Gharda Institute of Technology(GIT)
Energy Audit Report

25/02/2021
Gharda Chemicals Ltd
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EA 21958 (BEE)

For Gharda Chemicals Limited

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1. Introduction

The Gharda Institute of Technology approachedGhardaChemicals Limited to conduct a preliminary energy audit as the primary step of an objective to develop an energy efficiency roadmap to transform and improve their energy performance

The overarching objectives of the exercise were to:

- Determine the energy conservation potential for a typical GIT basedon technological interventions

- Determine the energy losses which can be prevented through proper measures and timely action.

- Determine the energy conservation potential for a typical GIT basedon architectural interventions (especially related to conditioned space insulation)

- Establish the comparative financial feasibility of proposed alternatives on a life-cycle cost basis

2 Project Scope

The geographical scope of the project comprised execution of a preliminary 1-day

Energy audit of Gharda Institute of Technology, Lavel, Tal:Khed, Dist: Ratnagiri.

The systems studied and assessed as part of the Energy Audit and Energy Conservation

Strategy devising process included the following:

- Split ACs, Window ACs

- Lighting Systems: TFL Lights and CFL Bulbs

3 Preliminary Energy Audit Report

3.1 Electricity Consumption

The baseline energy consumption of the GIT researched through utility bills. The monthly energy consumption and other electrical load parameters for the period of Oct2019 to Jan2021:

Bill Month	P.F	MD kVA	kVAhconsmn	kWh consmn	Difference kVAh-kWh	PF Penal/ Incent	Total Bill in Rs.	Per Unit Cost Rs/Kwh
Oct-19	0.982	117	44542.00	43620.00	922.00	-9898.35	617625.31	14.16
Nov-19	0.985	115	39710.00	39044.00	666.00	-12078.44	576591.95	14.77
Dec-19	0.969	109	25023.00	24194.00	829.00	-3117.18	375990.08	15.54
Sep-20	0.962	119	21777.00	20950.00	827.00	NA	311172.28	14.29
Oct-20	0.945	119	19545.00	18470.00	1075.00	NA	280825.56	14.37
Nov-20	0.919	119	14337.00	13175.00	1162.00	NA	220595.54	15.39
Dec-20	0.912	119	15500.00	14136.00	1364.00	NA	232338.31	14.99
Jan-21	0.902	119	18053.00	16283.00	1770.00	NA	262456.73	14.54

- GIT maintaining Power factor unity and taking power factor rebate in the Monthly bills from the MSEDCL.
- Last year due to Covid-19, their APFC relay which was malfunctioning, could not be repaired hence PF lowered.
- This has led to increased kVAH consumption which can be controlled by proper monitoring.

3.1.2 Lighting System

The lighting system of the GIT was assessed through visual observation, technical specification data recording and luxmeter readings. The resulting information related to the lighting fixture types, loads and lux levels is presented below.

- GIT has replaced 40watts tube lights with 200 nos. 24watts LED lamps in all corridors.

Wing	Location	No. of tube Light	Lux	Recommended Values of Illumination and Glare Index(Clause 6.6.1 of NEC)
A	Project office	1	152/116	150
	H R office	4	180/190	150
	waiting room	1	170	150
	Registrar cabin	2	474/340	300
	P A room	1	238	150
	principal cabin	4	227	150
	toilt room-1	1(10w LED)	117	100
	toilt room-2	1(11w CFL)	24	100
	computer hall	16	114	150
	faculty room	2	72	300
	account officer cabin	1	58	150
	academic section	1	83	150
	staff counter-1	1	306	300
	staff counter-2	1	214	300
	staff counter-3	1	190	300
	conference hall	36w (PL)	517	300
	Trustee cabin	2	186	150
	TPO cabin	1	144	150

B(Ground)	BEE lab-1	16	56	300
	BEE lab-2	9	75	300
	faculty room-1	1	345	150
	faculty room-2	1	75	150
	chemistry lab-1	16	172	300
	chemistry lab-2	6	246	300
	faculty room	1	97/105	150
	faculty room	1	105	150
	HOD(FE) cabin	1	57	150
	physics lab	8	80	300
	faculty room	1	60	150
	server room	2	115	150
	seminar hall	15	130	300
	class room-1	9	120	150
	class room-2	9	120	150
	class room-3	9	120	150
	communication lab	10	82	300
	faculty room	4	260/90	150
	Mechanics lab	14	130	200
B(Ist floor)	Store room	2	105	150
	Exam room	12	90	300
	class room-1	12	114	150
	class room-2	8	95	150
	class room-3	12	95	150
	HOD(chem) cabin	1	130	150
	faculty room-1	1	130	150
	faculty room-2	1	130	150
	faculty room-3	1	88	150

C(Ground)	class room-1	9	70	150
	class room-2	9	70	150
	class room-3	9	70	150
	HOD(mech) cabin	3	72	150
	CAD lab	6	112	300
	faculty room-1	3	145	150
	faculty room-2	2	100	150
	computer lab	6	110	300
	Heat & mass Trans. Lab	9	75	300
	AIC lab	6	90	300
	Fluid lab	6	70	300
C(Ist floor)	Multimeadia lab-1	6	50	300
	Multimeadia lab-2	6	82	300
	HOD(comp) cabin	4	100	300
	class room-1	9	75	150
	class room-2	9	75	150
	class room-3	9	75	150
C(2st floor)	class room-1	9	85	150
	class room-2	9	85	150
	class room-3	9	85	150
	faculty room-1	3	80	150
	faculty room-2	3	85	150
	computer lab	6	87	150
F	HOD(civil) cabin	2	65	150
	Building material lab	8	80	300
	class room-1	6	125	150
	class room-2	6	125	150
	class room-3	6	125	150
	computer lab	6	100	300
	Envirolment lab	6	185	300
E	Reading room(boys)	18	127	150-300

	Reading room(girls)	24	125	150-300
	Incharge-library	2	108	70-150
	Hostal room (Girls)	2	86/90	100
Hostel	Hostal room (Boys)	2	105	100

- Some of the areas highlighted are not having adequate lighting levels. Necessary arrangement has to carry out to keep their illumination levels as per the standard.
- Need to recheck (every year) the Lux-level in all areas as the data is few years old

4. Energy Conservation opportunities.

4.1 Existing 40 watts tube lights can be replaced with 18 watts Led tube light fittings. The 18 watts tube light specifications are

- Power Factor: >0.92
- Lighting Efficiency: > 85%
- CRI: >75
- Work Frequency: 50Hz
- Constant Circuit Error: <2%
- Microwave/Noise: <240mV
- Short Circuit Protection: OK
- Operation Temp: -20C~65C (-4F~149F
- Lighting Source: SMD3528 Episar
- Efficiency: 100 lm/w
- Beam Angle: 120degree

Fitting	Actual	Total	Operating	Annual	Annual	Unit	Annual

Type	wattage	Fittings	hours per day	working hours	consumption in kwh	charge	Energy Charges
1X40 Watts	55	250	4	1460	5018	10.21	51,233
1X18W	19	250	4	1460	1733	10.21	17,693

Pay back calculations

Energy Charges for 36W FTL	51,233
Energy Charges for 18 W FTL	17,693
Cost of 18W LED fitting (250 X Rs 1000)=	2,50,000
Annual saving of electricity cost	33,540
Payback after replacing the Led lamps 2,50,000/8,34,769	7.4 years

4.2 Occupancy Sensors for Infrequently Occupied Areas

Energy consumption from college staircase12, toilets that do not require continual lighting to infrequent occupancy can be significantly diminished by use of Passive Infrared Sensors- PIR Sensors to controls lighting fixtures. Incorporating PIR Sensor-control in tube lights, used 12 hours per day (approximate usage in stairwell lighting applications), can mitigate energy consumption.

4.3A**/C units**

Sr.No	Type Of A/C unit	TR	Qty	Installed KW

1	Window	1.5	6	7.2
3	Split	1.5	25	42.5
4	Split	2	2	4.4
	Total		**33**	**54.0**

4.3.1How use A/C effectively

- Run it at 25 to 28 degrees Celsius.
- Try to insulate the room from all sides.
- Check its star rating.
- Shade your condensers. A well-shaded condenser will use up to 10 per cent less electricity than those in direct sunlight.
- Every degree below 26 increases energy consumption of AC.
- Clean the filter of your AC regularly as it can help reduce energy consumption by almost 10 per cent.
- If you prefer lower temperature, it would be wiser to use the AC along with a ceiling fan

4.3.2 Advantages of A/C Inverter Technology.

An inverter model means that the compressor is powered by a variable speed drive or 'inverter', which enables the compressor to run at a range of speeds from slow to fast, to match the output required. Most conventional compressors run at a constant speed and these types of units vary their capacity by switching on and off at different intervals.

Inverters improve the performance and energy efficiency of air conditioners under normal use. An inverter unit will gradually increase its capacity based on the capacity needed to cool down or heat up the room. The non-inverter can be compared withswitching on or off a lamp. Switching on this type of unit will start to run on full load.

4.3.3 Advantages

• You reach your desired comfort temperature much faster.
• The start-up time is reduced by one-third.
• You save energy and also money: there is 30 per cent less power consumption.

• You avoid cycling of the compressor, which **means that there are no voltage peaks.**
• The energy consumption cost is reduced by one-third (compared to normal on/off units).
• There are no temperature fluctuations

4.3.4Replacing the existing standard A/C units with inverter A/C unit will get pay back in 1.7 years. .
The energy saving details of A/C unit as follows.

SNo	Type Of A/C unit	TR	Qty	Installed KW	Kwh for 12 hours	Kwh for 12 hours with inverter A/C	Energy Saving per day	
1	Window	1.5	6	7.2	86.4	79.2	7.2	
3	Split	1.5	25	42.5	510	330	180	
4	Split	2	2	4.4	52.8	34.8	18	
	Total		**25**	**54.1**			**205.2**	

4.3.5 <u>Observation found during Audit</u>

Most of the A/C units condenser (Outdoor unit) coil is clogged with dust. This will increase the energy consumption and reduces the life of the compressor

drastically. It suggested to do schedule maintenance to the A/C units to reduce the power consumption.

- Main PDB Multifunction meter (Load manager) is faulty, need to be replaced. For measurements of PF/ kWH/KVAH &KVArH
- APFC Panel is available but switched OFF, to be made ON with appropriate settings & based on readings , no. of capacitors can be made ON/OFF
- Observed the billings as in attached file, PF & hence the corresponding billing units are in downward trend. By attending above 2 points, this can be improved.
- Load managers (MFMs to be installed at major base locations to assess major consumption for eg. Colony/Hostel/ Workshop-(lathe m/c)/overall 1 for all classrooms/overall 1 for whole admin bldg/ for water Pump/s
- GIT is implemented the solar lighting system to the street lights. Total 22 no's street lights installed are not working in the GIT campus.