Innovative Ideas to Development of Green Campuses for Sustainable Environmental Development

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Abstract:

According to the statistics of Bombay Municipal Corporation, most of the problems of Mumbai are related to pollution of air, noise, water and soil. In Mumbai where the people don't have proper space to live, there is hardly any space to plant trees. The solution is in utilizing campus for this purpose. Various campuses in Mumbai consist of large acres of land which need to be utilized technically. Our report deals with the implementation of such energy efficient techniques by the means of such large campuses. In this paper, power consumption statistics of IIT Bombay are discussed. Also various energy efficient techniques such as introduction of bicycle system, concept of car pooling, piezoelectric plates on the college gates, use of canteen soap water for flushing in toilets, use of internet facility over the paper (journals, files), use of hamsters wheel as an amusement are described. The most technical way involved is the use of DATA LOGGERS for creating awareness among the students and staff as this awareness matters a lot.

Introduction:

The main metropolitan cities are basically made up of many things which consists of multi-national companies, various pharmaceutical industries, chemical industries and educational campus. Thus eco-friendly changes made in cities would probably make changes in the whole country and which would make changes in the whole world.

The need of today's world is to reduce the pollution any how. The pollution is mainly due to megacities. In the city , like Mumbai people normally don't have space to live….so how they could find space to plant trees?? Here with the help of this paper, we are trying to give some innovative techniques about how to build our cities green and clean.

There are various sought of educational campus present in our cities. They should be improved technically to improve the status of our environment. This paper brings different engineering approaches to convert our ordinary educational campuses into GREEN CAMPUSES

Existing System:

- Less of trees around the campus and more of buildings
- Waste of Electricity when not in use
- Use of polluting vehicles for transportation to colleges
- No use of technology (Piezo-electricity, etc.) which could reduce the consumption of non-renewable fuels
- No use of technology which would reduce the wastage of electricity .For example LDR(Light Dependent Resistor)

ENERGY AUDITING OF IIT BOMBAY

This energy audit assumes significance due to the fact that the IIT-B electricity bill had crossed Rs. 10 crores during 2007, and it was aimed at obtaining a detailed idea about the various end use energy consumption activities and identifying, enumerating and evaluating the possible energy savings opportunities. The target is to achieve savings in the electrical energy consumption to the extent of 20%. The audit was also aimed at giving the students a feel of the practical problems and difficulties in carrying out energy audits. As energy engineers, the students of the department enthusiastically participated in the Endeavour.

1.2 IIT present energy scenario

The energy consumption on campus is mainly in the form of electricity, apart from the use of LPG as cooking fuel in the hostels.

The campus had a connected electrical load of 5.3 MW as on April 2008 and a contract demand of 4.5 MVA. The monthly recorded peak demand for the year 2007 is given in Fig.1.1. The IITB energy bill for the year 2007 was Rs. 10.2 crores. The electricity bill comprises two parts: one related to the energy consumed (per kWh or per unit energy consumed) and the (Maharashtra State Electricity Distribution Company Ltd.) for category HT-I is as given in Table 1.1. The existing tariff rate is Rs. 300/kVA for maximum demand and Rs. 4.3 /kWh on an average. The maximum demand in April 2008 was 4168 kVA and corresponding power factor was 0.97. The energy charges during the month were Rs. 3.1 per unit for industrial use, Rs. 2.6p.u. for residential users and Rs. 4.5 p.u. for commercial activities. The average power factor for the year 2007 was 0.98 which was achieved by means of power factor correction units. The contract demand in the year 2001-02 was 3000 kVA, which was increased to 3708 VA and then finally to 4500 kVA in 2005-06. Before the last extension, the institute was

Paying a penalty to MSEDCL (Maharashtra State Electricity Distribution Company Ltd.) for drawing more than the contract demand. Recently, IIT-B had again applied for extension of present contract demand to 5000 kVA, which was not granted by MSEDCL/ Tata Power Supply Company.

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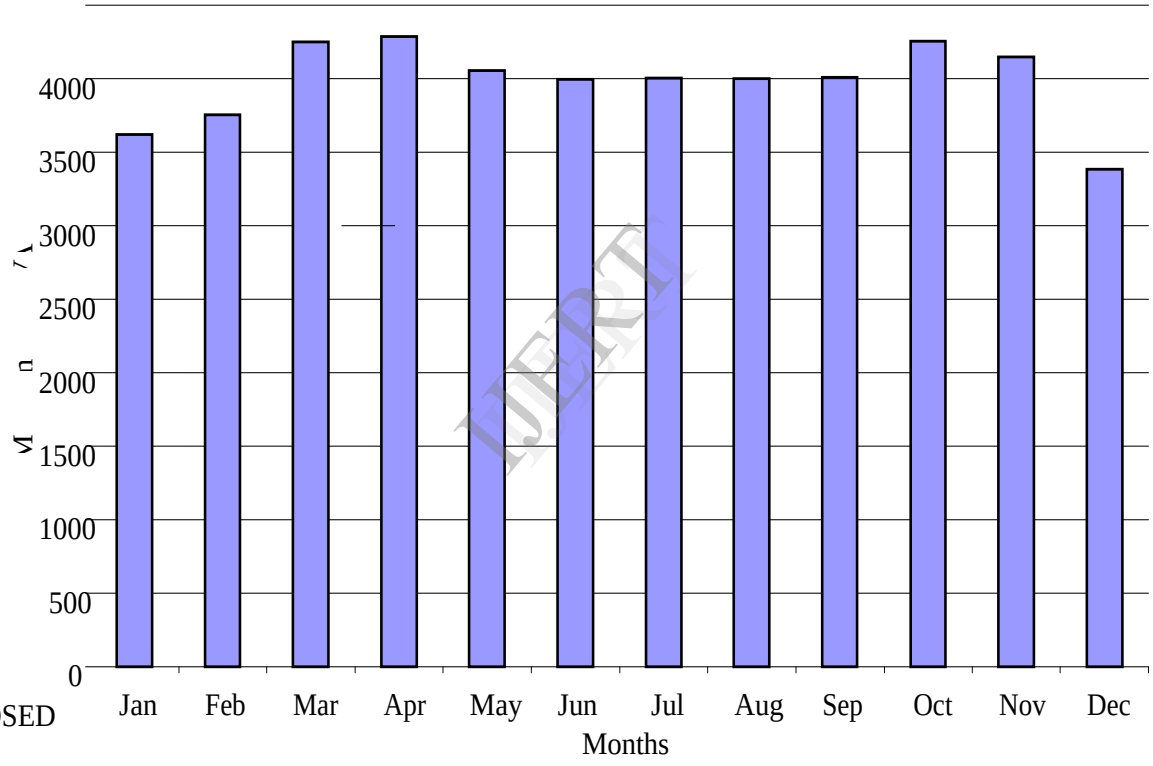
1.3 Specific Energy Consumption (SEC)

The Specific Energy Consumption (SEC) is defined as the energy consumption per unit of product output. The specific energy consumption considering students, faculty and staff members were calculated which forms the institute SEC and was taken as reference for comparison. The SEC was calculated to be 1384 kWh/person/annum (for 2007) for the academic area and Rs. 5950 per person per annum.



PROPOSED SYSTEMS:

The given graph represents about the statistics of the power dissipation of IIT Bombay

Monthly maximum demand for IIT-B in 2007

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Fig. 1.1: Recorded monthly peak demands at IIT-B during the year 2007

1) Introduction of Bicycle System:

When the people coming from the campus they usually come from auto rickshaw or from private vehicles. They can use the bicycles which will be provided at the station to the students. For this, the person have normally must have to enter some bucks in the locking system with the proper security system and he can come to campus where again a locking system has been involved. Also he may be fined if the cycle does not reaches the campus in a speculated period of time

2) Introduction of piezoelectric Materials at campus gate:

Everyone has to enter the campus studying in one or other colleges near to the station .So the pressure created by the footwork can be used to gen-generate electricity. This can be done by using by using piezoelectric materials at the entrance gate. Piezo-electric materials works on the principle that pressure exerted on piezoelectric crystals would generate a AC voltage across it

3) FLYOVER CONNECTING THE TWO BUILDINGS:

Suppose if one person wants to go from one floor of a multistoried building to the some high floors of an other multistoried building then he will use the lifts which consume a lot of energy and its states as a waste of energy. Our proposed system consist of an alternative for this , it consist of a pattern called as a link between the mid floor of one building to the mid floor of other building. This will reduce the amount of energy wasted due to lifts and also its acts as a physical exercise of the person. The concept is only to provide a passage between both the buildings so that the people can use this path to travel .Also we know that lifts consume a lot of energy so this energy will be used in other terms.

4) PAPER WASTE SHOULD BE LESS AND PAER SHOULD BE RECYCLED:

The need of today is reduce the paper waste. India is considered as the among the countries having high amount of paper waste. Our proposed system consist of the idea over how can we reduce this paper waste. Today all of us are using internet and a lot close to social networking sites like facebook, whatapp. Etc. so we come proposed a idea to transfer all the college related information on these sites. We see many sought of paper on the tile wall. Firstly it is needy but don't it make a lot of paper waste. This sought of paper waste should be stopped .The colleges must come up with their networking sites on which they could launch their results and other ought of data they want to make noticed by students. Also the journals which we write though this could be done on computers that student should do the experiment and mail the readings to the teacher

and the teacher can verify .It can save not only the papers but the efforts for the teachers will be less also the records can be kept for this .This is also economical. I have the idea that the examination should be also through net.

5) PROPER DRAINAGE OF SOAP WATER OF CANTEEN TO A USEFUL PLACE:

There is also a situation of water problem in our city. There are simple ways to solve it .We see the maximum use of water in a campus is generally taken place by canteen of that college. So a lot of water is required for washing plates .These water can utilized and could be used for lots of purpose. We proposed a system in which a proper drainage of this water is required as in this the water is collected in a place and this water is provided to the bathrooms and the toilets just for flushing out the dirt and this soap water could easily be used there and could also help in removing dirt of the place. This would add some sought of investments but later it will definitely results in the reduction of the bills of the campus.

6) INTODUCTION OF SLIDES IN CAMPUS:

There is always the problem of lifts as it is filled and also it takes more sought of energy so to avoid this we come to the idea that the college building must consist of slides where the people can slide and go to ground floor if there of lift. It sounds some sound of joking of applying this concept in the colleges but this concept is already applied in one of the largest MNC of today's times "GOOGLE". There people the officials have to slide over the sliders and cover their path. Also in this busy daily schedule people don't have the time for doing enjoyment .People sliding over the slides are actually enjoying themselves .This sought of enjoyment can provide the sense of mind fresh to the students of colleges and in turn it's a tremendous way through which one can contribute to save energy in terms of not using lifts.

7) GENERATING ENERGY THE MEAN OF HAMSTERS RUNNING ON A WHEEL:

It is said that "All work no play makes jack a dull boy". By HAMSTERS we mean a device which is used by the children for a fun and this device can be used to produce energy. It basically a Rat which is running on wheel and the rotational Energy of wheel is getting converted into Electrical Energy. So proposed system consist of an idea which a devices over many places in the campus so that this type of device can be used by children or students for fun (to refresh their minds) and this device can be used to generate electrical energy from the movement of the people .This easy principles should be employed so that it can be used

for an enjoyment and also for generating electricity.

8) UNDERGROUND SEWAGE SYSTEM AND USE IT FOR PURPOSES:

This concept again links with the waste disposal of a particular campus .Maximum waste of a particular campus comes from the canteen of that campus. Don't this waste should disposed and to be used for generating electricity. The proposed system involves the idea of biogas production .It involves firstly making the garbage of whole campus collected at a particular place but this should be taken underground as it might provide some sanity problems. The whole system is provided with some sought of suitable atmosphere where a gas called as bio gas can be generated .We know that this gas can be used in canteen itself so that this may help the canteen finance and also college finance. Also the garbage we just throw for waste goes to our oceans , lakes ,rivers etc. thus providing diseases to us and also it is major source of pollution.

9) STREET LIGHTS IMPLEMENTING THE SOLAR CONCEPTS:

We look in our campus only there are many street lights which consume a lot of energy for their illumination. This required a lot of energy so to provide a right and sustainable street lights our system will involve the street lights working on solar panels .Though the solar panels are very much costly but its only one time requirement after that it can save many watts of power .The system involves the concept that due to presence of light of day the solar panels will get charged and this charge of the solar panels can be used for making the light to lamp up in the night . Its very tough job to implement this much solar panels as they are very much costly but don't forget the need of today is not the money but to improve the power transmission and to save the energy.

10) IMPLEMENTATIO OF LDR (LIGHT DEPENDENT RESISTER) ON STREET LIGHTS:

LDR basically is a type of resistor which change its value when light fall on it when light fall on it its behaves as open circuit due to which it don't allow the light to be illuminate that is in day just opposite is the concept in the night . When in the night there is no light the LDR allows the current to flow and it becomes conducting due to which the street lights automatically turns OFF. This concept is generally used when there is a case when the lights of a particular class room or street light is ON. It will automatically make the light to be OFF. This concept is also costly but same procedure is applied in it as the previous one .This is the immense way by which we can save electricity.

11) IMPLEMENTATION OF WIND MILLS FOR GENERATING THE ELECTRICITY:

We know that in the campus like and in other campus like IITB WIND MILLS concept can be used as there is the case of high sought of air flow in our campus which can have

many sought of wind mills worthwhile. Also there is a lot of space present which could be used for the concept of WIND MILLS. However this concept also involves a lot amount of money but it can be highly useful. The idea includes that each college in the campus must be given some sought of jurisdiction where it can have its private wind mills and they can harness the power from the wind mills.

INTRODUCTION OF SMART GRID:

At last but not the least the most important is how to make people used to for this system for this an awareness must be created in the minds of the people for this we have involved a important concept of smart grid .It is a great concept through which one can have a monitoring over the power consumption of the various colleges of the campus. The system involves a particular monitoring room and some sought of sensors over every floors of all the colleges .Every person of the campus will provided a monthly SMS in the regard of the power consumed by their college particular floor wise, this will create a type of awareness in the mind of the people and a sense of strong proud about their contribution for the development of the colleges.

This technique will involve the concept of DATA LOGGERS .It involves the collection of data from the various floors of various colleges in analog form and then reported as required. The college which is most energy efficient should be provided credit points which would be a sought of a good motivating stuff for the college.

COMPARISON BETWEEN THE EXISTING SYSTEM AND THE PROPOSED SYSTEM:

- In the proposed system we have the bicycle system in which the people have the tendency to save the handsome amount of money and also it will act as the good health for them. According to the stats we have nearly 15,000 people coming to our campus through auto or taxis and they use to pay nearly Rs. 10 daily if they go by the bicycle system they will save nearly Rs.300 in the month which is worthwhile
- Also the concept of applying the piezoelectric material is worthwhile as it will generate electricity on its own.
- The concept of making a link between the new building and the old building will reduce the electric bill of the college by more than 30% that's sounds great.
- The concept of applying the sensors in the college for detecting the light illumination can stop the various sought of high electric bills.
- The concept of making a common portal of college on which everything regarding the time tables, roll numbers will be provided and also the concept of making online journal system, online exams can reduce the paper wastes of college by more than 80%.
- The concept of making the canteen water flush out through the toilets will save nearly 1000's of gallons of water which in turn reduce the water waste and also the water bill of the college.
- The concept of making the street lights working on solar panels can reduce the power consumption of our colleges by more than 30%.
- The implementation of the waste of the canteen in biogas technology can solve the problem of fuel for all the canteen in the college. All the canteens of the

campus can use it forever without any power disruption.

- The implementation of smart grid will encourage all the colleges of the campus to save more and more energy to get the credit points.
- The message will make a sense of awareness in the mind of the students and they feel happy about their service to the college and the city.
- The existing system consist of so much problems and if they are solved by the use of this proposed system then the college electric bill be reduced by 80% making the profit of nearly in crores, the problem of the water in the whole campus will be solved as the water bill will be reduced by 30%, the garbage of the campus will be reduced by more than 90%, pollution will be not be present any.
- Though there is some sought of initial high investments but they can be overcome in one year only because the proposed system would be useful forever and avail the gain for more then 70% in all.

ADVANTAGES OF THE PROPOSED SYSTEM:

- Firstly, the gain in the power consumption and the power efficiency is too high. There is a tremendous growth in the finance of the campus.
- Secondly, students have the tendency to have the sense of entertainment due to the hamsters running on the wheel and the slides.
- Thirdly, there is the reduction in the college electric bill as described it is decreased by more than 50%.
- Fourthly, the students will be provided the messages by the method of smart grid due to which it creates a sense of proud and awareness.
- Fifthly, the pollution of the campus is decreased a lot.

CONCLUSION:

By our the comparison of the both the existing system and the proposed system we can say that all the thing we want to change to our city to a green city is just a initiative and some sought of funds by us ….. The youth of our country INDIA.

There are a lot of changes which we can do which can make our environment clean. Though the initial investments are too much high but the need of today is to save our planet “EARTH” rather than saving money. The proposed system will provide the college more than 50% decline in its electric and water bills and after this there is handsome amount left which can used for the development of the college.

Thus, if these useful methods will be employed in all the campus of our city we can say that our whole campus or the whole city will be emerge as the most energy efficient city in the world and the day is not far when our homeland “MUMBAI” will be the best homage for all world. We the youth of our country take an oath that we will always try to conserve energy and make our “MUMBAI” the greenest city in the world.

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