KOLKATA STATE CENTRE

Student Awards and Technical Lecture

July 20, 2011

The Kolkata State Centre organised a function to handover the cheques and certificates to the 14 students selected for scholarships for the year 2009-10. The function was held at the Seminar Room of the Electrical Department at Jadavpur University.

The Secretary of the Kolkata State Centre, Mr. A.K. Das Chowdhury welcomed the 50 guests that included ISLE members and students. Prof. Saswati Mazumdar was requested to preside over the function.

Following the conferring of awards there was a technical lecture by Mr. Rainer Heid'kamp from the University of Applied Science, Hagen, Germany on Application of New Illumination Technology with LEDs. He gave several examples of the R&D work in Germany in this field including studies on the effectiveness of lighting in child education programmes to increase brainpower. He also showed examples of the special LED street lighting fixtures being developed in Germany.

Mr. Bipin Dattani, former Chairman KSC gave the vote of thanks. The function concluded with refreshments.

A brief note on each project is given below. Except for the group of five students (3rd prize UG) who are from the Academy of Technology, Aedconnagar, all other students are from Jadavpur University.

First Prize of UG Level

Lighting Design of a Library Room Using DIALux

In case of lighting design, Co-efficient of Utilisation is generally available for the horizontal plane; so, it's not possible to design some practical fields which incorporate vertical planes for observation by using Lumen Formulae. That is why the lighting design software DIALux is used. In this design, IS recommendation [IS 3646 (Part I): 1992] is followed and the required lux levels are selected. Two types of luminaires are used in the design: TCS 306/136 & TCS 306/236. With both types of luminaires, calculation is carried out to determine the amount of investment to be made by using electronic ballast, as well as, magnetic ones and a comparison is brought out between these two types of ballast. Finally, by calculating pay-back period, the decisions are made to select the type of ballast and number of lamps to be placed per luminaire.

Avishek Sengupta

Second Prize of UG Level

Comparative Study of Design of Emergency Lighting at the Triguna Sen Auditorium of Jadavpur University with and without Solar Cells

Emergency lighting, required when normal lighting fails, is used to enable normal human activities to continue and it also ensures that the routes of escape can be safely and effectively used. In case of a power failure much time is required for the human eyes to adapt to the dark environment. Importance of emergency lighting lies in the fact that the human eyes undergo a transition from lighted environment to semi-illuminated one. Horizontal illuminance level on the centre line of any escape route should lie between one-tenth and one-fiftieth of the normal lighting level with a minimum value of 1 lux. The normal practice is to use a basic battery inverter system which supplies power to the various light sources. The light sources to be used should be energy efficient like compact fluorescent lamps (CFLs) and light emitting diodes (LEDs). The battery is charged using the power from the mains supply. However, much

energy from the mains supply could be saved if the charging of the battery is done using solar photovoltaic cells. This is a step taken towards using renewable energy. Though the cost of the project increases, it greatly reduces the power consumption thereby leading to energy saving. However, the utilisation could be increased manifold if the solar power is used not only for the purpose of emergency lighting but also for general lighting.

Jayita Sarkar

3rd Prize of UG Level

Design of an Automatic Light Switch

Energy is fundamental to the quality of all lives. It is known that energy demand will increase significantly in the future. But the resource of energy is limited. The only way to solve this problem is evolution of energy in a green way and its utilisation in a clean way. From this point of view, a system has been developed which restricts the wastage of energy.

Street lights are provided for lighting the streets at night. But sometimes by some mistake or carelessness, it remains on in the day time also. A system has thus been designed which can switch the lamps off during the day time automatically. So the wastage of electricity can be restricted when sun light is present.

The system contains a light detecting resistor, which can easily detect the light and dark condition and accordingly switches the bulb on or off. Not only at night, but on cloudy days or during solar eclipse also. If it is dark enough to reach the threshold voltage limit, the lamp will switch on.

The circuit has been developed for the market use but it supports only one LDR at the moment. To make it effectively available for the market there is a need to alter the circuit a bit and tweet with the resistors present, which can restrain more current and help to support more LDRs together to have its effect considerably in the street lamps. The power supply for the IC 741 is provided by a 12V step down transformer followed by a rectifier. The potentiometer is calibrated over a wide range adjusting the sensitivity from very light to high light.

According to some calculations and assumptions, replacing these LDR lamps with the present street lamps will save up to a massive 13140KW of power annually. Thus this circuit can provide the solution for present energy wastage due to street lamps.

Arnab Banik, Deepmalya Das, Paramita Basu Roy Chaudhuri, Sagnika Ghosh, Srija Saha
Under the Guidance of Ms. Debadyuti Banerjee

1st Prize PG Level

Museum Lighting

In museum lighting different kinds of lamps should be used to serve different purposes as mentioned by IS standards the lux levels should also be maintained according to the susceptibility of objects to light. In that respect different louvres, lenses, filters, dimmers are used to protect museum objects from excessive heat and humidity, chemical attack, air-borne pollutants and also certain conservation and maintenance rules should be followed. Use of fiber optics lighting system in museum lighting is a very good option as it is free from above mentioned problems and especially helpful for lighting of large 3D objects, lighting in vertical surface displayed objects. This system can provide a superior aesthetic environment in the museum and also meet the conservation requirements of the museum.

The case study of Indian Museum reveals very poor lighting as well as poor maintenance and conservation and the recommendations of IS standards are not also followed.

Chaitali Chakraborty

2nd Prize PG Level

Stage Lighting Design

The aim of stage lighting is not to render the stage or any of the technical equipment it comprises visible; what the audience has to perceive is changing scenes and moods - light alone can be applied on the same set to create the impression of different times of day, changes in the weather, frightening or romantic atmospheres.

After surveying the currently available lighting possibilities it is concluded that as energy consumption is a burning issue, we should keep in our mind that only the Tungsten and Halogen lamps for their colour effect and high intensity discharge lamp like Metal halide should not be our last choice. High wattage CFL is already widely available in our market, not only that, they are available in different colors also. So we can replace the Tungsten and Halogen with golden CFL. We should use electronic ballast in place of electromagnetic ballast to reduce the ballast loss and to reduce the flicker effect. For future development we can introduce new ideas about the control part of the stage lighting. There are existing methods of controlling the moving lights and luminaires, control of each channel etc, but in future we should introduce new control strategies, for example, time scheduling instead of scene presetting. As already the idea about Memory console has been developed and also highly accepted, we can use the same technology for our new control strategy. Instead of writing only the control programs for the luminaire particular to a scene, we can write the time scheduling program (getting the idea from the rehearsal time) in addition to the control program. Then the total system will be fully automatic, no operator interference and no changeover of the slider will be required. As the complexity of the program will be higher, accuracy of the control system will be higher. Thus we can introduce new ideas and can do the future modifications. As this is a most flexible design field, there are huge opportunities for experiments, play with the new innovative ideas and future developments.

Priyanka Samanta

2nd Prize PG Level

Automatic Controlled & Dimmable HID System

The system is designed to control the HID lamp automatically and also to dim it when required. A 250W SON is made to glow with a 250W ballast which contains two extra windings of 150W SON ballast. These two extra windings are not connected at first when the lamp glows. They are connected one by one when required to dim the lamp to the necessary level. A Timer circuit is used to connect these two windings in series with the lamp through relays. A photosensor or Light Dependent Resistor (LDR) is used to detect the presence of daylight. In absence of daylight, its resistance increases and the 555 Timer gives the output. Based on it, the Timer circuit is turned on and also the lamp glows as the Phase terminal of supply line is connected with lamp. The system is designed so that the lamp will give full light output for first 3 hours. Then the first winding of 150W ballast is connected in series to reduce the light output by 60% of its maximum value. After another 2 hours the next winding will be connected and the light output will reduce to 30% of its maximum value. At daytime, in presence of daylight, the resistance of LDR will decrease and the 555 Timer will give output. The phase terminal of the supply line will be disconnected with the lamp and it will extinguish. The Timer circuit will also stop counting and it will be reset.

Atanu Chakraborty

The Lighting Project of Budge Budge Generating Station of Unit # 1 and Unit Control Room-1.

The lighting project includes measurement of lighting level at different elevations of unit #1 boiler and also comparison of the measured light level with the recommendations as per Indian Standards (I.S. 6665-1972) in Lux at the different positions of the boiler area.

It also includes how the electrical power is getting distributed from power supply to the different lighting loads i.e. to the different luminaries at different locations in the boiler area.

The measurement of light level at different positions of unit control room-1 (UCR-1) was also performed. A software simulation has done on the same project with existing luminaires at the existing position and condition.

The simulation result indicates what the present status of the boiler is. It also indicates accuracy of the simulation software with the reality.

Recommendations for improvement were made.

Gopal Ghoshal

Road Lighting Design

The road lighting design is mainly based upon few design criteria like adequate luminance/illuminance level, high degree of uniformity, limitation of glare, effective visual guidance etc.

There are several International and National Standards available for the road lighting design, which can be consulted as recommendations.

The project encompasses a detailed survey of Road lighting on the Jadavpur University Campus.

Finally the redesigning of all streets of Jadavpur University main campus has also been done in this project. The increase of light level as well as saving of electricity as a result of energy conservation has been shown in the report also.

Good road lighting must result in fewer accidents, good night time vision and use less energy.

Bibekananda Roy

Studies and Development of a High-Flux White LED Based Lighting System having Hand-Driven Charger back-up and also Continuous Monitoring & Controlling of Load.

Here in this project some experiments have been done with LEDs because LEDs have very high efficacy and very low power loss. Some new types of LED lighting system has also been designed which includes High-Flux LEDs. These high flux LEDs differ from 5mm LEDs with respect to physical as well as electrical properties. The light output is very high for these high- flux LEDs. Studies on various LED drivers finally led to implement a new LED driver circuit using a Driver chip called VIPER12A, make STMicroelectronics. This LED driver can drive 3-16pcs of 1w LED and its loss is nominal. In another circuit high frequency switching is being implemented by a 555 Astable Multivibrator for boost converter drivers at high frequency. The frequency has been set up to 1 kHz to switch the LED luminaire. Testing of some other 3W/4W LED luminaires is also another part of the project. LED light output depreciation has also been checked for a long time. Some new installations of LED luminaires have also been done and some design proposals have been made for future installation in the Jadavpur University Campus.

Again, a hand driven battery charger has also been implemented to charge the 4.8V battery to drive a small LED lighting system. High rated batteries can also be charged with a minor change in its circuit only. For this hand driven battery charger a regulator circuit of 5V is being added so that the charging voltage and current may not fluctuate.

Piyali Das

SPV Based Lighting System

The electronic components in an SPV system are the charge controller, maximum power trackers, linear current booster and inverters. All of these components handle a relatively large amount of current. The charge controller must shut down the load when the battery reaches a prescribed state of discharge and must shut down the PV array when the battery is fully charged. Linear current boosters (LCB) are special purpose maximum power trackers designed for matching the PV array characteristics to the characteristics of dc motors designed for daytime operation, such as in pumping applications. Inverter selection will depend on whether the inverter will be a part of grid connecter or stand alone system. Inverter failure remains one of the primary causes of PV system failure. The SPV lantern presently being disseminated in India consists of a PV module, a storage battery, a charge regulator, a light source (generally a compact fluorescent lamp, CFL) with fitting, an inverter, cables, switches. The charge regulator is used to protect the battery from overcharging/deep discharge and also to prevent reverse flow of current. In India, SPV lanterns are normally manufactured using 5 watt or 7 watt CFLs. The battery is generally made of fiber reinforced plastic. The size of the SPV lantern, in principle, can be specified either in terms of the Power rating of the module/CFL or the capacity of the storage battery. In this work the power rating of CFL has been used to specify the size of the lantern and it is assumed that the module and battery are sized for a given duration of lighting (in hours, h) on a daily basis. As per the existing practice of SPV lantern manufacturers in India, mono-crystalline silicon solar cell modules of ratings between 9-15 peak watts are supplied with CFLs of 5-9 watt rating.

Sanchita Sarkar