ENERGY, ENVIRONMENT & GREEN AUDIT REPORT

DETAILS OF THE CLIENT

THAMIRABHARANI ENGINEERING COLLEGE

Thatchanallur, Tirunelveli – 627 358, Tamil Nadu, India

DATE OF AUDIT

13 JUNE 2018

(Audited and Accounted from June-2017 to May-2018)

AUDIT CONDUCTED AND SUBMITTED BY

RAM-KALAM CENTRE FOR ENERGY CONSULTANCY AND TRAINING

(Chennai ♦ Coimbatore ♦ Erode)

Mobile: +91- 80567 19372, 99420 14544 (Whatsapp) E-mail: ramkalamcect@gmail.com

1.1: Preface about the Institution:

- **Thamirabharani Engineering College** which is in the Tirunelveli Corporation limits is located at Thatchanallur, 5km away from Palayamkottai and 40 km from Tuticorin airport. Unfolding its grandeur over 25 acres of land, the college exhibits an attractive panorama conducive to studies. Considering a holistic approach to life and education, an ambient infrastructure is provided for the students. They enjoy a natural sanctuary of birds, magnificent scenery of evergreen trees and amazing mountains and a gorgeous garden of multicoloured flowers. **Thamirabharani Engineering College** was founded with the noble vision to raise professionals and leaders of high academic calibre and unblemished character, nurtured with a strong motivation and commitment to serve humanity. TEC aims at educating & training its students to become not only competent professionals but also excellent human beings to influence the quality of life of people around.
- **Thamirabharani Engineering College** was established with the goal of producing outstanding students in Technical and Business fields and preparing them to tackle the challenges of a dynamic and rapidly changing world. The management implements an interdisciplinary approach to the programs of Anna University, making sure that practical applications are combined with the classroom material. All the programs offered by the institute are recognized by and affiliated to statutory bodies like the All India Council of Technical Education (AICTE), New Delhi and Anna University, Chennai. In a nutshell, Thamirabharani Engineering College is a co-educational, residential, technological college imparting holistic education to develop the technical and the character of the students.

1.2: Vision:

- To be a center of excellence in Engineering, exposing emerging technologies and instilling Entrepreneurial Attitude.

1.3: Mission Statement:

- Empower students through effective teaching and learning process for the development of critical thinking, effective communication and creativity.
- Develop industry readiness by encouraging learning by doing, exposing current innovation and providing adequate facilities for Research.
- Create the entrepreneurship desire by developing individual skills, professional ethics, moral values and societal concern.

1.4: Quality Policy:

We are committed to produce excellent technical personnel with ethical and moral values for overall growth of the country through;

- Resolute efforts at all levels.
- Continuous improvement in infrastructure.
- Improved teaching-learning process by committed and continually trained faculty.

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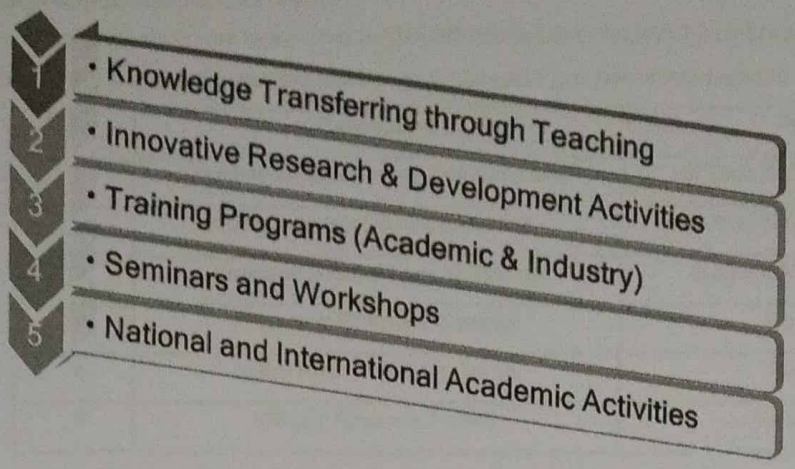
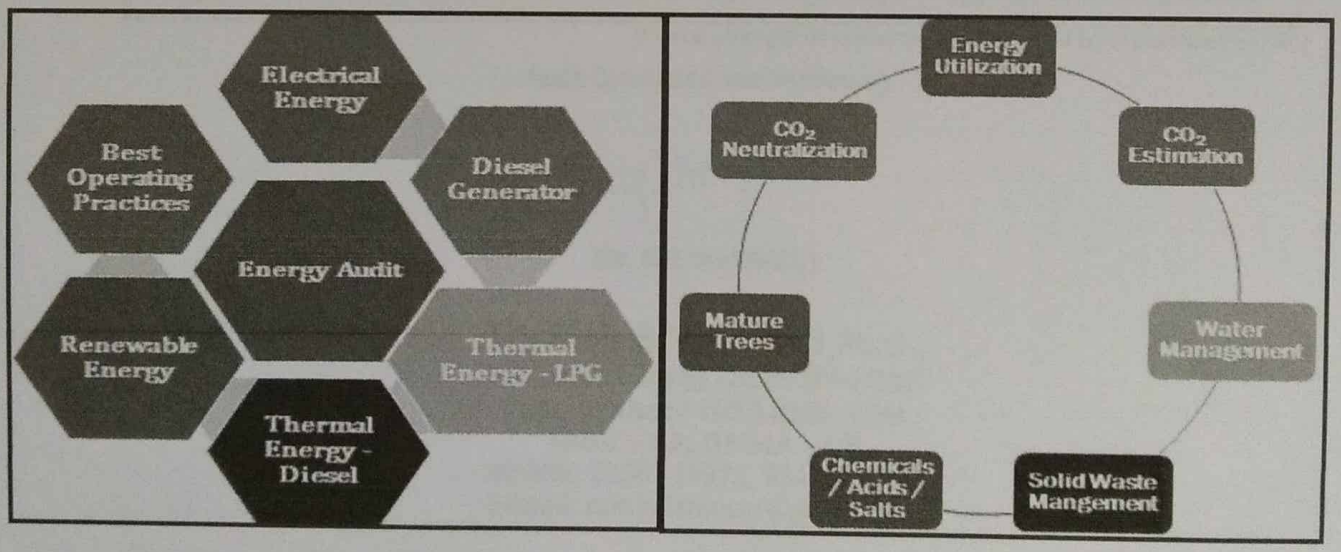
1.5: Major Activities in the Institution:



1.6: Scope of the Audit Process:

- **Energy Audit:** To conduct a detailed energy audit in the college campus with a main focus to identify judicious usage of electrical and thermal energy (where, when, why and how energy is being utilized).
- **Environmental Audit:** Identification of history of activities, present environmental practices followed, monitoring records and known sources of environmental issues inside the college.
- **Green Audit:** Assessment on Campus greenery in terms of mature trees, flowering shrubs, bushes, medicinal plants, adoption of green energy generation and utilization, reduction of CO_2 due to green energy system and identification of possible implementation and enhancement of current greenery practices.

1.7: Coverage in Energy, Environment & Green Audit Process:



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EXECUTIVE SUMMARY

2.1: Analysis of Energy Audit Process:

A detailed audit was conducted in THAMIRABHARANI ENGINEERING COLLEGE, Thatchanallur, Tirunelveli – 627 358, Tamil Nadu, India and the summary of the audit process is represented below:

S. No.	Description	Parameters
1.	Present Annual Energy Consumption	96,249 kWh + 4,182 kg of LPG
2.	Proposed % of Energy Savings	10.0 % Electrical + 5.0 % LPG
3.	Proposed Annual Energy Savings	9,625 kWh + 209 kg of LPG
4.	Proposed Financial Savings	Rs. 1.0 Lakhs
5.	Initial Investment Required	Rs. 1.8 Lakhs
6.	Simple Payback Period	Nearly 1.8 Years

2.2: Analysis of Environment Audit Process and CO_2 Balance Sheet:

S. No.	Annual Energy Consumption & CO_2 Emission			Annual CO_2 Neutralization		
	Description	Annual Usage	CO_2 Emission (Tons)	Description	Annual Usage	CO_2 Neutralized (Tons)
1.	Diesel	63,269 Litres	167.0	Mature Trees	626 No's	13.6
2.	Electrical Energy	96,249 kWh	78.9			
3.	LPG	4,182 kg	12.5			
4.	Total Emission		90.3	Total-Neutralized		13.6
Balance CO_2 to be Neutralized = 258.5 Tons/Annum & Per Capita CO_2 Consumption = 0.33 Tons/Annum [1]						

([1] Total strength of students, teaching and technical staff = 734)

Audit Conducted and Verified by

S.R. Sivarasu

(Dr. S.R. SIVARASU)

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3.1: Observations – Electrical and Thermal Energy Systems:

S. No.	Description	Parameters
Electrical Energy (Consumption)		
1.	Name of the customer (As per the utility bill)	**KALAIARASI EDUCATIONAL TRUST & M.R. PAULRAJ THAMIRABHARANI ENGINEERING COLLEGE**
2.	Type of Utility Supply, Service No.& Tariff	LT SC. No: 07-007-013-230;Tariff-LT-II—B2 LT SC. No: 07-007-013-545;Tariff-LM-61 (Temporary Supply)
3.	Tariff Structure	Rs. 7.50/kWh + Rs. 120 as demand charges – College Rs. 12.0/kWh + Rs. 690 kVA as demand charges – Temporary
4.	Permitted Demand (PD)	LT SC. No: 07-007-013-230; **99.83 kW** LT SC. No: 07-007-013-545; **4 kW**
5.	Specification of the Diesel Generator (DG) Set	**63 kVA** (200 L internal tank), Air-cooled – **1 No**

Electricity from EB	Electricity from DG	Diesel Consumption for DG
96,249 kWh (Both service)	800 kWh (0.8 % Contribution)	250 Litres

6.	Types of Thermal Energy Used	Liquified Petroleum Gas (LPG)	Cooking
		Diesel (Ordinary)	Transport + DG
Annual Thermal Consumption		LPG Consumption – 4,182 kg Diesel for Transport – 63,019 Litres	

General Loads (Both Electrical and Thermal)		
7.	Lighting System	• **Indoor lighting**: Conversion of Florescent Tube Light (FTL) into LED in a phased manner • **Outdoor lighting:** Combination of FTL, CFL & LED
8.	Fan Loads (Ceiling)	• All the indoor ceiling fans are conventional fans.
9.	HVAC System	• Unitary air conditioning system installed in the required places • Most of the AC units are **BEE star rated** and the outdoor units are mostly placed in shading.
10.	Motors and Pump loads	• Mainly used for water distribution & purification. • Small motors are used in kitchen equipment's.
11.	Uninterrupted Power System (UPS)	• All the computers, servers, surveillance systems, projectors, telephonic units are connected with UPS (**35 kVA Capacity**) with nominal back up time of **15-30 min.**

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Table-1: Annual Consumption of Electrical & Thermal Energy Parameters (2017-18)

S. No.	Month	Electricity Consumption/ Generation (kWh)			LPG Consumption (kg)	Diesel Consumed (L)		
		SC. 230	SC. 545	From DG		DG	Transport	Total
1.	Jun-17	3,414	460	0	204	0	4,335	4,335
2.	Jul-17	7,329		0	238	0	5,389	5,389
3.	Aug-17	8,592	710	218	340	68	5,297	5,365
4.	Sep-17	11,320		102	340	32	5,134	5,166
5.	Oct-17	8,656	590	0	374	0	5,021	5,021
6.	Nov-17	8,584		102	408	32	5,186	5,218
7.	Dec-17	4,853	410	0	340	0	5,015	5,015
8.	Jan-18	6,400		102	408	32	5,547	5,579
9.	Feb-18	8,665	730	96	374	30	5,497	5,527
10.	Mar-18	9,469		0	408	0	5,625	5,625
11.	Apr-18	8,670	570	179	340	56	5,535	5,591
12.	May-18	6,827		0	408	0	5,438	5,438
Average		**7,732**	**289**	**–**	**349**	**–**	**5,252**	**5,272**
Total		**92,779**	**3,470**	**800**	**4,182**	**250**	**63,019**	**63,269**
(The average cost of the I) electricity is Rs. 8.80/kWh & II) LPG is Rs.60/kg)								

3.2: Environmental Audit Process:

1. All the transport vehicles are having pollution certificates and maintaining the emission level within the Pollution Control Board limits
2. Chemicals, Acids and Salts used in the science departments are properly handled and disposed
3. The management wisely thinking and implemented a comprehensive Solid Waste Management (SWM) system. Based on the SWM procedure, all the degradable wastes are properly collected, segregated, stored and disposed
4. All types of non-gradable wastes are disposed through third party at regular interval
5. The list of transporting vehicles available in the college campus along with their type of engine are represented in Table.

S. No.	Type of Vehicle	Quantity	Purpose
1.	Bus	17	Transporting students + staff
2.	Van	02	

6. Most of the AC system has **R-22** as refrigerant which has **Global Warning Potential (GWP) of 1,810** and **Ozone Depletion Potential (ODP) is Medium**. Some of the newly installed AC system are having R-410 A as refrigerant which has **Global Warning Potential (GWP) of 2.068** and **Ozone Depletion Potential (ODP) is Zero.**

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3.3: Green Audit Process: RO Plant and Treated Water for Drinking Application:

- The college management is keen on providing uninterrupted, safe and healthy drinking water to all; throughout the year.
- The specifications of RO Plant and distribution of water to the entire campus is given in Table-2.

Table-2: Specifications of RO Plant

S. No.	Parameters	Description
1.	Total no. of RO Plant	• 05 No's (Total 450 LPH)
2.	Location of RO Plants	• Main Building – 50 LPH – 1 No
		• EE Building – 50 LPH – 1 No
		• CSE Building – 50 LPH – 1 No
		• Mechanical Building – 50 LPH – 1 No
		• Hostel – 250 LPH – 1 No
3.	Source of raw water	• Bore & Open well water
4.	% of RO & grey water output	• 70 % RO water : 30 % grey water
5.	Usage of grey water	• Used for gardening & vessel cleaning
6.	Cleaning schedule of filter	• Once in three months (Replaced every year)
7.	Cleaning schedule of membrane	• Yearly twice
8.	Functioning of RO Plant	• Manual operation
9.	Quality of RO water	• Internally tested
10.	RO water storage	• Stored in the HPDE tanks connected with taps for distribution
11.	RO water tank capacity & location	• 15 Litre in Mech building – 1 No
		• 15 Litre in Civil building – 1 No
		• 15 Litre in EEE building – 1 No
		• 15 Litre in ECE block – 1 No
		• 15 Litre in Main building – 3 No
		• 1,500 Litre in Hostel – 1 No (For both boys & girls hostel)

3.4: Rain Water Harvesting (RWH) – from Building Roof Area & Run-off Area:

- The audit team appreciates the effects taken by the management of **Thamirabharani Engineering College** for harvesting the rain water almost in all buildings.
- The roof area is so arranged to collect the rainwater and then passed through proper piping system, and then bring back to the RWH pits which are located close to each pits
- The building run off are collected through each pits mostly located in each buildings. Common area and road run-off are properly collected and routed to i) Pond and ii) Open well.

3.5: Solid Waste Management:

The college management practised some methods to treat the waste generated and Table-3 shows the process of treating the solid waste generated inside the college campus.

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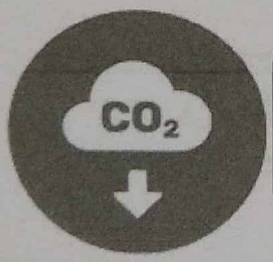
Table-3: Process of Waste Management

S. No.	Waste Type	Waste Treatment
	Bio-Degradable Waste Management	
1.	Food and Vegetable Waste	Collected and dumped in a yard (used as manure)
2.	Garden Wastes and Plant Leaves	Daily collected and dumped in a yard
3.	Paper Waste	Collected and stored in a separate place
		Sold to third party for recycling
4.	Napkin Pads	Collected, dumped in a yard; set fire and destroyed
	Non-Bio-Degradable Waste Management	
5.	Plastics	Banned in the college campus (Welcome step). The chemical/salt storage plastic containers are disposed to third party
6.	Metals	Construction metals or metals from any other sources are stored in a separate place
		Used for sale to third party for recycling
7.	Transport Oil + Tyres	Stored in a separate place and used for sale to third party
8.	Transport Vehicle and Computer Batteries	Procuring new batteries with buyback offer (old battery replacement)
9.	Used edible oil	Almost zero waste. Mostly used for internal cooking and frying.
10.	E-Waste Management	Used for sale to third party for recycling

3.6: Observations – Green Audit Process:

The college is completely covered with mature trees grown for more than 10 years. The total number of mature trees available in the college campus is ***626 with 30 varieties of trees.*** Apart from the mature trees; preserving the ecology; the entire college campus is planted with various flowering shrubs and bushes.



Total No. of Mature Trees available in the college campus is **626** which contributes for reduction of **13.6 Tons of CO_2 emission/Annum**

3.7: Availability of Landscaping & Indoor Plants:

- Indoor plants not only looks beautiful, but also brings life to our living space. They also help purify the air. According to a study of NASA even a small plant inside the workspace can help remove at least three household toxins (think benzene, formaldehyde, and trichloroethylene, which are carcinogenic chemicals commonly found in stagnant indoor environments)
- The college has planted many indoor plants which acts as a natural air purifier one can try with indoor area to remove toxins and improve air quality.

- Here are the list of the indoor plants which acts as a natural air purifier that one can try with indoor area to remove toxins and improve air quality. The variety of indoor plants are i) Snake Plant, ii) Spider Plant, iii) Aloe Vera, iv) Money Plant (Devil IVY), v) Bosten Fern, vi) Chrysanthemum and vii) Kimberly Queen Fern

4.0: RECOMMENDATIONS OF THE AUDIT PROCESS:

I. Energy Conservation & Management:

1. Battery voltage of each UPS must be measured and monitored. This ensures good practices on UPS & battery maintenance.
2. Prepare and adhere a cleaning schedule for UPS (both inside and outside the cabinet) and ensure proper heat dissipation
3. Convert (one to one) the existing Fluorescent Lighting into non-blue tinge LED lightings in most utilized areas.
4. Conduct some kind of awareness programmes on Energy Conservation to all the stake holders.

II. Environmental Management:

1. Develop a policy for waste handling and management
2. Segregation of different types of waste has to be done at source level
3. Establish an MoU with the third party to safely dispose the wastes
4. Conduct a study on water utilization in the college campus
5. Prepare a plan for maximum water utilization from natural source and reduce the water consumption from the bore wells
6. Convert the existing conventional pumps into BEE star rated energy efficient pumps which directly saves nearly 15 % of present energy consumption
7. Install drip irrigation or low pressure water sprinkler for gardening water supply
8. Conduct a study on availability of matured trees inside the campus along with their location, botanical name and landscape area.
9. Prepare a plan to increase the coverage of i) tree and ii) renewable energy sources.

COMPLETION OF THE REPORT

This report is prepared as a part of the Energy, Environment and Green Audit process conducted at **THAMIRABHARANI ENGINEERING COLLEGE,** Thatchanallur, Tirunelveli – 627 358, Tamil Nadu, India by **RAM-KALAM CENTRE FOR ENERGY CONSULTANCY AND TRAINING,** Coimbatore – 641 062.

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CERTIFICATE FOR ENERGY-ENVIRONMENT-GREEN AUDIT PROCESS

This is to certify that, we have conducted an ***ENERGY-ENVIRONMENT-GREEN AUDIT*** in **THAMIRABHARANI ENGINEERING COLLEGE**, Thatchanallur, Tirunelveli – 627 358, Tamil Nadu, India on **13 JUNE 2018**. The description of the audit process is given below.

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Recommendations of the Audit Process:

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9. Prepare a plan to increase the coverage of i) tree and ii) renewable energy sources.

Equipment's/Systems Audited:

• Electrical System & Network	• Motors & Water Pumping Systems
• Lighting, Fan & Air Conditioning System	• Cooking System Maintenance
• Inverter, UPS & Battery System	• LPG Consumption
• Diesel Consumption (Vehicles + DG)	• Solid & E-Waste Handling & Management
• Usage of Chemical, Salts & Acids	• RO Plant & Water Distribution System
• Coverage of mature trees	• Pollution certificates for all transport vehicles
• Rain Water Harvesting	• Survey on Bio-diversity

Note: Audited and Accounted from June-2017 to May-2018

Audit Conducted and Verified by

S.R. Sivarasu

(Dr. S.R. SIVARASU)

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