**JANATA SHIKSHAN MANDAL’S**

**DEVCHAND COLLEGE, ARJUNNAGAR**

**ENERGY AUDIT REPORT**

**2016-17 to 2018-19**

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**Prepared By**

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1. **PREAMBLE:**

Energy sector has played a very important role in development of human race. Various forms of energy are used in industrial as well as domestic sector. Energy resources can be divided mainly into two types i.e. renewable resources and non-renewable resources. The renewable resources of energy mainly include solar energy, wind energy, water energy etc. The non-renewable resources include coal, petroleum, natural gas etc.

Now-a-days, 90 percent of our energy needs are fulfilled by non-renewable resources, which has led to increase in environmental pollution level. The burning of coal leads to release of Sulphur dioxide, which in turn causes acid rain. The carbon dioxide released from various industrial activities has caused significant increase in the level of green house gases, which is main cause of global warming. Along with this, various other major and minor pollutants are released into atmosphere. The renewable energy sources are continuously available and are environment friendly. More use of renewable energy resources ensures sustainability.

The energy audit mainly focuses on evaluating the use of energy in institutions generated through renewable and non-renewable means of energy and promoting the use of renewable resources for environmental sustainability.

**2. COLLEGE PROFILE:**

Devchand college has been established by the Janata Shikshan Mandal , Arjunnagar in the year 1961. This institute is grant-in-aid institution which is affiliated to Shivaji University, Kolhapur. This institute was established by Padmabhushan Shriman Seth Devchandji Shah with objective of transforming lives of many poor people, farmers. landless labourers and workers around Nipani Its one of the major objective was to set up a degree college of Arts, Commerce and Science for the poor and needy marathi peoples of the border area of Karnataka and Maharashtra states.

The college is run by an educational trust, Janata Shikshan Mandal, which has attained Jain minority status in year 2011. The management of college consists of highly educated and renowned persons who are driven by service motive, dynamic and democratic in approach. The head of the institution is an academician with leadership qualities, executive skills and has passion and commitment for development of institution. College has also started various undergraduate, post-graduate and certificate courses.

**VISION:**

Tamaso Ma Jyotirgamaya (i.e. Transition from Darkness to Light)
‘The present era is the era of knowledge. Every child should get quality education at minimal cost to carry out the duties of responsible citizen. It is education which develops thought, intellect, and moral values’: Padmabhuashan Shri. Devchandji Shah.

**MISSION** **STATEMENTS:**

* To provide quality education to the rural and socially and economically backward students (children of beedi workers and farm labourers) and to make them globally competent;
* To promote scientific temper, research and environmental consciousness;
* To inculcate human values such as equality, honesty, compassion and discipline; and
* To promote the values of social service, secularism and nationalism.

**COURSE OFFERED BY COLLEGE:**

|  |  |  |
| --- | --- | --- |
| Sr. No. | Programme level | Name of programme |
| 1 | Diploma | Spoken English |
| 2 | Undergraduate | B.A. |
| 3 | Undergraduate | B.Com. |
| 4 | Undergraduate | B.Sc. |
| 5 | Post-graduate | M.A. |
| 6 | Post-graduate | M.Com. |
| 7 | Post-graduate | M.Sc. |
| 8 | M. Phil | English |
| 9 | Ph.D. | Chemistry, Electronics, Commerce, Hindi, History, Zoology |
| 10 | Certificate Course | Spoken English |
| 11 | Certificate Course | Computerized accounting |
| 12 | Certificate Course | Data entry operators |
| 13 | Certificate Course | Computer fundamentals MS |
| 14 | Certificate Course | Training in competitive exam |

**NAME AND ADDRESS OF COLLEGE:**

|  |  |
| --- | --- |
| **Name of college:** | **Devchand College, Arjunnagar** |
| **Address** | At post: Arjunnagar, Tal: Kagal, Dist: Kolhapur |
| **Pin : 591237** | State : Maharashtra |
| **Website :** | [www.devchandcollege.org](http://www.devchandcollege.org) |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Designation** | **Name** | **Telephone with** **STD code** | **Mobile** | **Email** |
| **Principal** | Dr. P.M. Herekar | 0:08338/220112 | 9901573365 | prakashherekar@gmail.com |
| **Vice Principal** | Dr. P. P. Shah | 0:08338/220112 | 9373627119 | ppshahanpn@gmail.cpm |
| **Steering committee** | Dr. P. P. Shah | 0:08338/220112 | 9373627119 | iqacdevchand@gmail.com |

|  |  |
| --- | --- |
| **Status of the institution:** | Affiliated college |
| **Type of institution:** |  |
| **a. By gender** | Co-education |
| **b. By shift** | Regular |
| **Sources of funding:** | Grant-in-aid |
| 1. **Date of establishment of the college:**
 | 01/06/1961 |
| 1. **University to which the college is affiliated:**
 | Shivaji University, Kolhapur |
|  |  |
| 1. **Details of UGC recognition:**
 |  |
| **Under section** | Date, month and year |
| 1. **2 (f)**
 | 20/06/1961 |
| 1. **12 (f)**
 | 20/06/1961 |

**3. ENERGY CONSUMPTION:** Electricity is used for illuminating the rooms, fans, computers, Laboratory equipment, and pumps and for cooling rooms (AC).

Table No. 1: Number of rooms in the college:

|  |  |  |
| --- | --- | --- |
|  | Total number of buildings | 05 |
|  | Total number of rooms: | 36 |
|  | Total number of labs: | 15 |
|  | Boys hostel: | 29 |
|  | Girls hostel: | 47 |
|  | Rector bungalow (boys) | 06 |
|  | Rector bungalow (girls) | 06 |
|  | Seminar halls | 02 |
|  |  | 140 |

Details of various sources of energy consumption units is given in table no 2

**3.1 ENERGY CONSUMPTION UNITS**

Table No. 2: Energy consumption units

|  |  |  |
| --- | --- | --- |
|  | **Energy sources** | **Electricity/generator/solar lamps** |
| a. | No. of PC and laptops | 04 |
| b. | No. of tube lights | 285 |
| c. | No. of computers | 219 |
| d. | No. of CFC bulbs | 05 |
| e. | No. of UPS | 13 |
| f. | No. of fans | 89 |
| g. | No. of fridge | 03 |
| h. | No. of generators | 01 |
| i. | No. of A.C. | 01 |
| j. | No. of LED bulbs | 15 |
| k. | Electric pump of 5 HP | 01 |

**3.2 ENERGY REQUIREMENT:**

Electricity supplied from the Maharashtra State Electricity Board is the main source of energy for the activities on the campus. In addition to the regular supply, the college has two generators (30 KVA) and 13 UPS of 45 KVA capacity.

1. Energy conservation measures taken up by the college:
2. Increased use of Compact Fluroscent Lamp and LED bulbs against incandescent bulbs
3. Increased use of UPS against conventional generator
4. Most of the fans carry three star rating of electrical appliances.
5. College has encouraged use of SMS/e-mail instead of sending notices and faxing documents.
6. Awareness amongst students was carried out and accordingly sign boards are displayed at strategic locations for conservation of energy and students positively responding.
7. College is using flat-screen LCD monitors rather than CRT monitors.

**3.3 USE OF RENEWABLE ENERGY:**

1. **Use of solar lamps:** In order to reduce the dependency on non-renewable sources of energy to certain extent, the college has installed solar lamps on streets.
2. **Use of solar water heater:** Previously, electricity based hot water geysers were used in the hostel which used to consume huge amount of energy. But then these waters geysers were replaced by solar water heater.
3. **Efforts for carbon neutrality:**
* The college is situated away from city and the nearby road is connected to villages bearing less traffic. Proper measures have been taken to reduce carbon emissions to keep campus pollution free and uncontaminated.
* The two wheelers and four wheelers of the college staff are monitored by PUC.
* Carpooling and share auto system is used by staff for transport and conveyance.
* Carbon emission is minimized by the greenery planted in the spacious area on the campus. Along with that, botanical garden and nursery are established in college campus. The trees planted in campus and the garden in college helps for reducing concentration of carbon dioxide in college campus and helps for carbon neutrality.

 Whenever we think about carbon neutrality, carbon footprints should be taken into consideration. Carbon footprint is the amount of green house gases like carbon dioxide, methane, nitrous oxide emissions emitted by a building, organization etc. It relates to the amount of greenhouse gases we are producing in our day-to-day lives through burning fossil fuels for electricity, heating, transportation etc.

By reducing our carbon footprints, each one of us can contribute to making the earth a safer, better place to live. Estimates suggest that almost half of our carbon footprint is due to electricity and 17% is due to lighting alone.



 **Solar Panel**



 **Use of solar panels for heating water**

 At Devchand College carbon footprint for indoor lighting in office building is considered. The performance of the building by using LCD and LED lights is monitored which reduces the building carbon foot print. The carbon foot print is monitored for –

1. Incandescent Light
2. Compact Fluorescent Light
3. LED Lights

**3.4ELECTRICITY:**Nearly half of our carbon footprints are due to electricity and 17 % are due to lighting only. This electricity is produced by natural gas, coal, petroleum and some other renewable resources. Electricity is produced from different sources. The following table shows the quantity of green house gas released from them:

Table No. 03: Electricity produced from different sources

|  |  |  |
| --- | --- | --- |
| **Source** | **Million metric tons of CO2 emission for 1 year** | **Electricity generation (Billion kWh) for 1 year** |
| Coal | 1788 | 1882 |
| Petroleum | 106 | 119 |
| Natural gas | 337 | 562 |
| Other | 14 | 22 |
| Non fossil fuels | None | 1106 |
| **Total** | **2245** | **3621** |

Since close to 2245 million metric tones of CO2 emitted by total electricity generation per 1 year. A single kilowatt-hour of electricity will generate 619 grams of CO2 emissions.

Following sources of light are generally used:

1. **Compact Fluorescent Light**

Compact Fluorescent Light produce less heat and more visible light compare than incandescent lamp. We can calculate how much CO2 will be emitted by 14 watt incandescent bulb

* Power Consumption- 14 watts
* Operation per day- 10 hours
* Power Consumption per annum-51100 watt
* Electricity per hour (kwh) – 0.014 (1 kWh=619 g CO2 can be released)
* Lighting Carbon Emission per year/lamp- (51.1\*619g ) - 31.6 kg.

A single 14 watts CFL lamp will generate 31.6 kilograms of CO2 for every year. The reduction of carbon footprint is none for this lamp. CFL contains harmful mercury which creates mercury emission. Estimated suggestion led lights only will reduce our carbon foot

print over than other lights.

**2. Incandescent Light**Incandescent lamp is a source of light which produce light when the filament is being heated. It can release 80% electrical energy converted into heat energy. We can calculate how much CO2 will be emitted by 40 watt incandescent bulb.

* Power Consumption- 40 watts
* Operation per day- 10 hours
* Power Consumption per annum-146000 watt
* Electricity per hour (kwh) - 0.04 (1 kWh=619g CO2 can be released)
* Lighting Carbon Emission per year/lamp (146\*619g ) -90.3 kg.

A single 40 watts incandescent bulb will generate 90.3 kilograms of CO2 for every year. The reduction of carbon footprint is none for this lamp.

**3. LED Lights**

LED lights consumes low power and energy efficient over than other lights. Not even a single point we can’t compare led lights with other lighting.We can calculate how much CO2 will be emitted by 8 watt LED lamp  -

- Power Consumption- 8 watts

* Operation per day- 10 hours
* Power Consumption per annum-29200 watt
* Electricity per hour (kwh) – 0.008 (1 kWh=619 g CO2 can be released)
* Lighting Carbon Emission per year/lamp(29.2 \*619g) - 18 kg.

A building’s carbon footprint from led lighting can be reduced by 68%.
- Reduction in Carbon Footprint (tons)-0.122(12.28 kg)

The 8-watt LED equivalent will only be responsible 18 kilograms of CO2 over the same time span.

Table No. 04: Carbon foot prints

|  |  |  |  |
| --- | --- | --- | --- |
|  | CFL | Incandescent bulb | LED light |
| Power Consumption(watt) | 14 | 40 | 8 |
| Electricity(kwh) | 0.014 | 0.04 | 8.008 |
| Hours of Operation Per Day | 10 | 10 | 10 |
| Carbon Emissions (tons) per year/lamp | 0.316 | 0.903 | 0.18 |
| Reduction in Carbon Footprint (tons) / lamp | -- |  | 0.12 |

 - LED light can reduce our carbon footprint by 0.12 tones per year.

* Led light does not contain mercury; it is a big benefit for this lamp.
* CFL contain 3-5mg per bulb which is poisonous. Mercury emission is 1.2mg from power plant using CFL.
* Incandescent, it is 5.8 mg from power plant.

The 8-watt LED equivalent will only be responsible 18 kilograms of CO2 over the same time span.

Based on above comparisons, LED emerges as the BEST option to reduce carbon footprint.

At Devchand college, all together there are 138 class rooms with 920 incandescent bulbs

Details of CO2 emitted from these lights is given in table 07.

Table No. 05: Details of CO2 emitted due to bulbs

|  |  |  |  |
| --- | --- | --- | --- |
| Light  | No. of bulbs  | CO2 emitted per 40 watt lamp / year  | Total CO2 emitted per year  |
| Incandescent | 920 | 90.3 kg | **83,076 kg** |

If all the 920 Incandescent bulbs are replaced by CFL and LED there will be a substantial reduction in CO2 emitted.

Table No. 6: Total CO2 emissions:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Light  | No. of bulbs  | CO2 emitted per 40 watt lamp / year  | Total CO2 emitted per year  | Reduction of CO2 emission  |
| Incandescent | 920 | 90.3 kg | **83,076 kg** | **-** |
| CFL | 920 | 31.6 kg. | **29,072 kg** | **54,004 kg** |
| LED | 920 | 18.0 kg.. | **16,560 kg** | **66,516 kg** |

* From the energy conservation point of view, college has taken initiative to replace conventional incandescent bulb by means of CFL.

**3.5 SUGGESTIONS:**

* Considering the benefits of CFL and LED it is recommended to replace all the existing Incandescent light bulbs by CFL and subsequently by LED during the time period of next two years.
* Even after installation of Solar Power Pack system, consumption of energy can be saved, so that surplus energy can be sold.
* Replacement of conventional bulbs has contributed significantly in the reduction of CO2.
* Further, all the fans should be replaced in phased manner energy efficient fivestar rating fans.

