cacons Newsletter
CA Consultants Limited
ISO 9001:2008 Certified Company
May, 2014
Volume 9 Issue 2

ENERGY CONSERVATION IN BUILDINGS – FOCUS ON LIGHTING SYSTEMS

Owing to the rise in the emission of greenhouse gases and increasing global warming from conventional sources of electricity generation; energy conservation has become a very important topic in the 21st century. Approximately 19% of the world electricity energy consumption is used for lighting applications. Figure 1 below shows that 31% of this energy accounts for residential buildings, 43% for commercial buildings, 18% for industrial lighting applications and 8% for outdoor lighting (Street lights in particular). The above data emphasizes the need to consciously look for ways to conserve energy consumed by lighting systems in buildings.

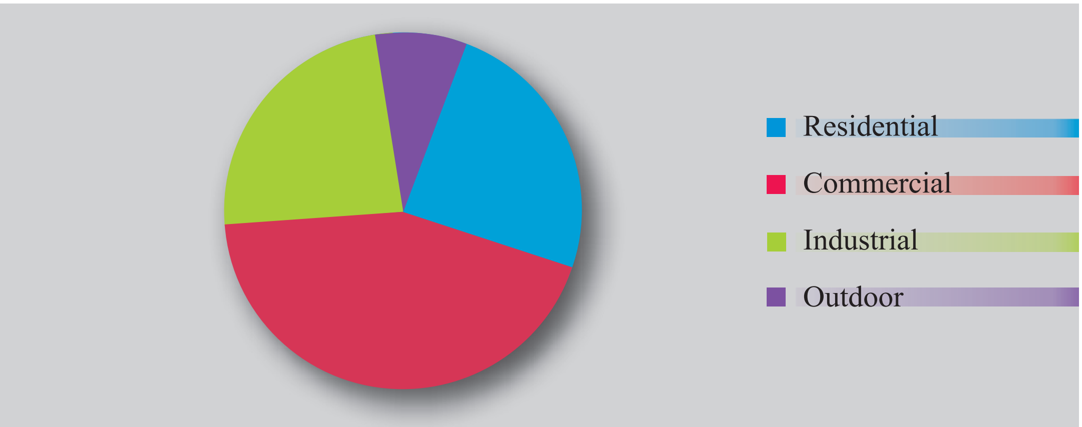

Figure 1: World Electricity Consumption by Area

The following measures have been identified as efficient ways to conserve energy in lighting systems:

- Use of more Efficient Lighting (Energy Saving Bulbs) - Compact Fluorescent Lamps (CFLs) and Light Emitting Diodes (LEDs) fall into this category. They offer better energy efficiency. Typically, energy saving bulbs consume 25%, 80% less energy when compared with energy consumed by incandescent bulbs. Apart from the energy conservation, energy saving bulbs require reduced maintenance and overall lifecycle cost relative to incandescent bulbs.

- Optimum use of Natural Light—Certain Architectural features like façade walls and transparent roof permit the maximum use of sunlight which in turn reduces the need for artificial lighting. Implementing these materials where possible can help reduce the energy expended in lighting buildings.

- Replacement of Conventional Fluorescent Lamps with Energy Efficient Fluorescent Lamps – Fluorescent lights have been used extensively over the years. However, not all fluorescent lights are energy efficient. For instance, the T-12, T-8 and T-5 series have varying level of energy efficiency. The T-5 fluorescent is the most energy efficient of these categories, next to this is the T-8 series which is 30 -40% more efficient than the T-12. " T" indicates that the shape of the lamp is tubular, while the numerical value represent the diameter of the tube. Figure 2 below shows a comparison between incandescent and energy efficient bulbs at the same lux level.

	60W Traditional Incandescent	43W Energy Saving Incandescent	15W Compact Fluorescent Lamp	12W Light Emitting Diode
Energy Saved (%)	-	25%	75%	75 – 80%
Bulb Life (Hours)	1000	1000 - 3000	10000	25000

Figure 2: Comparison between Conventional Incandescent and Energy-Efficient Light Bulbs

- Implementation of LED "EXIT" Signs—LED require 80% less energy than conventional incandescent lamps and 75% less energy than compact fluorescent lamps. Apart from the energy savings, LEDs can have up to 5 years lifecycle.

- Use of High Frequency Electronic Ballast – Ballast are part of the fluorescent lighting luminaire that helps regulate the starting and operating characteristics of fluorescent bulbs. Up to 35% energy savings can be achieved by replacing the conventional ballast by high frequency electronic ballast.

- Using System Control Technologies—Implementing control technologies like occupancy/motion sensors and automated key tag systems to turn light on and off helps eliminate the wastage experienced with typical manual control switches where light bulbs can be left on when not in use or when the building occupants are not there.

Continues on page 3

Inside this issue:

We will love to hear from you! Please send your comments, suggestions and contributions to: info@cacons.com

INDOOR AIR QUALITY: A COMPROMISED CONCEPT IN PLACES OF ASSEMBLY IN NIGERIA

Let us for a minute imagine a very hungry man in an enclosed kitchen, with the windows and all doors closed, using a deep fryer with the whole place laden with smoke. At the end of the cooking, he was able to satisfy his desire for food but at the expense of his lungs therefore finding himself in the hospital soon after eating. This, he could have successfully achieved by opening all the doors and windows to allow for air movement in and out of the kitchen. Such is the scenario in most places of assembly in Nigeria. That comfort, as regards body temperature, is satisfied at the expense of the health and wellbeing of the occupants.

The common places of public assembly in Nigeria today are the religious centers such as churches and mosques. When it comes to air conditioning to achieve comfort, the most common equipment installed in these places of assembly is the floor standing free blow units mounted at strategic points. This gives the occupants a sense of comfort but at the expense of the indoor air quality. Indoor Air Quality (IAQ) can be defined as the physical, chemical and biological properties that indoor air must have, in order not to cause or aggravate illnesses for the building occupants.

The commonly used free-blow air conditioning units, and the wall mounted split air conditioning units, are purely re-circulating units, therefore warm air in the space is drawn through their cooling coils and the resultant cooled air is thrown back into the space and this result to a 100 percent recirculation of the same air. The re-circulated air is contaminated as different occupants might have various air-borne diseases like, coughs etc. and since the same air is sucked in by the air conditioning equipment just to be inhaled by another occupant that come into the hall in a good state of health. Other contaminants in the air could be, chemicals from wall paints, body odours etc. This became known as the *indoor air quality* (*IAQ*) *problem* or *sick building syndrome.* In response, research studies and experiments established levels of outdoor air ventilation needed to achieve acceptable indoor air quality.

The concentration of indoor air contaminants and odors can be maintained below levels known to impair health or cause discomfort, by the controlled introduction of outdoor air to exchange with room air. This is known as ventilation.

To allow for individual variations in health, eating habits, and activity level, and the presence of other air contaminants, with a margin of safety, ASHRAE (American Society of Heating, Refrigeration and Air-conditioning Engineers) Standard 62.1-2007, *Ventilation for Acceptable Indoor Air Quality,* specifies a minimum of 2.5 litres per person of outdoor air together with 0.3 litres per second per square area of the space should be injected into any particular place of assembly.

Other problems associated with the use of free-blow air-conditioning unit in places of assembly is improper air distribution, as some occupants may complain of dizziness, feeling cold as a result of direct blow of cold air at them, and headaches. Another is the sweating in under arms despite the working air conditioning units. This is due to the equipment's lack of capacity to control the humidity level of the air.

To mitigate against all these issues, the ideal air conditioning system in places of assembly must be capable of ensuring proper air distribution, humidity control, removal of stale or contaminated air by the injection of outdoor air and exhaust of staled or contaminated air. While at the same time ensuring that the occupants have the highest level of comfort desired. Therefore, the following air-conditioning system options are recommended to be deployed in places of assembly.

1. Rooftop air-conditioning units.
2. Custom Spilt air-handling units with air-cooled condensing unit.
3. Custom chilled water air-handling unit with chiller plant (either air-cooled or water cooled type).

CEO'S COLUMN

Volume 9 Issue 2

Dear Reader,

We are glad to be with you again on this edition of our newsletter. The topics focus on methods in achieving energy conservation in buildings and the benefits in maintaining an acceptable Indoor Air Quality in places of assembly. They are systems we would enjoin you to consider installing in your future buildings.

In order to include issues/articles that are important to you and your industry, we would love to hear from you, email us at info@cacons.com with your suggestions.

If you will require reprints of previous newsletter, kindly visit our website www.cacons\newsletters to download the newsletter.

Your active support is crucial. We thank you for staying with us all these years and we do sincerely look forward to hearing from you.

Engr. Charles 'Yele Akindayomi
Founder/CEO

cakindayomi@cacons.com

BMS (Building Management System) is a high technology system that consists of software and hardware, installed in buildings to centrally control and monitor some of the building's mechanical and electrical equipment. BMS automates and takes control of various operations. It efficiently manages and coordinates the various systems connected to it, to provide a comfortable working/living environment, energy utilization and management. Its purpose is to control, monitor and optimize building services such as: air handling and cooling plant systems, lighting, power systems, fire systems, security systems, ventilation and climate control; time and attendance control and reporting.

How BMS Works

The BMS is a "stand alone" computer system that can calculate the pre-set requirements of the building and control the connected plant to meet those needs. Its inputs and outputs which includes temperature sensors and on/off signals respectively are connected into devices around the building. Programs within these devices use this information to decide the necessary level of applied control. The devices are networked, enabling flow of information between devices. In addition, a modem can also be connected to the system to allow remote access.

The level of control via the BMS is dependent upon the information received from its sensors and the command based on its applicable programs. In addition to offering a degree of control to its environment, it can be made to alarm on conditions that do not meet specification or instances of plant failure.

Occupancy times for different areas are programmed into the Building Management System such that the plant is brought on and off to meet the occupier requirements. These times are often under optimum start control. For instance, the cooling plant is enabled, at a varying predetermined time, to ensure that the cooled space is at the set or desired temperature for the start of the day. The Building Management System therefore, based on the outside air temperature, the space temperature and the building structure, determines the plant start time.

Functions of Building Management Systems

The four basic functions of a central, computer-controlled BMS are Providing Control, Easy Monitoring, Optimizing Energy and Reporting.

Some Common Areas of BMS Application Include:

1. Energy Savings

The use of various building automation techniques, by merging independent systems (ventilation, air conditioning, humidity control, lighting, access control, video, communications, data collection, information sharing, networking etc.) into a single, inter-operable system, combined with the help of occupancy sensors provided in various areas of the building, the service plants can be brought into operation only when needed and also to the optimum condition, thereby leading directly to better performance and more intelligent energy use.

2. Intelligent Environmental Systems

By introducing various intelligent control systems, the environment can be made much easy and conducive to work in. BMS can automatically monitor and control certain factors such as;

- Acceptable levels of temperature and humidity.
- Safe guard against odours and indoor air pollutants.
- Provide sense of habitability through air movement, ventilation and slight temperature variation.

While also allowing the occupant to control and modify conditions to suit individual preferences.

3. Security and Life Safety Systems

Through the installation of various security and life safety systems like Closed Circuit Televisions and Surveillance Systems, Smart Access Control Systems, Smoke Detection Systems, Fire Alarms and Sprinklers, Emergency Control of elevator/doors, Intelligent Comfort Systems, Passive Infrared Occupancy Sensors (PIR) etc., the environment can be made much safer and conducive

4. BMS and Illumination System Control

Illumination is an essential part in the design of a building. Optimal control of lighting fixtures can cause significant savings in energy. Different control systems exist, time-based control and optimizer parameter-based where a level of luminance or particular use of lighting is required.

Zones: lights are switched on corresponding to the use and layout of the lit areas, in order to avoid lighting a large area if only a small part of it needs light.

Time control: to switch on and off automatically in each zone to a preset schedule for light use.

Passive Infra-Red (PIR) Occupancy sensing: In areas which are occupied intermittently, occupancy sensors can be used to indicate whether anybody is present or not, and switch the light on or off accordingly.

Light level monitoring: this consists of switching or dimming artificial lighting to maintain task-specific light level measured by a photocell.

Continued from page 1

The energy savings potential that can be achieved by using Occupancy Sensors is shown in Figure 3 below.

Application	Potential Energy Cost Savings
Private Office	25 -50%
Open Office	20 – 25%
Restrooms	30 – 75%
Corridors	30 – 40%
Storage Areas	45 – 65%
Meeting Rooms	45 – 65%
Conference Rooms	45 – 65%
Ware Houses	50 – 75%

Figure 3: Light Energy Saving Potential with Occupancy Sensors

Finally, the importance of conserving energy expended for lighting our buildings cannot be overemphasized. Also most of the measures for conserving energy as discussed offer reduced life cycle cost when compared to the conventional systems.

References:

"Energy Efficiency in Buildings a must, both Economically and Ecologically" - www.sweden.sk
"Energy Efficient Lighting" - www.energystar.gov
"World Electricity Consumption for Lighting by Sector and Potential Electricity Savings", 2005 - www.earth-policy.org
US Department of Energy: www.eere.energy.gov

CONSULTANTS CORNER Mechanical, Electrical & Piping Consulting Engineers

CA CONSULTANTS LTD

Head Office:
6th Floor, UBA House,
57 Marina, Lagos, Nigeria
Telephone: +234-1- 4622734, 4622735
E-mail: mainoffice@cacons.com

Abuja Office:
Suite 1, 1st Floor, Wing B, City Plaza Ahmadu Bello Way,
Garki 2, Abuja, Nigeria
Telephone: +234-9- 2918015
E-mail: abujaoffice@cacons.com

www.cacons.com

Our Services

FEASIBILITY STUDIES:
Technical and economic surveys, comparative cost evaluations and recommendations into various methods of resolving a problem. Preparation of project reports.

DESIGN:
Design of air-conditioning, electrical, extra low voltage, lighting, plumbing & drainage systems.

CONTRACT:
Preparation of specification, functional and layout drawings for tender action.

DOCUMENTATION:
Preparation of Bills of Quantities as required.

COST CONTROL:
Budget estimating. Evaluation of Tenders. Valuation of Variations. Certification of interim payments and final accounts.

TROUBLE SHOOTING:
Investigation, reporting and recommendations on faults or lack of performance, on Mechanical and Electrical systems.

ADVISORY SERVICE:
The company advises on refurbishment and remedial works and provides supervisory site staff as required. The company is completely independent of any manufacturing, supply or construction company and its advice is completely professional and unbiased in anyway.

About Us
In just 26 years, CA Consultants Limited, an ISO 9001:2008 Certified, Mechanical, Electrical and Piping consulting engineering firm has grown to a professional and technical staff of 25 out of our 44 employees. In 2000-2014, we completed more than 155 projects for diverse clients.

We appreciate your comments, suggestions and recommendations , please send them to any of our addresses above.

ON-GOING PROJECT

On-going Civic Centre Towers Project at Ozumba Mbadiwe Avenue, Victoria Island, Lagos

CA Consultants Limited designed and is overseeing the installation of the Mechanical, Electrical and Piping (MEP) systems of the Civic Centre Towers, located along Ozumba Mbadiwe Avenue, Victoria Island, Lagos. It is a 15 storey office building with three level car parking with a gross area of 16,000m^2.

The air conditioning is provided by air cooled chillers located at the open part of third floor of the building. Every floor has an Air Handling Unit (AHU) that supplies cool air to the respective floors. The air flows through a ducted system, with multiple variable air volume (VAV) boxes situated at various sections to control the air supply to each section. The fresh air requirement for the building is provided by a dedicated fresh air handling unit located in the plant room at the highest floor.

With respect to water supply, water is pumped from two number 10m^3/hr boreholes. The raw water is processed in a water treatment plant located on site and in turn stored in an underground water tank. The treated water from the underground tank is pumped to a storage tank on the fourteenth floor via transfer pumps, and will flow by gravity to the sanitary fixtures on all the floors. Other piped services installations in the building include a drainage system and a fire fighting system which comprises of sprinklers, hose reel and fire hydrants. In addition, one above ground diesel storage tank is provided to supply diesel to four standby generators located on site. An underground sewage treatment plant is provided to treat the entire soil and waste water from the building before disposal into the public drains. The building is serviced by four lifts to all the floors; 3 number 17 passengers lifts and 1 number goods and services lift.

Electrical power supply to the building is from PHCN (1.5MVA 50Hz 11/0.415KV). There will be four in number 500KVA sound proof generators synchronized to serve as backup power to the mains power supply from PHCN. One out of the four generators serves as back up to the other three generators during selective or forced maintenance period. The lighting systems are controlled by presence detectors, which switch power on and off when presence is detected. This is to ensure that un-accommodated rooms are not lit. This, in effect will improve energy conservation in the building. The final Sub circuit power distribution is through floor boxes which also convey dual outlets for data and voice systems. Raised floors are used on all lettable spaces, this is to enable power distribution in line with requirements of prospective tenants.

It is designed to be an intelligent building which converges Access Control, CATV system, PA system, Fire alarm, Data and Voice systems on a single platform. The Building will also contain an integrated Building Management System (BMS) to monitor and control the Mechanical, Electrical and Plumbing systems.

Quality Policy
" To be trusted advisers in Building Engineering System and Infrastructure who satisfy customers' expectations through active customer listening, deployment of highly competent and motivated workforce, use of advance technology, nurturing of long term mutually beneficial customer relationship and the continual improvement of our Quality Management System while complying with applicable national & international statutes and regulations".