost recovery time = (2670000)/ (539200) = 4.95 yr

Hence, the capital cost recovery time for replacing zero stars ACs of the campus is around 4.95 years.

Proper Insulation of Room

Good quality insulation must be maintained in the air conditioned rooms by keeping all doors and windows closed properly so as to prevent cool air go out and hot air come in.

Proper Insulation of Refrigerant Pipe Line

During audit mostly Refrigerant pipe line of outdoor units found without insulation. This increases the temperature of refrigerant entering into the evaporator and thus reduces the refrigerant effect. For getting same refrigerant effect (cooling) more energy is consumed.

Curtains

Always keep curtains on windows to prevent direct sunlight inside the room to avoid heating of cooled air. This reduces load of AC significantly.

Maintenance

Proper maintenance and cleaning of ACs is required at regular intervals to make it work at highest efficiency. Any dirt in filter will reduce efficiency of ACs very significantly. (During Audit it has been seen that many ACs filters were not clean)

4.5 Other Recommendations

This section includes some other useful recommendations for energy saving.

4.5.1 Use of Master Switch Outside Each Room

Installation of a master switch outside a room can make it easy for a person to switch off all the appliances of a room in case someone forgets to switch off while leaving the room. This can help improving energy efficiency.

4.5.2 Use of Reflectors in Tube Lights

Use reflector in tube lights to improve the lux levels. This is clear from photo that mostly light is falling on ceiling where it is not required. By using reflector this light can reflect towards floor (where its required).

4.5.3 Cleaning of Tube Lights

Cleaning of tube lights increases its lux level

4.5.4 Use of Pressure Cooker in Mess Kitchen

Daily more than thousand people's food is cooked in mess. Rice and pulses is routine item of menu. Presently pressure cookers are not used in Mess kitchen. If pressure cookers are used in mess for cooking rice, pulses and boiling other eatable item then up to to 20% LPG gas can be saved.

4.5.5 Bio Gas Plant

Mess produces more than 100 kg kitchen waste per day and it is dumped outside. This waste may be a good source of bio gas plant.

4.5.6 Energy Saving Measures for DG Sets

Energy Saving Measures:

- Ensure steady load conditions on the DG set, and provide cold, dust free air at intake (use of air washers for large sets).
- Improve air filtration.
- Ensure fuel oil storage, handling and preparation as per manufacturer's guide lines/oil company data.
- Consider fuel oil additives in case they benefit fuel oil properties for DG set usage.
- Calibrate fuel injection pumps frequently.
- Ensure compliance with maintenance checklist.
- Ensure steady load conditions, avoiding fluctuations, imbalance in phases, harmonic loads.
- Carryout regular field trials to monitor DG set performance, and maintenance planning as per requirements.
- Use of Waste heat recovery unit for exhaust gases.

List of selected students involved in energy audit

Department of Information Technology

S.NO	Name	Roll No
1	Abhishek Jain	13ESKIT004
2	aishwarya Rathore	13ESKIT006
3	Akshika Jain	13ESKIT007
4	Aman Goyal	13ESKIT009
5	Bhavna Rathi	13ESKIT019
6	Bhawana Agarwal	13ESKIT020
7	Chirag Gangwal	13ESKIT023
8	Harsh Bansal	13ESKIT027
9	Ishnai Pandya	13ESKIT028
10	Jai Surana	13ESKIT031
11	Kirti Dodeja	13ESKIT032
12	Mehul Kumar	13ESKIT037
13	Mohak Gaur	13ESKIT039
14	Monika Prasad	13ESKIT042
15	Nitesh Moorjani	13ESKIT052

Department of Electronic Engineering

NAME	ROLL NUMBER	CLASS
Aman Agarwal	13ESKEC012	EC-A 1st Shift
Harshit Indoria	13ESKEC035	EC-A 1st Shift
Harshit Soni	13ESKEC036	EC-A 1st Shift
Raina Sood	13ESKEC063	EC-B 1st Shift
Rajat Sharma	13ESKEC065	EC-B 1st Shift
Shailendra Sharma	13ESKEC071	EC-B 1st Shift
Shresth Sharma	13ESKEC075	EC-B 1st Shift
Shreya Bhatia	13ESKEC076	EC-B 1st Shift
Urvi Sharma	13ESKEC086	EC-B 1st Shift
Anshul Vanawat	13ESKEC713	EC 2nd Shift
Harshita	13ESKEC722	EC 2nd Shift
Kalpesh Jain	13ESKEC725	EC 2nd Shift
Khushal Sharma	13ESKEC727	EC 2nd Shift
Natwar Singh	13ESKEC740	EC 2nd Shift
Shree Soni	13ESKEC749	EC 2nd Shift
Abhijeet Singh	13ESKCS004	CS 1st Shift
Arpit Singh	13ESKCS022	CS 1st Shift

Department of Mechanical Enginnering

S.No.	Name of Student	Roll No.
1	Hitesh Sharma	13ESKME036
2	Ayush Mathur	13ESKME016
3	Anshul Bhardwaj	13ESKME010
4	Mohit Jain	13ESKME060
5	Prateek Agarwal	13ESKME739
6	Dileep Kumawat	13ESKME715
7	Geetendu Sharma	13ESKME716
8	Shubham Jain	13ESKME754
9	Himanshu Khandelwal	13ESKME721
10	Shubham Kothari	13ESKME755
11	Rajat Jangir	13ESKME744
12	Justin Varghise	13ESKME723
13	Anurag	13ESKME011
14	Arjit Jain	13ESKME012
15	Akshaya Garg	13ESKME004

Swami Keshvanand Institute of Pharmacy, Jaipur

S. No.	Name of Student	Class
1.	Arjita Jha (Miss)	B. Pharm -III
2.	Sakshi Khandelwal (Miss)	B. Pharm –III
3.	Meraj Ali Ansari	B. Pharm –III
4.	Shiv Kumar Saini	B. Pharm –III
5.	Imadur Rahman	B. Pharm –II
6.	Mohd.Arif	B. Pharm –II
7.	Mohd.Salman	B. Pharm –I
8.	Vishnu Chaudhary	B. Pharm -I
9.	Chatrapal Singh	B. Pharm -I
10.	Mukesh Mandal	B. Pharm -I

Department of Civil Engineering

Sr. No	Name	Class
1	Jitendra Kumar Gurjar	6th Sem -A
2	Shubham Sharma	6th Sem -A
3	Md. Irfan	6th Sem -A
4	Deendayal Saini	6th Sem -A
5	Anshuman Singh Rathore	6th Sem -A
6	Aman Purohit	6th Sem -A
7	Bramha Singh Mali	6th Sem -A
8	Kumar Mayank	6th Sem -A
9	Jitendra Singh Rathore	6th Sem -A
10	Arvind	6th Sem -A
11	Divyanshu Varshney	6th Sem -A
12	Kartik Gupta	6th Sem -A
13	Akshay Kumar	6th Sem -A
14	Lokesh Nagar	6th Sem -A
15	Deepak Pareek	6th Sem -A
16	Sumit Mittal	6th Sem -B
17	Vikas Prajapat	6th Sem -B
18	Tarun Kasliwal	6th Sem -B
19	Sunita Meena	6th Sem -B
20	Swati Achra	6th Sem -B
21	Shivani Goyal	6th Sem -B
22	Vishakha Bhandari	6th Sem -B
23	Punit Sharma	6th Sem -B
24	Uday Bhanu Singh Khichi	6th Sem -B
25	Kishore Suwalka	6th Sem -B
26	Anoop Singh Bhati	6th Sem -B
27	Sumit	6th Sem -B
28	Shashank Agarwal	6th Sem -B
29	Saurabh Sain	6th Sem -B
30	Ramdhan Choudhary	6th Sem -B

Department of Computer Science		
S.NO	Name	Roll NO
1	Abhijeet singh Rathore	13ESKCS004
2	Anirudh Pareek	13ESKCS012
3	Arpit Singh Sikarwar	13ESKCS022
4	Garima Kaur	13ESKCS036
5	Kaushal Kumar	13ESKCS048
6	Shubham Jain	13ESKCS091
7	Shubham Sharma	13ESKCS095
8	Shubham Singh Tanwar	13ESKCS096
9	Vaishali singh Daiya	13ESKCS111
10	Sumit Arora	13ESKCS853
11	Goral Arora	13ESKCS715
12	Mohammed Akram	13ESKCS721
13	Palash Bhatnagar	13ESKCS729
14	Riya Soni	13ESKCS746
15	Yashmayee Jain	13ESKCS763

Department of Electrical Engineering

S.NO	Students	Class
1	Teena	VI sem II
2	Heena agrawal	VI sem II
3	Dhruvesh Singh Shekawat	VI sem II
4	Kuldeep	VI sem II
5	Girish	VI sem II
6	Amit	VI sem II
7	Anil	VI sem II
8	Ayushi	VI sem--A
9	Ashal gautam	VI sem--A
10	Anjali Mahla	VI sem--A
11	Amar Kumar	VI sem--A
12	Chirag Soni	VI sem--A
13	Bharat	VI sem--A
14	Himanshu	VI sem--A
15	Kamaljeet	VI sem--A
16	Garvit	VI sem--A
17	Devesh	VI sem--A
18	Shilpi	VI sem--B
19	Surbhi	VI sem--B
20	Rajsee	VI sem--B
21	Rashmi	VI sem--B
22	santosh	VI sem--B
23	lekha	VI sem--B
24	neha	VI sem--B
25	vivek sharma	VI sem--B
26	parth	VI sem--B
27	udit	VI sem--B
28	narendra	VI sem--B
29	sumit	VI sem--B
30	sumit talwani	VI sem--B
31	titiksh	VI sem--B

INTERNAL
GREEN AUDIT REPORT
FOR
SWAMI KESHVANAND INSTITUTE OF TECHNOLOGY, MANAGEMENT & GRAMOTHAN, JAIPUR

Date: 30 June 2019
By Green Audit Assessment Team

SWAMI KESHVANAND INSTITUTE OF TECHNOLOGY, MANAGEMENT & GRAMOTHAN,

JAIPUR

SKIT

असतो मा सद्गमय

CONTENT

A tribute to tree……..
I think I shall never see
A poem lovely as a tree
Poems are made by fools like me
But only god can make a tree. -Joyce Kilmer

1 INTRODUCTION

Swami Keshvanand Institute of Technology, Management & Gramothan (SKIT) inspired from the learnings of Swami Keshvanand, was established in the year 2000 by Technocrats and Managers Society for Advanced Learning.

Today the institute is recognized as one of the canters of academic excellence in Northern India. The Institute is affiliated to Rajasthan Technical University, Kota for offering Postgraduate and Graduate Courses in Engineering and Management. Our sister institution Swami Keshvanand Institute of Pharmacy (SKIP) is affiliated to Rajasthan University of Health Sciences for offering Graduate Course in Pharmacy. Located in the Pink City Jaipur, which is a blend of traditional history and modern outlook, SKIT is putting in efforts for making industry ready engineers and managers through effective Industry –Institute Interface.

Apart from University curriculum SKIT also pursues activities for research and development in various fields. The green landscaping, aesthetic elegance of arches and the vibrant pursuit of knowledge by the young aspirants make the environment serene, pleasant and dynamic. Students joining the institute share the box full of opportunities for professional and personal development through an environment of practical orientation, industrial interaction and student led activities which help the students to develop good communication skills**,** integrated personality and greater competitive spirit.

A) **Intake under Self Financing Scheme (SFS) as per AICTE Approval:**

Name of Branch	**Approved Intake**	Division of Approved Intake		
		15% seats for **Out of Rajasthan** Candidates through **REAP**	70% Seats for **Rajasthan** Candidates through **REAP**	15% seats for **all states candidates** under Management Quota (At Institute Level)
Civil Engineering	120	18	84	18
Computer Science & Engineering	180	27	126	27
Electronics & Communication Engineering	90	14	63	13
Electrical Engineering	120	18	126	18
Information Technology	90	13	63	14
Mechanical Engineering	180	27	126	27
Computer Science & Engineering -II	60	9	42	9
Electronics & Communication Engineering-II	60	9	42	9
Electrical Engineering I	60	9	42	9
Mechanical Engineering	60	9	42	9
Grand Total	**1020**	**153**	**714**	**153**

INFRASTRUCTURE OF SKIT COLLEGE IS AS PER BELOW

The entire campus combines spacious and technologically driven blocks that are stretched with sprawling green areas. The various blocks are multi-storied buildings empowered with properly ventilated and spacious classrooms, laboratories and tutorial rooms and various seminar halls and auditoriums. The classrooms are equipped with smart classroom applications and audio and visual aids that foster quality training. The various blocks for the functional purposes are:

THE VIKRAM SARABHAI BLOCK : This block houses the administrative offices of the Directors, the Departments of Computer Science and Engineering, Information Technology and Electronics, Communication and Training and Placement Cell. The block also has the glorious Amphi Theatre that has held the most memorable events for the last 15 years. 3900 (Sq.Mtr)

THE DHANVANTRI BLOCK : The Dhanvantri Block includes the Administrative offices of the Chairman and Director, the Department of Pharmacy and other administrative offices. The Block houses the central library that is The Gyandan Resource Center. Area: 1166 (Sq.Mtr)

THE VISHVAKARMA BLOCK : The Vishvakarma Block houses the Department of Mechanical Engineering and the Department of Management Studies. The block also has a seminar hall having a seating capacity of 250 persons and many small halls for student activities. Each block encompasses a disciplined academic environment and provides ample opportunities to organize significant extra-curricular activities. Area : 1540 (Sq.Mtr)

SIR M. VISVESVARAYA BLOCK : This block is the working space for the Department of Electrical Engineering, Civil Engineering and the Sciences and Humanities Department. Built on an approximate area of two lac sq. feet, the block holds the biggest auditorium called the Gyanmandir Auditorium of a seating capacity of 850 people and a mini auditorium named as J.C Bose Auditorium having a seating capacity of 250 persons. It also has a mini open-air theatre called the C.V Raman Theatre. Area : 3343 (Sq. Mtr)

These four blocks encompass administration offices to the modern classrooms to provide amity of learning to intellectuals. In accordance with the need of engineering courses, labs, classrooms and departments are established.

During Audit team of internal Audit interacted with following persons

Name	Designation
Dr CM Choudhary	HOD, CS
Dr Anil Choudhary	HOD, IT
Dr S.K. Bhatnagar	HOD, EC
Dr. N.C.Bhandari	HOD, ME
Dr. D.K.Sharma	HOD, CE
Dr. Akash Saxena	HOD, CE
Mr Mani Ram Choudhary	Purchasing Officer
Mr Jagdish Choudhary	House Manager

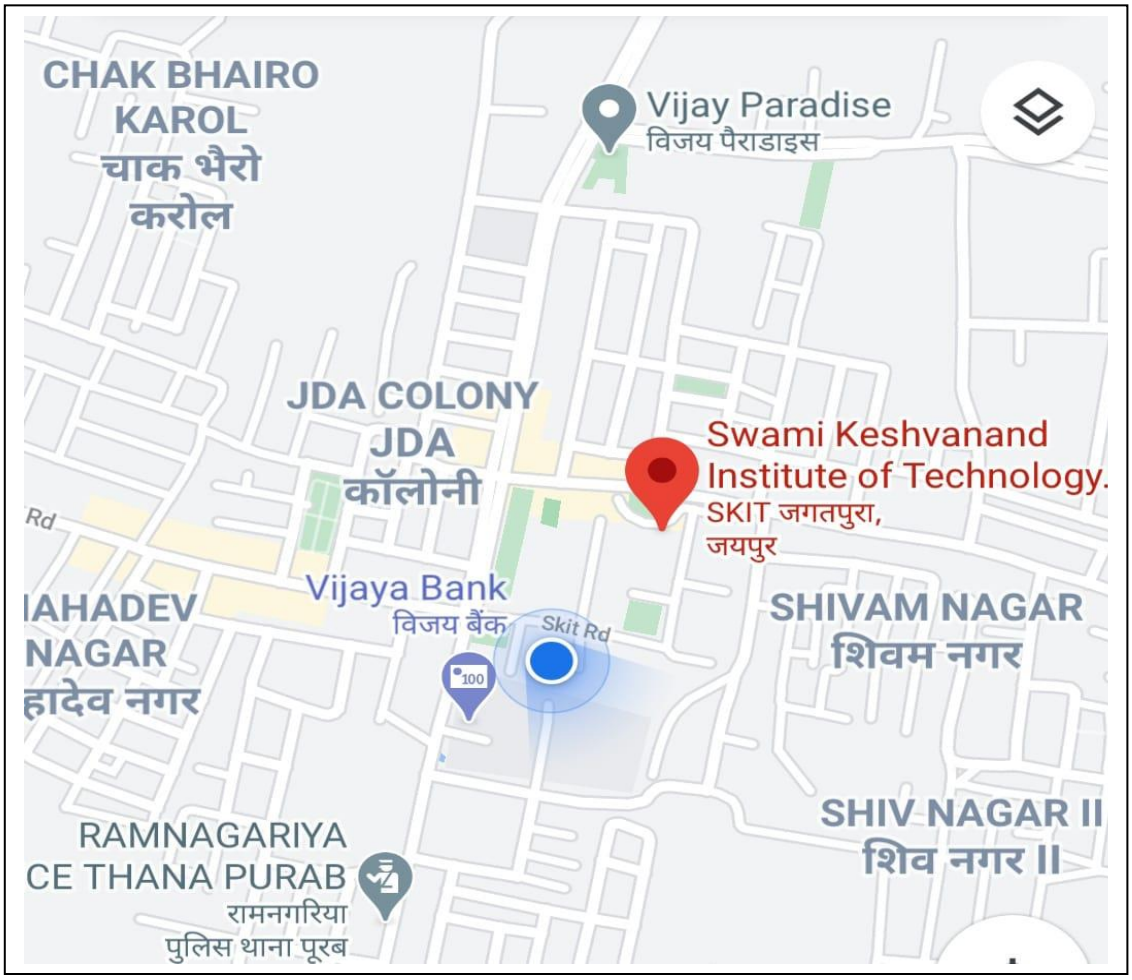
2. OBJECTIVES: In recent time, the Green Audit of an institution has been becoming a paramount important for self-assessment of the institution which reflects the role of the institution in mitigating the present environmental problems. The college has been putting efforts to keep our environment clean since its inception. But the auditing of this non-scholastic effort of the college has not been documented. Therefore, the purpose of the present green audit is to identify, quantify, describe and prioritize framework of Environment Sustainability in compliance with the applicable regulations, policies and standards.

3. METHODOLOGY

The purpose of the green audit of swami keshvanand institute of technology, management & gramothan, Jaipur is to ensure that the practices followed in the campus are in accordance with the Green Policy adopted by the institution. The methodology include: preparation and filling up of questionnaire, physical inspection of the campus, observation and review of the documentation, interviewing key persons and data analysis, measurements and recommendations. Some data have also been taken from the students' research works carried out by various departments of the college.

4. GEOGRAPHICAL LOCATION OF THE COLLEGE :

(SKIT Campus)



(Location of SKIT)

5. GREEN AUDIT

Green audit forms part of a resource management process. Although they are individual events, the real value of green audits is the fact that they are carried out, at defined intervals, and their results can illustrate improvement or change over time. Eco-campus concept mainly focuses on the efficient use of energy and water; minimize waste generation or pollution and also economic efficiency. All these indicators are assessed in process of "Green Auditing of educational institute". Eco-campus focuses on the reduction of contribution to emissions, procure a cost effective and secure supply of energy, encourage and enhance energy use conservation, promotes personal action, reduce the institute's energy and water consumption, reduce wastes to landfill, and integrate environmental considerations into all contracts and services considered to have significant environmental impacts.

Target areas included in this green auditing are:

5.1 Auditing for Water Management: Water is a natural resource; all living matters depend on water. While freely available in many natural environments, in human settlements potable (drinkable) water is less readily available. We need to use water wisely to ensure that drinkable water is available for all, now and in the future. A small drip from a leaky tap can waste more than 180 liters of water to a day; that is a lot of water to waste - enough to flush the toilet eight times! Aquifer depletion and water contamination are taking place at unprecedented rates. It is therefore essential that any environmentally responsible institution should examine its water use practices. Water auditing is conducted for the evaluation of facilities of raw water intake and determining the facilities for water treatment and reuse. The concerned auditor investigates the relevant method that can be adopted and implemented to balance the demand and supply of water. It is therefore essential that any environmentally responsible institution examine its water use practices.

The college does not have any automatic leak detection system and all the leakages are controlled by manual observation hence leak quantum water is another issue which shall be considered in designing the water conservation scheme. No leakage of water from pipes is observed from pipes by auditor team but leakages in taps were observed in some urinals. There are 1600 Taps in the college premises from which the water is used for different use. There is no tap maintenance schedule with the maintenance department; the leakage problem will be solved by them only when they get any compliant.

5.2 Auditing of Wastewater Management: The waste water produced in this college is about 6000 liters per week per laboratory and there are two such laboratories producing effluent is first year Chemistry Laboratory and the Environment Laboratory in Civil Engineering department. The effluent produced is released to the common drainage without any treatment which is damaging to the environment and have very big concerned with ground water contamination. The Sewage water mainly comes from Toilets of college, hostel, kitchen and canteen. Construction of Sewage Treatment Plant is in progress.

5.3 Auditing for Energy Management: Energy is one of the major inputs for the economic development of any country. The fundamental goal of energy management is to produce goods and provide services with the least cost and least environmental effect. It can be said as "the strategy of adjusting and optimizing energy, using system and procedure so as to reduce energy requirements per unit of output while holding constant or reducing total costs of producing the output from these systems". The energy audit is 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 serve to identify all the energy streams in a facility. This indicator addresses energy consumption, energy sources, energy monitoring, lighting, appliance, natural gas and vehicles. Energy use is clearly an important aspect of campus sustainability and thus requires no explanation for its inclusion in the assessment.

Aim and objective:

1) To save conventionally produce electric energy

2) Use of non- conventional source of energy

3) Use carbon neutral electricity

4) Minimization of electric expenses Observations

Following Energy Sources are used in the college:

• Solar

• Electrical

• Diesel

• Petrol

• LPG

Use of LED bulb is promoted and florescent Tube Lights and CFL are getting replaced, 85% of the present bulbs and tubes are replaced to LED. Energy saving fans is also evident and encouraged in use.

5.4 Auditing for on-site energy generation:

1. Solar power of Played a key role in establishment and commissioning of 400 kW, Roof Top Solar Power Plant at SKIT in 2016.

2. Chemistry lab, Environmental lab and canteen have LPG pipeline.

3. Institute have diesel generators for energy backup.

5.5 Auditing for Temperature Control:

The climate of SKIT College campus located in Jaipur District of Rajasthan is Sub-humid Region in nature and temperature varies from 7º C in January and highest 45º C in June. The coldest month during winter is January and warmest month during summer is June.

1. SKIT mostly has green area which helps in reducing temperature. The Leaves of plants absorb and filter the sun's radiant energy, keeping things cool in specially in summer.

2. Walls of different buildings have light reflecting colours.

5.6 Auditing of E-Waste Management:

E-waste can be described as consumer and business electronic equipment that is near or at the end of its useful life. This makes up about 5% of all municipal solid waste worldwide but is much more hazardous than other waste because electronic components contain cadmium, lead, mercury, and Polychlorinated biphenyls (PCBs) that can damage human health and the environment.

Observations E-waste generated in the campus is very less in quantity. Administration conducts the awareness programmes regarding E-waste Management with the help of various departments. The E-waste and defective item from computer laboratories are being stored properly. The institution has decided to contact approved E-waste management and disposal facility in order to dispose E-waste in scientific manner.

5.7 Auditing for Solid Waste Management: Wastes cannot be avoided in any environment. Wastes can be classified as Biodegradable and Non- biodegradable wastes. Biodegradable wastes include food wastes; which can be easily decomposed by the bacteria in soil. But nonbiodegradable wastes are those which cannot be degraded by any organism and remain as such for many years. Much amount of waste is generated from the SKIT college campus.

1 Canteen – The food waste generated from the canteen is collected and given to pigs. Plastic waste is generally less generated from the canteen. The plastic waste generated is burned inside the ring near the dog kennel. Some organic waste is used in biogas plant.

2. Library - The most generated waste is paper waste. It is taken for recycling.

3. Store- Not much waste is generated. But the paper waste and plastic covers are burned in the ring.

4. Office- Paper waste generated are recycled and reused.

5. Garden-Plastic and paper waste is comparatively less.

6. Auditorium -The wastes are collected after each programme and are burned in the ring.

7. Bathroom-The wastes are collected and burned in an incinerator behind the convent.

8. laboratory-The broken glass wastes and the useless instruments are disposed for recycling after thorough washing.

9. College Premises-Plastic waste generated is usually less. But paper waste is generated in a larger amount.

5.8 Auditing for Paper Wastes: Paper Wastes are collected in the waste basket and recycled. College using paperless work by promoting email, whatsapp and SMS. Used papers are given to venders for further recyclization. Prints are taken on both the sides.

5.9 Auditing for Green Campus Management:

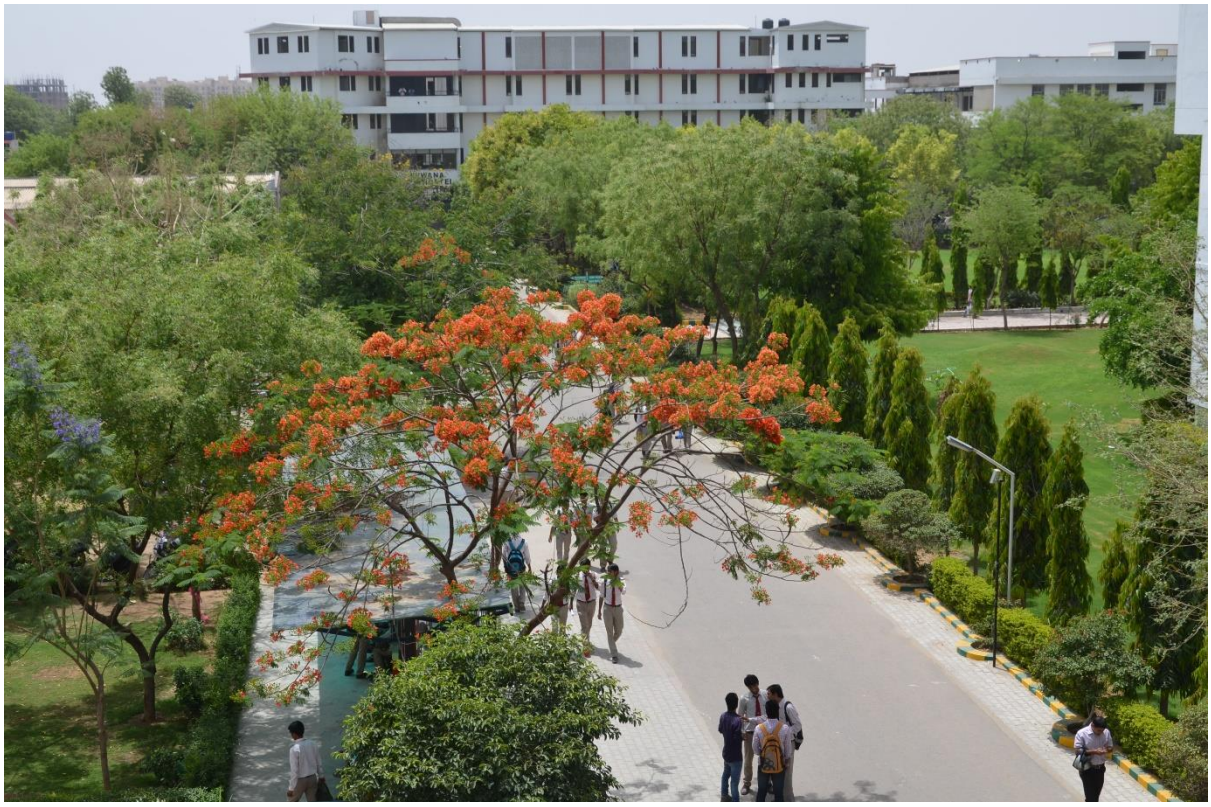
The area is immensely diverse with a variety of tree species performing a variety of functions. Most of these tree species are planted in different periods of time through various plantation programmes organised by the authority and have become an integral part of the college. The trees of the college have increased the quality of life, not only the college fraternity but also the people around of the college in terms of contributing to our environment by providing oxygen, improving air quality, climate amelioration, conservation of water, preserving soil, and supporting wildlife, controlling climate by moderating the effects of the sun, rain and wind. Leaves absorb and filter the sun's radiant energy, keeping things cool in summer. Many animals are dependent on these trees mainly for food and shelter. Flowers and fruits are eaten by monkeys, and nectar is a favorite of birds and many insects. Leaf – covered branches keep many animals, such as birds and squirrels, out of reach of predators. Different species display a seemingly endless variety of shapes, forms, texture and vibrant colors. Even individual trees vary their appearance throughout the course of the year as the seasons change. The strength, long lifespan and regal stature of trees give them a monument – like quality. They also remind us the glorious history of our institution. We often make an emotional connection with these trees and sometime become personally attached to the ones that we see every day. A thick belt of large shady trees in the periphery of the college have found to be bringing down noise and cut down dust and storms. A recent study has revealed that the rich diversity of tree species of about 48 species belonging to 27 families have sequestrated a total of 362.65 ton of organic carbon. Thus, the college has been playing a significant role in maintaining the environment.

5.10 Auditing for Air Quality Management: The plants, greenery and sustainability of the campus to ensure that the quality of air.

5.11 Auditing for Green belt: The Green Belt Area is meant for conservation of nature value of the college premises, As per the requirement of National Green Tribunal the green belt shall be developed as per the guide lines of Central Pollution Control Board. The Green Area in the college includes the plants,

greenery and sustainability of the campus to ensure that the buildings conform to green standards This also helps in ensuring that the Environmental Policy is enacted, enforced and reviewed using various environmental awareness programmes. Observations Campus is located in the vicinity of approximately 80 types (species) trees. Various tree plantation programs are being organized during the month of July and August at college campus and surrounding villages through NSS unit. This program helps in encouraging eco-friendly environment which provides pure oxygen within the institute and awareness among villagers. The plantation program includes various types of indigenous species of ornamental and medicinal. Instead of maintaining biodiversity the similar species planted is observed for example “NEEM”. The dominant species in green belt are Neem, Pongam Tree, Amaltash, Copperpod and Sita Ashok.

Green Campus



Green Campus

Green Campus

5.12 Good Daylight design:

1. All the buildings having large windows. Windows are kept open to adequate light.

2. Building designed of according to good light.

3. All the buildings are white washed. Which can enhance daylight.

5.13 Green Initiative by College Management and students: conducts regular trainings to staff and faculty. Use of bicycles, controlled use of paper, plantation target and implementation are some of the initiatives. Display of environment protection banners, posters like save water, save energy at prominent places, waste disposal bins for wet and dry waste disposal are some of the initiatives taken.

Routine Green Practices

World Environment Day – June 5 Awareness seminars are organized on various environmental problems. Planting trees, poster exhibition etc. are some activities on that day.

Ozone Day – September 16 Invited lectures, Painting competitions

Nature awareness programmes in the campus

Eco friends club

- Engaging students in maintaining garden
- Engaging students in maintaining herbal garden and medicinal garden.
- Plastic free campaign
- Workshop on eco-friendly carry bags
- Nature camps, field trips
- Switching from flex to cloth banners

Green Initiative

Green Initiative

Green Initiative

Green Initiative

5.14 Auditing for Noise pollution management:

A. Silence zones in the college: - Various display boards have been placed in the library and other places for awareness to maintain silence in the college.

B. Noise control in the college: - The college adopts no honking policy and prevents use of any honk and noise in campus. Certain areas like library, class room are declared as Silence zone and noise pollution is kept to minimum on college campus.

6 GOOD POINTS OBSERVED:

1. College has prepared Green Environmental policy and has taken efforts for sustainable development on the college campus.

2. College has formed the clubs of faculty and student which works to maintain biodiversity on the campus and also participates in preventing pollution in society through various drives.

3. College has installed solar panels and has further plans of its expansion.

4. College has a system of Hazardous waste disposal through Jaipur Nagar Nigam.

5. College has included environment protection and management a curriculum more particularly in Civil Engineering.

6. College has conducted Environment. Awareness trainings and workshop for faculty and students.

7 RECOMMENDATION/ SUGGESTIONS

Water Quality: Taps needed to be repaired. The water coolers which are not working need to be repaired immediately.

Air Quality: More plants need to be planted. More of shade trees to be planted inside the college campus. Plastic wastes should not be burned that leads to pollution. Instead, they could be given to different organizations on a monthly basis.

Energy: Consumption Energy consumption could be reduced. Unnecessary lights and fans could be switched off. During daylight, lights can be switched off. Energy conserving methods like usage of LED and CFL bulbs can be appreciated

College has many areas where lighting is not required at all times. Installing sensor-based lighting in such areas can generate massive rewards. This is one of

the easiest ways to save energy in college. If most systems in computer laboratory and instrumentation laboratory are based on old technology, they might be consuming more power than new technology. Replacing old computers and instruments with ones having energy efficiency certifications is the easiest way to conserve energy in college. By installing more solar energy panels generate more electricity and minimize their electricity bill. In the hostels increases use of solar water heater is needed.

Investment in solar lights for outdoor lighting can generate long term benefits. A huge amount of energy is wasted because no one really cares about switching off the fans and lights when not required. Hence, planning workshops on energy conservation to educate students, faculty and staff can generate huge results. Unplug overhead projectors, computers, and smart boards when not in use. This simple way to conserve energy can help save large amount of power and money in the long run. Recycle or safely dispose of white goods, computers and electrical appliances. Use reusable resources and containers and avoid unnecessary packaging where possible. Always purchase recycled resources where these are both suitable and available

Solid waste: The management of college shall consider the following recommendations on top priority: -

1) The solid waste generated in the collage premises to be be collected in scrap Yard (Notified Area) and segregated as per the category of solid waste management and stored in the well labeled area.

2) Plastic waste to be given to either recycler vender registered with Rajasthan State Pollution Control Board as per "The Plastics Manufacture, sale and Usage Rules, 1999 and all its Amendments.

3) Hazardous Waste to be disposed by identified disposal pathway within 90 days from its generation as per the guidelines of "Hazardous Waste (Management, Handling and Transboundary Movement) Rules 2008 with all the Amendments.

4) To avoid wooden waste generation the furniture to be transferred from wooden to metallic in future and today's wooden waste shall be reused in the college through carpentry shop of workshop in mechanical engineering department.

5) Metal Waste to be reused in the college and workshop department shall be engaged for it, if they prove that the waste cannot be reused will be sale out to the venders who will recycle and reuse the same.

6) Unused food waste to be used as cattle feed, as on today some unregistered persons take away these wastes, the one who uses it shall come regularly and

should be registered with the college concern department and its record shall be maintained .

7) Non- Biodegradable waste shall be disposed to the registered vender with Rajasthna State Pollution Control Board.

8) Biodegradable waste to be compost in the college premises in technical manner, it is observed that the vermin culture pans are present in the college but in technical institute it is expected that the composting shall be done in perfect technical manner.

9) Municipal Solid Waste to be disposed as per the guidelines "The Municipal Solid Wastes (Management And Handling) Rules, 2000 with its all Amendments.

10) Bio- Medical Waste is generated in very large amount and this waste to be disposed within 48 hours from the generation as per the guidelines of "The Bio-Medical Waste (Management And Handling) Rules 1998 and its all Amendments.

11) The replaced or used batteries which could not be recharge as the life get exhausted shall be disposed as per the guidelines of "The Batteries (Management and Handling) Rules, 2001 and all its Amendments.

12) The E-Waste Produced in the collage to be disposed of as per the guidelines in "E-Waste Management and Handling Rules, 2011 and all its Amendments.

13) The records of proper disposal of all the solid wastes to be maintained with its manifests at one central place.

a. Management of College may encourage the staff and students: -

1) To use Common or public Vehicle instead individual vehicle to conserve fossil fuel

2) Maximum Solar energy is recommended to use in mess and canteen

b. Management of College may consider implementing on top priority:-

1) Carbon Sequestration study shall be carried out before plantation of Green Belt.

2) Energy Consumption for each building should be estimated to design the energy conservation plan.

3) Instead of out-sourcing the Annual Maintenance of Electrical Equipment college concern department staff shall take that responsibility

4) Energy saving awareness shall be done by displaying the boards at appropriate place

5) Encourage natural ventilation and illumination by alteration in the building structures whenever going for new constructions.

Noise: Level Monitoring shall be done as per the guideline of "Noise Pollution (Regulation and Control) Rules 2000 2) Vehicular exhausts shall be examined regularly in the collage as per Central Motor Vehicle Act 1988.Vehicular movement shall be restricted by putting boundary limit and beyond that limit bicycles usage shall be promoted to all students and staff.

OVERALL RECOMMENDATIONS

1) Lab waste water quantity is not measured and drained to municipal drainage system.

2) Solid waste segregation is not done in lab as well as store room before final disposal. Green chemistry methods- Like solvent extraction are to be practiced.
3) Planning of chemical consumption and purchase to be ensured.

4) Calibration of instrument in lab to be done.

5) Composting of bio degradable waste to be scientifically done.

6) Septic tank sewage water analysis is to be done.

7) Plan for green belt development to be prepared.

8) Drinking water analysis shall be done as per IS 10500.

9) Rain water Harvesting (RWH) is to be done technically.

10) Reduction of wood policy.

11) Department wise electrical load consumption is to be done.

12) Energy used by each appliance is to be estimated.

13) List of equipment/instrument and their consumption of (energy/water) is to be estimated.

14) Awareness for energy and water conservation among students and staff by displaying boards.

15) Automatic leak detections in water flowing pipeline

16) Water usage reduction techniques to be used.

17) No previous for disposal of sanitary napkins. As per the Biomedical waste disposal Act.

19) Tree plantation shall be done to maintain biodiversity as well as artificial nesting shall be installed.

20) Awareness among students and staff about green environment shall be done use tools like display boards.

8 CONCLUSIONS

We, the Department of Chemistry, believe that we have successfully completed the analysis of various environmental components. We hope that the suggestions put forward by us would be considered by the college and implemented as soon as possible.

9 ACKNOWLEDGEMENTS

We would like to thanks our Director (Academics) Dr S.L. Surana for her consent to conduct this audit. We would like to sincerely thank all the Departments, students, teaching and nonteaching staff for their kind cooperation with us during this survey. We would also like to specially thank the Laboratory Assistants who helped us a lot in furnishing this information.

ANNEXURE 1

GARDENING DETAILS

S.NO	Common Name	Botanical Name	Family
1	Neem	Azadiracata indica	Meliaceae
2	Shisam	Delbergia sisso	Fabaceae
3	Gulmohar	Delonex regia	Caesalpiniaceae
4	Seeta Ashok	Saraca asoca	Caesalpiniaceae
5	Bel	Aegle marmelos	Rutaceae
6	Awala	Emlica officinalis	Phyllantheceae
7	Bor	Zizipus mauritiana	Ramhnaceae
8	Jamun	Syzygium cumini L	Myrtaceae
9	Anar	Punica protopunica	Lythraceae

ANNEXURE 2

GREEN AUDIT CHECKLIST

Wastewater Management & Waste water Management

Sr. No.	Design Feature	Status	Remarks (If any)
1	Drip irrigation (This refers to plant watering system)	✓	
2	Efficient plumbing system from maintenance & operation point	✓	
3	Display of signboards at appropriate places for water conservation	✓	
4	Use of bore-well water in the toilet for flushing	×	We should discourage use of ground water
5	Rainwater harvesting	✓	
6	Sewage treatment plant for treated sewage recycle	✓	

Energy management & On-site energy management

Sr. No.	Design Feature	Status	Remarks (If any)
1	Use of natural day light	✓	
2	Use of energy efficient equipment	✓	
3	Use of energy saving bulbs (LED lights)	✓	Installation of LED lights have been proposed in the entire institute however at the entrance CFL lights are installed.
4	On-site energy generation	✓	
5	Photocell occupancy sensor for automatic light control	✓	
6	Regular maintenance of electrical system	✓	
7	Computerized monitoring of electrical system	×	
8	Solar panel	✓	
9	Display of signboards at appropriate places for energy conservation	✓	

Temperature Control

Sr. No.	Design Feature	Status	Remarks (If any)
1	Use of daylight design (Building is constructed in such a way that diffused sunlight allows light but not the heat)	✓	
2	Special walls for temperature control and noise barrier (Thick/ Double/ Composite/ Acoustic control)	✓	
3	Earth air tunnel (cools air in summer and heat it in winter)	×	
4	Roof with reflective glass	×	
5	Use of cool roofing material during construction (mineral wool, rock wool, vermiculite, foams, expanded polystyrene, extruded polystyrene etc.)	✓	
6	Use of insulation material (e.g. autoclaved aerated blocks, hollow blocks etc.	×	
7	Use of water bodies/fountain	×	
8	Use of landscaping as sound barrier	✓	

Waste Management

Sr. No.	Design Feature	Status	Remarks (If any)
1	Segregation of dry and wet waste	✓	
2	Use of coloured bins with code to collect garbage	✓	
3	Setting up recycling area/ composing area	×	
4	Avoid use of paper by going digital (Paper)	✓	
5	Printing on both sides of paper	✓	
6	Reuse of printed paper/ envelops for other applications	✓	
7	Donation of books to store or other library	✓	
8	Donation of weeded books to needy students	✓	
9	Donation of computers to NGO's to refurbish and give it to needy schools/people	✓	
10	Creation of specified junctions for collection of E waste(E-waste)	✓	
11	Implementation of any recycling project or program	✓	
12	Purchase of electronic products from company's which have after sales service for the disposal of product with take back policy	✓	
13	Reusing waste to produce new sustainable products	✓	
14	Hand over to the organization or recycler who knows proper disposal system	✓	

Environmental Audit

Sr. No.	Design Feature	Status	Remarks (If any)
1	Water and waste audit (includes water quality, solid waste generation, solid waste disposal process)	✓	
2	Fire Safety audit	✓	
3	Energy audit (includes energy consumption, thermal emission, visual comfort)	✓	

Green Program

Sr. No.	Design Feature	Status	Remarks (If any)
1	Green education to improve environmental awareness	✓	
2	Outreach relationships with local groups interested in environmental concern and satisfy their information needs	✓	
3	Reduce, Reuse and recycle the products such as books, electronic appliances etc. (e.g. At the time of de-selection and disposal of library material)	✓	
4	Digitization of majority of processes	✓	
5	E-archiving	✓	
6	E-resources : E books, Online Journals, membership of consortium	✓	
7	Subscription to databases	×	
8	Contribute library information on sustainability resources to a institute publication, blog or website	✓	
9	Selection of material content of which informs and assesses green practices (green computing, energy conservation etc.)	✓	
10	Use of eco-friendly reading material	✓	
11	Creation of “Green Team” in the institution	✓	
12	Recycling beyond paper i.e. Plastic, e-waste	✓	
13	Disseminating expert advice about sustainability to other colleges to make their own college greener	✓	
14	E Publishing reviews of new green resources in the newsletter or news	✓	

Swami Keshvanand Institute of Technology Management & Gramothan, Jaipur

INTERNAL ENVIRONMENTAL AUDIT REPORT

2017-18

Prepared by

Swami Keshvanand Institute of Technology, Management & Gramothan, Ramnagaria, Jagatpura, Jaipur-302017, INDIA
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Internal Environmental Audit Report

of

Swami Keshvanand Institute Of Technology Management & Gramothan, Jaipur

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Executive Summary

An environmental audit is a type of evaluation intended to identify environmental compliance and management system implementation gaps, along with related corrective actions. In its pursuit for improving environmental quality and to maintain a pristine environment for the future generation of students, Swami Keshvanand Institute of Technology, Management & Gramothan (SKITM&G) Jaipur (Raj.) has made a self-inquiry on environmental quality of the campus with the following main objectives:

- The purpose of the audit is to make sure that the practices followed in the campus are environment friendly.
- The specific objectives of the audit are to evaluate the compliance with the applicable regulations, policies, and standards to ensure that the development of the campus foster to the concept of environmental sustainability.
- To identify gaps and suggest recommendations to improve the environment quality status of the institution.

As an Institution of higher learning and research, SKITM&G is deeply concerned and unconditionally believes that there is an urgent need to address these fundamental problems and reverse the trends of environment degradation.

Being a premier institution of higher learning, SKITM&G is aware of its responsibilities towards environmental issues and therefore has resolved to play a major role in the education, research, policy formation and information exchange necessary for a sustained environmental campaign.

The methodology included physical inspection of the campus, observation, and review of the documentation, interviewing key persons and data analysis, measurements, and recommendations. It works on the several facets of 'Environmental conservation and sustainability' including Water Conservation, Tree Plantation, Waste Management, Paperless Work, Alternative Energy and Mapping of Biodiversity. With this in mind, the specific objectives of the audit was to evaluate the adequacy of the management control framework of environment sustainability as well as the degree to which the Institutions/Departments are in compliance with the applicable regulations, policies and standards. It can make a tremendous impact on student health, learning outcome, operational costs and the environment. The criteria, methods and recommendations used in the audit were based on the identified risks.

This report is compiled by a committee constituted by the college. As there was no standard model for such an environment audit of campuses in the state, the committee with the help of the staff/student volunteers who are part of the ECO friend Club, Renewable Energy Club, the major part of the data was compiled, which the committee analysed. The committee has made short term and long-term suggestions to take environment protection to higher levels and it is hoped that this will receive due attention of Institute authorities and also all stake-holders of the Institute.

Environment Audit Assessment Team

S.No.	Name	Designation & Department
1.	Dr.Vinita Sharma	Professor, Chemistry
2.	Dr.poonam Ojha	Assistant professor, Chemistry (Eco-friend club)
3.	Mr.Sourabh Singh	Assistant Professor, Civil
4.	Harshita Sharma	Student, Computer Science
5.	Badal Singh	Student, Electrical Engineering
6.	Vishal Dandia	Student, Information Technology,
7.	Kusum Sharma	Student, Electronics & communication

Introduction to environmental audit

Environmental Audit can be defined as systematic identification, quantification, recording, reporting and analysis of components of environmental diversity. The 'Environmental Audit' aims to analyse environmental practices within and outside the college campus, which will have an impact on the eco-friendly ambience. It was initiated with the motive of inspecting the work conducted within the organizations whose exercises can cause risk to the health of inhabitants and the environment. Through Environmental Audit, one gets a direction as how to improve the condition of environment and there are various factors that have determined the growth of carrying out such audit.

Environmental Audit in Academic Institutes

In 2006, Government of India has declared the National Environment Policy 2006 and made green audit mandatory to each industry. According to the policy it is a response to India's national commitment to a clean environment, mandated in the constitution in Articles 48 A and 51 A (g), (DPSP) strengthened by judicial interpretation of Article 21 (National Environmental Policy 2006).

It is recognized that the maintenance of the healthy environment is not the responsibility of the state alone. It is the responsibility of every citizen and thus a spirit of partnership is to be realized through the environment management of the country. The process of environmental audit was formalised by Supreme Audit Institution (SAI) according to the guidelines given in Manual of Standard Orders (MSO) issued by Authority of the Controller and Auditor General of India 2002.

The Supreme Audit Institution of India is the highest national Institution of auditing in the country. By realizing the need of responsibility towards environment, NAAC, an autonomous body under UGC has added the concept of environmental audit in accreditation methodologies of universities and colleges.

Environment audit can be useful tool for a college to determine how and where they are using the most energy or water or resources; the college can then consider how to implement changes and make savings.it can also be used to determine the type and volume of waste, which can be used for a recycling projects or to improve waste minimization plan.

It can create health consciousness and promote environmental awareness, values and ethics. It provides staff and students better understanding of environment impact on campus.

Need for environmental audit

If self-enquiry is a natural and necessary outgrowth of a quality education, it could also be stated that institutional self-enquiry is a natural and necessary outgrowth of a quality educational institution. Thus, it is imperative that the SKITM&G evaluates its own contributions toward a sustainable future.

As environmental sustainability is becoming an increasingly important issue for the nation, the role of higher educational institutions in relation to environmental sustainability is more prevalent.

Develop an eco-friendly approach to carry out the activities of the college as per the environmental norms. The need of the environmental audit is to provide framework far:

1. To safeguard the environment within the campus.

2. To motivate all stakeholders for optimised sustainable use of available natural resources.

3. To increase awareness among staff and students regarding different issues and solutions related to environment.

4. To enhance skills among the stakeholders to for environmental conservation and protection.

5. To frame the green policies that will enhance the ecological efficiency in the campus.

The National Assessment and Accreditation Council, New Delhi (NAAC) has made it mandatory that all Higher Educational Institutions should submit an annual Environmental & Green Audit Report. Moreover, it is part of Corporate Social Responsibility of the Higher Educational Institutions to ensure that they contribute towards the reduction of global warming through Carbon Footprint reduction measures.

Objectives of environmental audit

The main objective of the environment audit is to promote the Environment Management and Conservation in the College Campus. The purpose of the audit is to identify, quantify, describe, and prioritize framework of Environment Sustainability in compliance with the applicable regulations, policies, and standards.

In its pursuit for improving environmental quality and to maintain a pristine environment for the future generations of students, SKITM&G College has made a self-inquiry on environmental quality of the campus with the following objectives to achieve:

1. To undertake baseline survey regarding implementation of green practices in the College campus.

2. To identify and analyse significant environmental issues in campus.

3. To generate awareness among masses regarding various environmental issues.

4. To examine the current practices which can have impact on the environment such as of resource utilization, waste management, energy conservations, etc.

5. To provide alternative eco-friendly practices to meet the needs of the campus without affecting the environment of the campus.

6. To improve resource use through reduction in material use, to minimize wastes and to identify recycling opportunities.

7. To prepare environmental audit report and listing the green practices followed by College.

8. Development of ownership, personal and social responsibility for the university campus and its environment.

9. Developing an environmental ethic and value systems in young people.

10. To promote the concept of sustainable development to minimize the exploitation of natural resources.

About the Institute

Swami Keshvanand Institute of Technology, Management & Gramothan (SKIT) inspired from the learnings of Swami Keshvanand, was established in the year 2000 by Technocrats and Managers Society for Advanced Learning. Today the institute is recognized as one of the centres of academic excellence in Northern India. The institute is affiliated to Rajasthan Technical University (RTU), Kota, approved by All India Council for Technical Education (AICTE), New Delhi and Govt. of Rajasthan. Engineering branches are accredited by National Board of Accreditation (NBA), New Delhi and also by Institution of Engineers (I), Kolkata. SKIT offers –

Under Graduate Programme-B.Tech. (Bachelor of Technology) - Duration: 4 Years

1. Civil Engineering
2. Computer Science and Engineering
3. Electrical Engineering
4. Electronics and Communication Engineering
5. Information Technology

Post Graduate Programme -M.Tech. (Master of Technology) - Duration: 2 Years

1. Computer Science
2. Digital Communications
3. Power Systems
4. Production Engineering
5. Renewable Energy
6. VLSI Design

M.B.A.(Master of Business Administration) - Duration: 2 Years

1 Finance
2 Human Resources
3 Marketing

Research/Doctoral Programme-Ph.D (Doctor of Philosophy)

1 Computer Engineering (SKIT research centre is recognized by RTU, Kota)
2 Electrical Engineering (SKIT research centre is recognized by RTU, Kota)
3 Electronics and Communication Engineering (SKIT research centre is recognized by RTU, Kota)

Located in the Pink City Jaipur, which is a blend of traditional history and modern outlook, SKIT is putting in efforts for making industry ready engineers and managers through effective Industry –Institute Interface. Apart from University curriculum SKIT also pursues activities for research and development in various fields.

The Vision of the Institute is **"To promote higher learning in advanced technology and industrial research to make our country a global player" and the mission "To promote quality education, training and research in the field of Engineering by establishing effective interface with industry and to encourage faculty to undertake industry sponsored projects for students"**

The institution is developed with intellectually vibrant ambience in a serene and lush green environment. Comprising smart buildings with well-equipped lecture theatres, tutorial rooms, laboratories, Wi-Fi connectivity, hostels, canteen, mess, sports grounds, Learning Resource Centre, all in an eco-friendly environment.

The institute has one N.S.S. unit, which is doing tremendous job through organizing activities like blood donations, tree plantations, health check-up, etc. are conducted by this unit.

Swami Keshvanand institute of technology, management & Gramothan offering Academic and Research facilities to about 4124 students including research scholars in various Departments and Centres. A total of 500 teaching faculty and nonteaching staff are effectively working for the smooth functioning in the Institute.

The entire campus combines spacious and technologically driven blocks that are stretched with sprawling green areas. The various blocks are multi-storied buildings empowered with properly ventilated and spacious classrooms, laboratories and tutorial rooms and various seminar halls and auditoriums. The classrooms are equipped with smart classroom applications and audio and visual aids that foster quality training.

SKITM&G is using land for diverse purposes so that facilities are provided to all concerned for the smooth functioning and working. The Institute covers an area of 13.2 acre. After digital image processing of the area, the information about the area occupied by the various land uses from the map is gathered. The data is reflected in Table.

Table. Area under various land uses in the Institute.

Land use	**Area (in Sq-mtr.)**
Built up	14258.79
Green spaces	8875
Playground	12270.14
Road	13744.22
Vehicle Parking Spaces	1795.62
Others	2474.73
TOTAL AREA	**53418.50**

Methodology of Environmental Auditing

The purpose of the audit was to ensure that the practices followed in the campus are in accordance with the environment policy adopted by the institute.

To perform environment audit, the methodology included different tools such as physical inspection of the campus, observation, and review of the documentation, interviewing key persons and data analysis, measurements, and recommendations. The study covered the following areas to summarize the present status of environment management in the campus:

1. Water management
2. Green area management
3. Waste management
4. Biodiversity conservation
5. Energy Management
6. Clean Air

Auditing for Water management

Water audit is conducted periodically to determine water supplied in the distribution system as well as water lost and/or used within a distribution system. It aims to establish the water consumption pattern in individual sections, so as to realise the consumption levels with respect to exploring various pollution prevention and waste water minimisation opportunities. Water audit also helps to establish the existing water distribution system as well as waste water collection and recycling, if any. The water is supplied in the college by the ground water supply. The storage capacity of water in the college is shown in Table

Table. Total water storage capacity in the Institute

S.No.	Storage Resources	Number	Storage Capacity (in litres)
1.	Water Tanks	05	663,935
2.	Underground water tanks	03	46,433
3.	**Total Storage Capacity**		710,368

The total water consumption in the Campus is 2.50 lac litres per day in summers and 1.50lac litres per day in winters. The utilizations of such a huge resource of water include usage for cooking, drinking, cleaning, laboratory use, garden use, leakages and overflows sometimes. The waste water generated is disposed off into the underground sewage tanks through waste water drainage to STP in college campus.

Photo- Bore wells in the college

Moreover, Construction of bunds, terraces and drains has led to collection the run off and thus conserving the rainwater by rain water harvesting system in college.

The Institute is presently dependent on Bore wells which are presently 7 in numbers. The water is hard with average prevailing TDS 700.

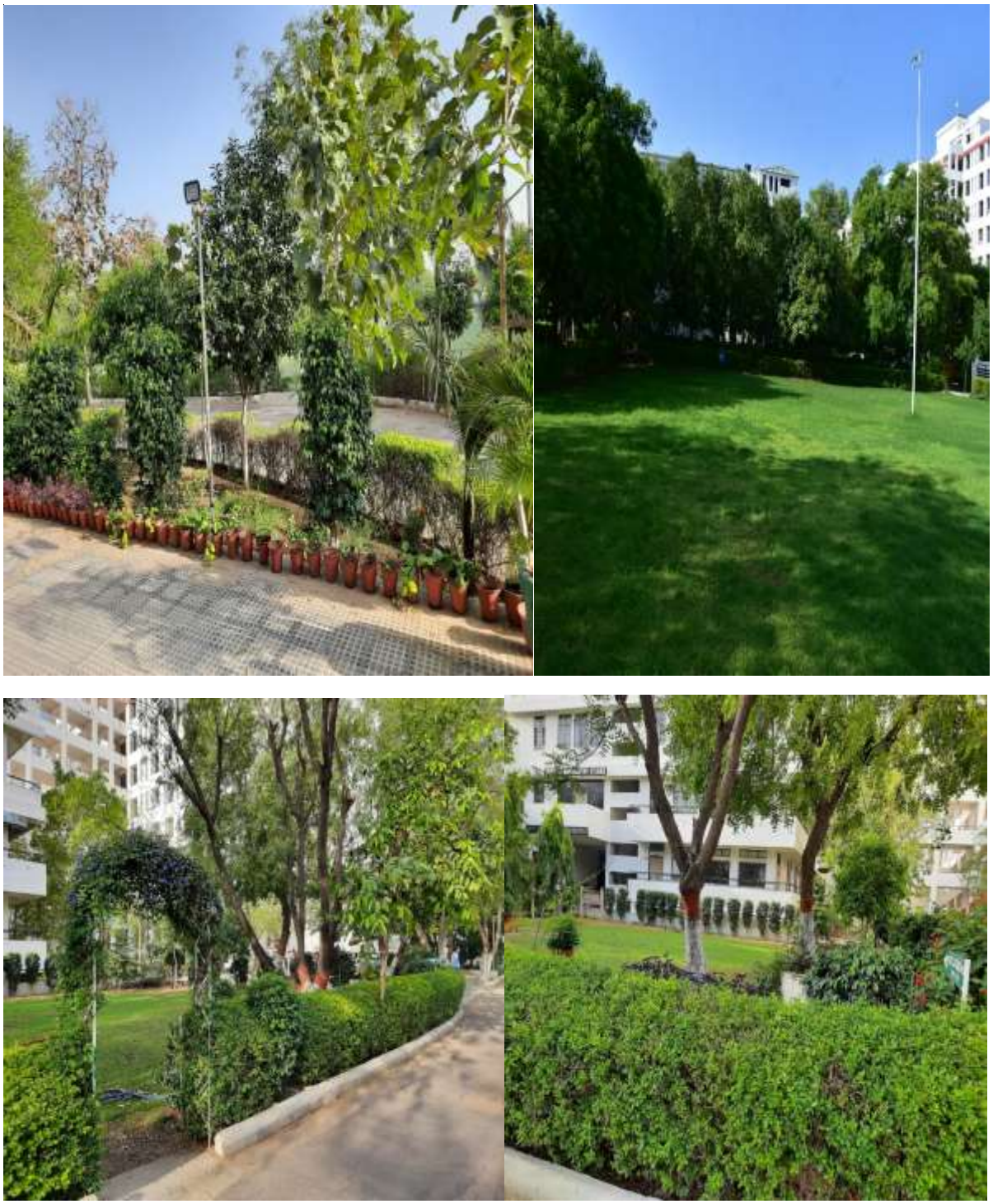
During the survey, no loss of water is observed, neither by any leakages, nor by overflow of water from overhead tanks. Water quality is enhanced by using ROs system installed in the campus to provide potable water.

RO System	Number	Capacity (in litres)
1	01	20
2	01	250
3	02	500
4	02	1000

Photo-RO System in SKITM&G

Auditing for Green Area Management

Due to extensive plantation drives the campus is turned into a lush green spot with fair magnitude of biodiversity. More than 3000 thousand saplings planted in the campus have assumed a full canopy now and have attracted a lot of faunal diversity including birds, reptiles and small mammals.



Photos-Green Spaces and Parks in SKITM&G Campus

Photo-Green Spaces and Parks in SKITM&G Campus

This includes the plants, greenery, and sustainability of the campus to ensure that the buildings conform to green standards. This also helps in ensuring that the Environmental Policy is enacted, enforced, and reviewed using various environmental awareness programmes.

The Institute has maintained the existing and added to the land scape environment of the Campus. This has made the campus layout beautiful and has been appreciated by all dignities and visitors visiting the campus. Campus is located in the vicinity of many trees (species) to maintain the biodiversity. Various tree plantation programs are being organized at university campus and surrounding villages through NSS (National Service Scheme) unit, ECO Club etc. This program helps in encouraging eco-friendly environment which provides pure oxygen within the institute and awareness among villagers.

Photo-Plantation drives carried out in SKITM&G

Auditing for Waste Management

Solid Waste Management-The solid waste management is in order with the installation of dust bins and their daily cleaning. The Institute has its own collection facility that collects the solid wastes daily from canteen, mess, Hostels and Departments. This helps in maintaining the cleanliness by providing an efficient, safe and regulated management of solid wastes in the Campus.

Photo-Solid waste collection service and dustbins provided by SKITM&G

The waste is segregated at source by providing separate dustbins for Bio-degradable and Plastic waste. Single sided used papers are recommended for use for writing and printing in all departments.

Most of the official correspondence is through emails. Metal waste and wooden waste is stored and given to authorized scrap agents for further processing. The solid waste is collected by the municipal corporation and disposed by their methods.

The data showed that the total generation of solid waste in the Campus is 500 kg per day. Out of which non-biodegradable is 50 kg per day while the biodegradable is 450 kg per day.

First of all there is no food waste in campus but in case if any food is left after use then this food is distributed between needy persons around the college.

Waste generated from tree droppings and lawn management is a major solid waste generated in the campus. It is noteworthy that SKITM&G has adopted an environmentally sound practice of converting biodegradable waste into composting which is a useful resource. The composting produced is used in the gardens of the Institute.

Photo- Composting in SKITM&G

Liquid Waste Management

Liquid wastes that are generated in the institute are-

- Septic tank effluents from various sanitary blocks.
- Water used for washing and cleaning of utensils etc. from canteen and washing of hands.
- Waste water from laboratories using chemicals.
- Reject water from RO plant.

College has got few open drains to convey this water. Wastewater generated from the toilets is disposed of into septic tanks located at different places in the campus and their effluents combined with canteen waste water is used for gardening, watering tress etc. The excess waste water is being directed into natural drain passing near by the campus.

One STP have been installed with following capacity:

(1) STP No -1 —2.25litre/ day

Photo-STP in SKITM&G

E-Waste Management

E-waste mainly include obsolete electronic devices such as, computer system, servers, monitors, electrical components etc. E-waste are disposed-off through authorized vendors. It is required to establish the authenticity of vendors.

Time to time college conduct swachhata abhiyaan through NSS club, ECO Friend club.

Auditing for Biodiversity conservation:

The practices for the conservation of biodiversity is well adopted in the campus. This is done by planting local tree species, arranging food, and shed for the birds. This indicator addresses the extent of flora and fauna inside the campus and initiatives adopted by the Institute for Maintenance and conservation. The different types of species of plants growing naturally and planted to provide sustainability to the man-made ecosystem.

The college campus is lush green with plantations of ornamental plants, trees, shrubs, and herbaceous species. It has a well-maintained gardens and lawns.

Regular plantation of different types of plants is undertaken on important occasions like "World Environment Day, with the participation of staff and students. The lush green campus of the environment is attracting the migratory bird particularly during the winter seasons. Adequate arrangements have been made to provide water and feed to the birds.

Photos- Arrangement of food and shed for the birds in SKITM&G

Auditing for Energy

According to the definition in the ISO 50002 standard, an energy audit is a systematic analysis of energy use and energy consumption within a defined energy audit scope, in order to identify, quantify and report on the opportunities for improved energy performance.

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 facility.

It quantifies energy usage according to its discrete functions. The energy is utilized in the campus for transportation, lighting, space heating and cooling, running of lab instruments, appliances, water heating, ground water pumping, cooking, etc.

The data regarding the energy consumption in the SKITM&G is as following:

Table -Total energy consumption of the SKITM&G College

S.No.	Energy Sources		Consumption (annual)
1.	Electricity	Electricity Purchased	9.87030 lakh kW
		Generated (Solar Power Plant)	3.63523lakh kW
2.	Fuel	LPG	1825 cylinders
3.	Fuel Oil	Diesel	75,000 litres

The data in table indicated that the Institute utilises renewable as well as non-renewable energy sources to meet its energy needs.

Most of the energy utilized for lighting, space heating and cooling, pumping, running of instruments is supplied by hydropower generated electricity from state government.

In addition to solar, two diesel generators of 320kW &220kW are installed as backup power in case of power cuts.

Photo- Diesel generators installed near Gate No.2

SKIT is the first total green campus in Rajasthan with 900 kW Solar Power Plant (400 kW Rooftop + 500 kW Captive).

Photo- Solar Power Plant, SKITM&G (400 kW Rooftop)

Photo- Solar Power Plant, Bikaner (500 kW Captive)

Most of the energy requirement of the Institute is met by purchased electricity supplied by the State Government. Some amount of energy requirement is met out of the power generated by the Solar Power Plant commissioned in the Institute.

Transportation is an important part of any institution relying on the energy consumption. SKITM&G campus provides transport facility to both students and staff. So Far Institute owns 18 Operational vehicles of different capabilities which are being used for pick and drop services to distant areas, field surveys and other purposes.

Photo-BUS

Vehicle pooling is among both students and faculty and use of bicycles is promoted by Institute. In its eco-friendly approach, the Institute has brought in use an electrically operated cab that runs within the campus carrying differently abled persons to from respective gates to different destinations inside the campus.

Photo- Electrically operated cab

Auditing for Air

Air is one of the essential elements for sustainability of life on this planet. This is often most polluted by humans along with water. It is required monitor its quality frequently to establish its goodness. Physically due to greenery and absence of polluting industries are processes in the vicinity the air quality appears to be very good. In addition the parking area and bus bay are maintained clean by paving and regular cleaning giving no scope for dust rise. Also the road sides are all covered with plants and trees aiding for good air quality.

Photos-Roadside plantation

Suggestions

The committee has made short term and long term suggestions to take environment protection to higher levels and it is hoped that this will receive due attention of Institute authorities and also all stake-holders of the Institute.

1. Environmental auditing may be conducted by the Institute in every two years. The college can also offer consultancy projects on environmental auditing for other academic and research institutions.
2. Specific waste management plans should be adopted to manage solid waste in the campus, with the assistance of State Swachhta Mission and use of plastic carry bags, thermocol cup, plate and flex boards should be banned inside the campus.
3. For managing organic wastes, biogas plants may be commissioned at the hostels, canteens, and mess. There should be a system for the management of hazardous wastes.
4. The public lights within the campus may be run with solar panels and the replacement of existing lights should be done with LED lamps.
5. Green habitat concept should be adopted for all the building construction activities of the college in future, which may help a long way in reducing energy usage, increasing aesthetic appeal of the buildings and class rooms, besides reducing carbon foot print.
6. Reuse and recycle of water system are necessary. Although the wastewater from the RO water purifier is used for gardening purpose, the scope can be increased to large scale re-cycling of water
7. Promote environmental awareness through scientific lectures, conferences, seminars, Independent research projects, and community service.
8. Celebrate every year June 5 as 'Environment Day' and plant trees on this day to make the campus Greener.
9. Important and confidential papers after their validity to be sent for pulping.
10. Botanical garden to be established with plants of ethno botanical & medicinal importance.
11. More underground water tanks are required for water storage and metering of water from bore well and other sources in different uses should be installed.

Conclusions

The environmental awareness initiatives undertaken by the Institute in the ten years of its existence are substantial. The installation of one units of STP for waste management and rain water harvesting systems is noteworthy. Besides, environmental awareness programmes initiated by the administration/departments shows how the campus is going green. Few recommendations are added like more efficient waste management using eco-friendly and scientific techniques. This may lead to the prosperous future in context of Green Campus, thus fostering sustainable environment and community development.

As part of environment audit of campus, we carried out the environmental monitoring of campus including illumination and ventilation of the classroom. It was observed that illumination and ventilation is adequate considering natural light and ICT facility are provided in all the Lecture Theatres and Classroom on need basis. In addition, WIFI is provided to the entire Campus including Hostels.

References:

•The Environment [Protection] Act — 1986 (Amended 1991) & Rules-1986 (Amended2010)

•The Petroleum Act: 1934 — the Petroleum Rules: 2002

•The Central Motor Vehicle Act: 1988 (Amended 2011)

•Energy Conservation Act 2010.

•The Water [Prevention & Control of Pollution] Act — 1974 (Amended 1988)

•The Air [Prevention & Control of Pollution] Act — 1981 (Amended 1987) the Air (Prevention & Control of Pollution) Rules — 1982

• E-waste management rules 2016, Electrical Act 2003 (Amended 2001) / Rules 1956(Amended 2006)

•The Hazardous Waste (Management and Handling and Trans-boundary Movement) Rules, 2008 (Amended 2016)

•The Noise Pollution Regulation & Control rules, 2000 (Amended 2010)

•The Batteries (Management and Handling) rules, 2001 (Amended 2010)

•Relevant Indian Standard Code practices

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