The power of daylight

By Brian Gould, Energy Solution Group

When does green equal white? When the white light of daylight produces benefits that are clearly green. Daylighting, a technology that has been used for decades, is seeing a new level of interest. It addresses concerns about reducing energy consumption and energy costs and offers a green approach for the efficient use of our environmental resources. Daylight is in the spotlight again because it provides effective lighting and reduces costs. However, it’s not just the use of what we have known as “skylights” that is making the difference. Natural lighting technology has made some notable strides recently; providing higher quality lighting at reduced costs.

Daylighting Revolution

So significant are the benefits from new daylighting technology that their application is, in fact, revolutionary. Before looking at some innovative products let’s dispel some common misconceptions about its use.

Daylighting is not more expensive to implement than traditional electric lighting solutions. If an integrated design approach is used, daylighting quickly produces attractive paybacks. A study for the Department of Energy’s Building Technologies Program, conducted by TIAX, LLC, concluded that top-lighting (skylights with lighting controls) systems produced savings of 35-55% of annual lighting energy, (roughly resulting in $0.11 to $0.32 per square foot savings per year).

And, daylighting is not complicated. It doesn’t require sunny days and is not limited to skylights and clear glass windows.

Technical Breakthrough

New daylighting applications use a state-of-the-art, solar powered GPS rotation control system that tracks the sun. The accompanying single mirror effectively reflects the sunlight into the building. The light passes through a thermal barrier, through a light well and a bottom light diffuser to effectively spread the light throughout the building. Since this type of system produces up to ten times more light than a passive skylight and distributes it more evenly and over a wider area, users can turn the lights off for an average of ten hours a day. That means no electrical draw from line voltage. Businesses that have implemented this system have realized dramatic savings: one clothing manufacturer found the artificial lighting costs in their warehouse dropped by two-thirds along with a one-third drop in HVAC costs. Other businesses have reported similar savings.
There’s More . . .
Cost savings from daylighting are only some of the benefits the technology offers. Improvements in students’ test scores, increases in retail store sales, and reduced employee absenteeism have all been attributed to daylighting. The Wal-Mart store in Lawrence, Kansas documented increased sales in sections of the store that were illuminated by daylighting, as reported in the Wall Street Journal.

The productivity gains and payback periods are on top of local, state and federal government incentives for supporting green energy practices. For some businesses the green investment in daylighting technology is returned quickly and then continues to save the business on their energy costs every year.

Who Benefits Most
By far, two types of buildings have been shown to benefit most from daylighting: warehouses and “big box” retail facilities. In those types of buildings, the return on investment is so favorable the payback typically only takes three to four years. A slightly longer payback period is usually required for existing office buildings and schools, but it is still very attractive.

The Experts Report
“We are very impressed with the combination of benefits from this type of product; everything from the short payback period to the numerous productivity gains. Installations like the one our company is scheduled to complete at the Columbus Zoo and Aquarium, in Ohio, show the significant reductions available in energy costs, lamp replacement times, maintenance and cooling loads,” reports Tom Anderson, President of The Energy Solution Group (www.theenergysolutiongroup.com), one distributor for this type of technology.

White daylight is now the new green.

Author notes:
- Brian Gould is a partner and COO of the Energy Solution Group, located in Columbus Ohio. 614-610-1398 brian@theenergysolutiongroup.com
- More information can be found at www.theenergysolutiongroup.com or www.ciralightglobal.com
Commercial skylights—Overcoming the objections

By Ken Laremore, Carlisle Syntec

Daylighting commercial buildings is a great strategy to save on energy costs and reduce a building’s carbon footprint. Even in a retrofit environment, skylights can be added to the roof assembly with very little disruption to the workplace below. However, most building owners express an aversion to skylights for multiple reasons. Unless skylight manufacturers can demonstrate the effectiveness of their products, building owners will not consider the option despite the benefits.

A recent advancement in the skylight manufacturing process could go a long way towards dispelling a common objection of building owners—the notion that skylights always leak. The production process is called Reaction Injection Molding (RIM). RIM parts are created through a process wherein two liquids undergo a chemical reaction, forming a polymer in a mold. The RIM integration of frame and glazing is watertight; no gaskets or sealants are necessary. Components of this assembly expand and contract at similar rates, unlike traditional skylights with metal frames and plastic domes. Any separation between the two could cause a gap to form, allowing water to collect in the cavity, which freezes and causes failure.

Building owners’ objections to the potential heat gain and loss through the building envelope by skylights must be addressed as well. In fact, the operation of electrical lights contributes to more heat gain than heat transferred through a skylight. Heat loss can be managed by selecting better insulating glazings for skylights. One other advantage of the skylight frame assembly described above is its ability to deter “temperature transference.” In other words, it does not conduct heat or cold, which increases the possibility of condensation forming on the inside of the skylight glazing.

Skylight curbs deserve a good deal of consideration in the area of heat loss as well. No matter how well the skylight glazing is insulated, heat loss through curbs can take place. One new curb design now available involves the use of SIPs (Structural Insulated Panels.) SIPs are high-performance building panels used in floors, walls and roofs for residential and light commercial buildings. The panels are typically made by sandwiching a core of rigid foam plastic insulation between two structural skins. These curbs are also available with white reflective interior skins to assist in light diffusion.

One of the most important considerations for building owners evaluating skylights is the expense, and in today’s economic climate, it is a major potential objective to overcome. However, skylights actually pay for themselves over time as long as some form of lighting control is utilized.

Daylighting a commercial building is, when all is said and done, one of the most cost-effective strategies for building owners to save operating dollars, reduce their carbon footprint, and demonstrate their sustainability. For property management companies, it is a strategy to attract lessees because it will lower their energy costs. Most, if not all, of the typical objections to skylights can be answered with common sense and new technology. It’s time to “Let the Sun Shine In!”
News

Lutron Controls at the Energy Center of Wisconsin
Lutron Electronics, Inc., a member of the Daylighting Collaborative and manufacturer of lighting control systems for residential and commercial buildings, donated a set of its lighting controls to the Energy Center of Wisconsin in September of 2010. The lighting controls were installed in a conference room and a copy room to reduce electric lighting usage, as well as for demonstration and educational purposes. Both installations are summarized below.

Conference Room
The Volt Room is a conference room that is approximately 12’ × 15’ in area and located on the building’s west-facing perimeter. The conference room has three 3-lamp, 32 watt, T8 fluorescent fixtures for lighting and ample glazing area for daylighting.

Dual photosensor and occupancy sensors were installed in the conference room. The Lutron photosensor and occupancy sensors communicate wirelessly with the programmable wall switch to control the electric lighting.

The occupancy sensor will turn on the electric lights when someone enters the room and keep them on so long as the room is occupied. However, if enough daylight is present, the photosensor will keep the electric lights off. Energy Center staff estimate that this control strategy will reduce the electrical usage by 75% due to the availability of daylight during operational hours. This reduction would correspond with an annual reduction of 1.2 kWh / ft2 and approximately $21 of energy cost savings.
Copy Room
The copy room is approximately 14’ × 22’ in area and located in the building’s core. It therefore has no available daylight. The copy room has three 2-lamp, 32 watt, T8 fluorescent fixtures for lighting.

An occupancy sensor was installed in the copy room. The occupancy sensor is mounted by the room’s entrance and will switch on the electric lights whenever someone enters.

The occupancy sensor keeps the electric lights on so long as the room is occupied. However, after one minute of unoccupied time, the lights will be shut off. Energy Center staff estimate that this control strategy will reduce the electrical usage by 80% due to the infrequency of this room’s use. This reduction would correspond with an annual reduction of 1.1 kWh / ft² and approximately $32 of energy cost savings.