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TUBULAR DAYLIGHT DEVICES DRAMATICLY BRIGHTEN DETROIT GEAR MFG PLANT

ENEREF INSTITUTE EXAMINES HOW DAYLIGHT TUBES SIGNIFICANTLY INCREASED A PLANT'S LIGHT LEVELS WITHOUT ADDING ENERGY COSTS.

“Just seeing the daylight that comes out of these things is absolutely amazing,” explains Keith Bonn, describing the natural interior daylight system installed in Delta Gear’s new 72,000 sq. ft. facility.

Bonn is Facilities Coordinator for one of the nation’s leading manufacturers of high precision gears for the automobile and aerospace industry.

The Michigan-based manufacturer purchased an abandoned newspaper

IT WENT FROM AN OLD BUILDING NEWSPAPER PLANT TO A BRAND NEW BEAUTIFUL BRIGHT BUILDING.

Bob Sakuta is President and owner of Delta Gear, Inc. in Livonia, Michigan.

office with an adjacent printing facility. The adaptive reuse of an old paper plant inspired Delta Gear's president, Bob Sakuta, to also build the facility to energy efficient LEED standards.

As part of our Natural Interior Daylight Initiative (NID) to reduce energy use in lighting, Eneref Institute interviewed a number of stakeholders on the recently built Delta Gear plant in Livonia, Michigan. Included in our interviews were Delta Gear's Bob Sakuta, Scott Sakuta and Keith Bonn. Also included were contractor Joe Hammond, and architect Lonny S. Zimmerman.

Their new freestanding facility, fifteen miles northwest of Detroit in an industrial area, doubles their previous space of offices, warehouse and manufacturing.

BUILDING THE DELTA GEAR REPUTATION

Delta Gear, a supplier to the aerospace and defense industries, strives to echo the sustainability efforts of their customers, according to Partner and co-owner Scott Sakuta.

Delta built their reputation on the manufacturing of precision equipment for harsh environments such as space, and down hole drilling, even building gear parts for the Mars Rover. That high level of machinery precision—critical to the manufacturing operations of aviation couplings, gear boxes and transmission gears—requires both high quality and high levels of light.

Delta has 140 combined employees, with 56 located at Delta Gear full-time; they work with very specialized gear equipment in a temperature controlled environment.

“Because of the nature of what we do, and the microns these guys work with, and the instrumentation they use, the first thing always has to be the quality of the light so the guys can do their jobs,” explains Bonn. A micron is about a four-hundred-thousandth of an inch.

Sakuta said the natural interior daylight system in the new facility satisfies several other criteria the company was looking to achieve

beyond the high quality of light. Visual comfort was important so that employees would not feel “locked in to four walls and a roof.” And the energy savings was, of course, critical.

Sakuta added, “Basically, it's free light.”

Still, Bonn said, everyone was surprised by just how effective the system was.

“You wouldn't believe it, how much daylight it makes inside the building. I mean it's phenomenal,” said Bonn.

TUBULAR DAYLIGHT DEVICES INSTALLED

To achieve the high level of light in the facility, Delta Gear hired General Contractor Joe Hammond to install seventy-nine VELUX Commercial Sun Tunnel skylights. Sun Tunnels are tubular-shaped devices that transfer daylight through a twenty-two-inch diameter tunnel made of highly reflective aluminum material.

Above the Sun Tunnel on the roof is a 22-inch round clear acrylic dome, designed to capture low-angle sunlight in the morning and evening hours, while managing the intense glare of the direct mid-day sun.

This system is ideal for flat or low slope commercial roofing applications.



TUBULAR DAYLIGHT DEVICES

*Delta Gear installed 79
VELUX Commercial
Sun Tunnel skylights.*

The reflectivity of tubular devices is crucial because some of the photons—or lightwave energy packets—are absorbed into the interior aluminum material of the tube with each angular bounce of light and converted into heat. However Sun Tunnels use an Almecco brand specular material that is nearly 100% reflective, so almost all the daylight collected on the roof is carried into the facility as light.

“The interior coating, as you look up inside of it, is extremely reflective,” said Hammond.

In the several acoustical ceiling offices and conference rooms,

electrically operated daylight controllers were installed on the bottom of the Sun Tunnels to dampen or completely block the light during video projection. In the shop areas, where the majority of the tubular devices were installed, the Sun Tunnels were set free hanging.

“We were able to optimize and maximize our natural light and reduce energy costs, which made the sun tubes an incredibly beneficial aspect of our remodeled facilities,” said President and owner Bob Sakuta.

Bob was “going for a feel,” said the junior Sakuta. “But also he

just thought it was a good idea.”

DECISION TO MOVE FORWARD

The system needed to meet certain criteria.

“We did a lot of research to find out what would be the most light for the most economical price,” said Bonn. “But number one, it had to be OSHA rated.”

OSHA regulations state skylights must be guarded and capable of withstanding a load of at least 200 pounds.

Because Delta Gear had two different roof types, the tubular

TUBULAR DAYLIGHT DEVICES CAN OFFER LEED CREDITS TOWARDS PROJECT CERTIFICATION

In commercial buildings, tubular daylight devices are designed for low-sloped and flat roof applications with a suspended ceiling or hard ceiling in the interior space.

system they specified needed to allow for curb mount and self flashing directly to the roof. VELUX offered a curb kit as well as a self flashed kit, said Bonn.

“I’m an electrical contractor, and I’ve built houses before where we’ve used the residential version of VELUX Sun Tunnels,” said Bonn. “That was a determining factor too.”

The project team investigated LEED certification for the building, but decided instead to follow the guidelines without claiming LEED credits. “We decided to use the money for LEED certification and throw it into the actual dollars in the building,” said Lonny Zimmerman of Siegal/Tuomaala Associates, the architect team.

INSTALLATION OF THE DAYLIGHTING TUBES

According to Zimmerman, the tubular devices allowed him to direct the light. The tubes have elbows designed to bend around unusual or difficult spaces, although most of the tubes installed in the building were straight.

“We couldn’t always have a direct vertical shot down,” explained Zimmerman. “Sometimes we had to modify it slightly and angle it. It gave us flexibility.”

Much of the old newspaper printing plant’s interior was gutted before Delta Gear occupied the building, although some of the front office areas were kept. Some offices were cleaned and carpeted, while other offices were new. The front of the building was retained but received major modifications to the entrance because of its visibility. To allow for the weight of some new hi-tech manufacturing equipment, part of the floor was dropped three feet. In other areas the floor was raised.

The attachment building was knocked down and replaced. The factory space was brand new.

Transitioning to the new facility was done in stages and “went fairly well,” according to Scott Sakuta. Some equipment was new and some of the existing equipment from the previous building was brought in. “It was a ballet dance.”

The roof of the new building was constructed with double insulated EPDM rubber. Hammond said installing the Sun Tunnels on the new roof was almost effortless. “It was just a matter of laying them out, cutting the deck and dropping the tubes through,” he said.

His roofer needed less than half

an hour for each tube and another half hour to flash them. The existing building kept the old coal tar pitch roof, and required more time to install the Sun Tunnels—double that of the new EPDM rubber roof. All in all, the entire installation was well within the timeframe expected by Bonn.

“I don’t think it took them very long,” said Bonn. “We gave them a six or an eight week window and they were able to deliver without a problem.”

The generous amount of roof space allowed architect Zimmerman, together with the HVAC team, to design the placement of the Sun Tunnels on the roof, which ended up as mostly symmetrical rows.

Hammond said the daylighting tubular devices were hand-carried to the roof to avoid any potential damage to the reflective material, but that this is not untypical of other building materials he works with. However, what he most remembered about the tubular devices was the vast amount of light they emitted.

“The amount of light broadcast on the floor was incredible,” exclaimed Hammond. “I was shocked. I was absolutely shocked.”



THERMAL ENERGY SAVINGS

The energy savings achieved from reducing dependency on electric lighting far exceeds any heat gain or heat loss in most applications.

Supplementing the four hundred electric T5 fluorescent light fixtures are seventy-nine VELUX Commercial Sun Tunnel skylights. While the T5 fixtures have sensors that can dim the fluorescent lamps when the sun is shining, the plant made the decision to blast the floor with both the natural daylight and the artificial electric light together.

Scott Sakuta said he never hears complaints from workers about not enough light in work areas under the Sun Tunnels but occasionally people do complain about it being too dark where there are only electric lights.

“They’re wonderful,” said Sakuta. “I just think they’re absolutely—if you were going to build a manufacturing plant anywhere in the world, I don’t know why you wouldn’t put these in.”

Sakuta explains that not only was the amount of light appreciated by the employees but the quality of the light as well.

“I think the guys are energized because it’s not just fluorescent bulbs generating this unnatural spectrum. It’s worth the money.”

The eighteen-month construction project of the new Delta Gear facility cost about \$4.5 million.

However, the company was able to take advantage of a Detroit Edison (DTE Energy) utility company incentive program to offset some of the cost of the daylighting system.

But even without the cost incentive rebate, Keith Bonn is convinced it was the right decision. “Daylight absolutely made a huge difference. I think it’s more than what we were hoping for.”

Research and reporting compiled and provided by Enerref Institute. Information generously provided by VELUX USA, Delta Gear and Siegal/Tuomaala Associates.