High Performance Retrofit Yields Lower Operating Costs and Reduced Energy Consumption

Tremco Headquarters

Transforming a 40 year old building into a sustainable showcase

An RPM Company

TREMCO®

The High Performance Renovation

OF THE TREMCO INCORPORATED HEADQUARTERS BUILDING MAKES A BOLD STATEMENT ABOUT THE CAPABILITY AND COMMITMENT OF THE RPM BUILDING SOLUTIONS GROUP (RPM BSG) TO GLOBAL SUSTAINABILITY.

Tremco is the foundation of the RPM BSG, which is itself part of RPM International Inc. This flagship project is the result of the integration of multiple RPM products, systems and services that serve the worldwide construction and maintenance and repair industries. By transforming the Tremco headquarters building into a sustainable showcase, the RPM BSG brings home its commitment to helping customers develop and maintain sustainable, high performance buildings that are energy efficient, have limited environmental impact and operate with the lowest possible life-cycle costs.

The Challenge

Like many circa 1970 buildings, Tremco's headquarters building was under-performing. The building was extremely energy inefficient with a dismal ENERGY STAR rating of 11 and energy costs exceeding $4.75/ square foot, twice the industry average. It was often uncomfortable to work in, and repair and maintenance costs on the three-story, 46,200 square foot facility were escalating. Faced with the following challenges, the status quo made for an unsustainable, costly approach to facility management.


AIR LEAKAGE


WINDOWS


ROOFS


FAÇADE


ENTRANCES


HVAC


BUILDING CONTROLS


WATER USE

"We wanted to create a higher-performing building. One that was a more comfortable work environment for our people and demonstrated our capability and commitment to clients and the community. And maybe most importantly, we wanted to be true to our vision of sustainability as a core business strategy."
—Randall Korach, President of the RPM Building Solutions Group

The Solution: *Whole Building Retrofit for High Performance*

FACED WITH THE SIGNIFICANT CHALLENGES OF THIS UNDER-PERFORMING BUILDING, THE CHOICE BECAME APPARENT: RENOVATE OR MOVE.

Tremco, which is committed to being a global leader in sustainable development, took the opportunity to lead by example and demonstrate how aged buildings can be converted into sustainable, energy efficient facilities. The Tremco headquarters was slated for a multi-million dollar, foundation-to-roof retrofit featuring an integration of solutions from multiple RPM companies.

The goals of the retrofit aligned with Tremco's broader vision for sustainability: reduce energy consumption and generate on-site renewable energy; capture stormwater and improve water conservation; minimize the amount of waste going to landfills; reduce operating costs; improve employee comfort; and protect the natural environment by reducing carbon output. The project was set with the ambitious goal of achieving LEED® Gold certification, and an even more ambitious five month construction schedule.

AIR LEAKAGE – Gaps, cracks and holes in the building envelope (including windows with degraded gaskets, doors with failed weatherstripping, and gaps within roof walls) created uncontrollable heat loss and gain which compromised the HVAC system as well as employee comfort, and fueled excessive energy costs.

WINDOWS – Inefficient single-pane, clear glass windows with non-thermal aluminum frames and degraded gaskets needed replacement.

ROOFS – All roof areas had degraded to the point of needing replacement.

FAÇADE –Cracks and fissures in the slate exterior allowed water to infiltrate the building.

ENTRANCES – The lack of a vestibule at the employee entrance allowed outside air to enter conditioned spaces. Also, the front entrance was not ADA compliant (nor were any restrooms).

HVAC – Outdated cooling and heating systems, which featured a constant flow mix of heated and cooled air, were extremely inefficient.

BUILDING CONTROLS – Constant speed/ constant flow controls wasted energy and were not integrated into the cooling, heating or air handling controls.

WATER USE – Dated plumbing fixtures prevented the most efficient use of water.

RPM SOLUTIONS
Deliver High Performance

Embracing a "whole building" approach to achieving high performance, in which a building is considered a system rather than individual elements, the retrofit included the product and service expertise of 10 different RPM companies. WTI, a subsidiary of Tremco Incorporated, managed the entire construction process. Material solutions were provided by the following RPM companies: Tremco Roofing & Building Maintenance; Tremco Commercial Sealants & Waterproofing; Canam Building Envelope Specialists Inc.; Dryvit Systems, Inc.; Increte Systems® (a division of The Euclid Chemical Company); Stonhard; Fibergrate®; Carboline®; and Modern Masters®.

canam BUILDING ENVELOPE SPECIALISTS INC.
carboline® Coatings - Linings - Fireproofing
dryvit®
Fibergrate
INCRETE SYSTEMS
M|M MODERN MASTERS®
STONHARD
TREMCO® Commercial Sealants & Waterproofing
TREMCO Roofing & Building Maintenance Division
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About the RPM Building Solutions Group

The RPM Building Solutions Group is an RPM International Inc. affiliate company, and employs over 3,500 people in dozens of locations around the world. The RPM Building Solutions Group consists of Tremco Barrier Solutions, Tremco Commercial Sealants & Waterproofing, The Euclid Chemical Company, Tremco Roofing and Building Maintenance, WTI and in Europe, Tremco illbruck. The facilities of each company are ISO 9001/9002 registered.

Surmounting Construction *Challenges*

Renovating While Building Is Occupied
A top priority during the renovation was that business operations not be interrupted as the occupied building underwent its roof to foundation overhaul. A major challenge was maintaining comfort for employees while installing the new HVAC system. As the renovation took place largely over the summer, maintaining a comfortable work environment was essential. "We spent a lot of time in the design phase creating a plan to maintain the old system as the new system was built in the same space," explained Craig Nelson, VP of Construction Operations for WTI. "The old system was disassembled and removed while the new, state-of-the-art chiller system was installed over a holiday weekend, in a matter of three days."

Nelson also noted that while the HVAC reconstruction took place in the mechanical room, which is adjacent to the vegetated roof, the vegetated roof was installed at the same time. A carefully orchestrated plan allowed for both plants and HVAC components to be installed concurrently.

Relocating Employees
To minimize the impact on people's jobs, Tremco temporarily moved the WTI and Tremco Roofing Customer Service groups to a nearby rented facility. This freed up the second floor, where interior reconstruction began. Once upgrades there were complete, employees from the third floor were moved to the second so that their floor could be renovated, followed finally by employees from the first floor. Each floor was temporarily moved for about six weeks.

The IT and Facilities Departments carefully planned and orchestrated both the offsite and internal moves and maintained connectivity to IT systems. The moves were conducted over weekends to make the transitions as seamless as possible. An added bonus of using an offsite facility was that it reduced the number of cars in the parking lot, making room for recycling construction debris.

Determining Load Carrying Capacity for Vegetated Roof
Prior to designing the vegetated roof, the building had to be examined to determine if it could support the roof's weight. With none of the original construction drawings available, WTI had to conduct physical testing to determine load carrying capacity. "Structural members of the building were examined through walls to determine the size of supporting girders and columns," said Nelson. "These invasive tests were completed at night and on weekends so as not to disturb employees. We found that the building could support over 170,000 pounds of engineered soil, and the vegetated roof was designed accordingly."

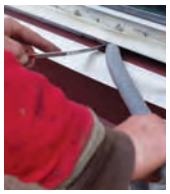
Capturing Water for Onsite Use
When installing a rain water harvesting system that can capture, filter and hold 15,000 gallons of water, the biggest question is where to put the enormous water capture reservoir. Tremco's is buried beneath its parking lot, where a pumping station ties in to the city's main storm sewer. Captured water is used to irrigate the vegetated roof and grounds around the headquarters building.

Installing New Façade Over Existing Slate
Because removing the exterior slate façade of the existing building was not possible while the building was occupied, a new exterior façade treatment was devised to be installed over the existing slate. Tremco's Commercial Sealants & Waterproofing Division and Dryvit Systems collaborated with WTI to design the new façade, which serves as an air barrier system where none had existed before. To ensure adhesion to the existing slate, testing was successfully conducted with Dryvit's Outsulation® Plus MD System®.

Scheduling, Timing, Budgeting
Timing was most certainly everything during the Tremco renovation. Originally slated for two construction seasons, the construction schedule was compressed into five months by carefully coordinating the concurrent work of a multitude of trades. Weekly scheduling, progress and costing meetings kept the project on schedule and on budget. Throughout the process, the WTI team maintained a full construction schedule, just as everyone else involved in the project carried normal workloads.




Sealing the *Building Envelope*



The following measures were taken to effectively seal the building envelope of Tremco's headquarters building.

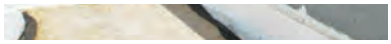
AIR BARRIER An air barrier audit by Canam Building Envelope Specialists identified numerous leaks throughout the building envelope which were remedied by the new Dryvit façade and high performance window system. Tremco Commercial Sealants & Waterproofing's ExoAir® 110LT Self-Adhered Air & Vapor Barrier Membrane was installed around the rough window openings and their Proglaze® ETA Engineered Transition Assembly sealed with Spectrem® 1 Silicone Sealant was used to ensure a secure, durable, airtight seal between the window system and the building façade. Benefits of the new, functioning air barrier system include improved indoor air quality, temperature control, energy efficiency and extended building life cycle.

FAÇADE Dryvit's Outsulation Plus MD System was installed directly over the existing slate façade, eliminating the time and expense of removing the slate and disposing of it in a landfill. (Slate from the mechanical room's façade, however, was removed and recycled as a walkway on the vegetated roof.) Outsulation provides exterior continuous insulation, a high-performance moisture drainage system and a durable exterior finish. The finish texture chosen was Dryvit's TerraNeo®, which gives the look of granite to the newly retrofitted structure. Employees who work in the building voted to select the color.

WINDOWS The high-performance window system was constructed on-site, incorporating numerous Tremco Commercial Sealants & Waterproofing products in the glazing system to ensure compatibility, long-term performance and airtight transitions. These included Spectrem® 2 Silicone Sealant for the metal-to-metal connections and structural tensile bead, spacer gaskets of SCR-900, and pressure bar gaskets of our peroxide EPDM with the Proglaze® ETA Engineered Transition Assembly at the window-wall interface. The new window system uses recycled aluminum and features double-pane tinted windows that exceed minimum energy standards.

MAIN ROOF The vegetated roofing system is the crowning glory of the renovation. Recycled slate and raised walkways circumscribe the rooftop blooming with more than 16,000 plants from 46 species. Four distinct horticultural areas are designed specifically for the local climate. The LEED®- friendly vegetated roof helps to reduce the demand on the heating and cooling system, improve air quality and aesthetics and extend the roof's life cycle through superior weathering protection.

MECHANICAL ROOM ROOF Tremco's TPA white thermoplastic single-ply roof system provides a highly reflective white surface to help decrease surface temperature and reduce energy costs. The roof system is approved by ENERGY STAR®, UL, FM Global, California's Energy Standard Title 24 and the Cool Roof Rating Council. All roofs were provided by Tremco Roofing and Building Maintenance.



THE INTEGRITY OF THE BUILDING ENVELOPE IS KEY TO A HIGH PERFORMANCE BUILDING BECAUSE IT DIRECTLY IMPACTS A BUILDING'S ENERGY USE THROUGH HEAT GAIN AND LOSS.

PARAPET WALL The height of the parapet wall surrounding the main roof was increased to improve safety on the roof and to coincide with the higher vegetated roof level. Its concrete block was sealed and waterproofed with Tremco Roofing's Wall-Tite, to provide a flexible "breathing" membrane. TremLock™ Series II "R" panels were installed to aid in a continuous waterproofing seal in conjunction with the flashing.

ENTRANCE CANOPIES The building's east canopy roof was replaced with Tremco Roofing's unique Rock-It™ system, featuring a highly reflective white gravel surface embedded in white adhesive that helps lower energy usage and slows the roof aging process. The west canopy roof was made over as a beautiful and self-sustaining vegetated roof.

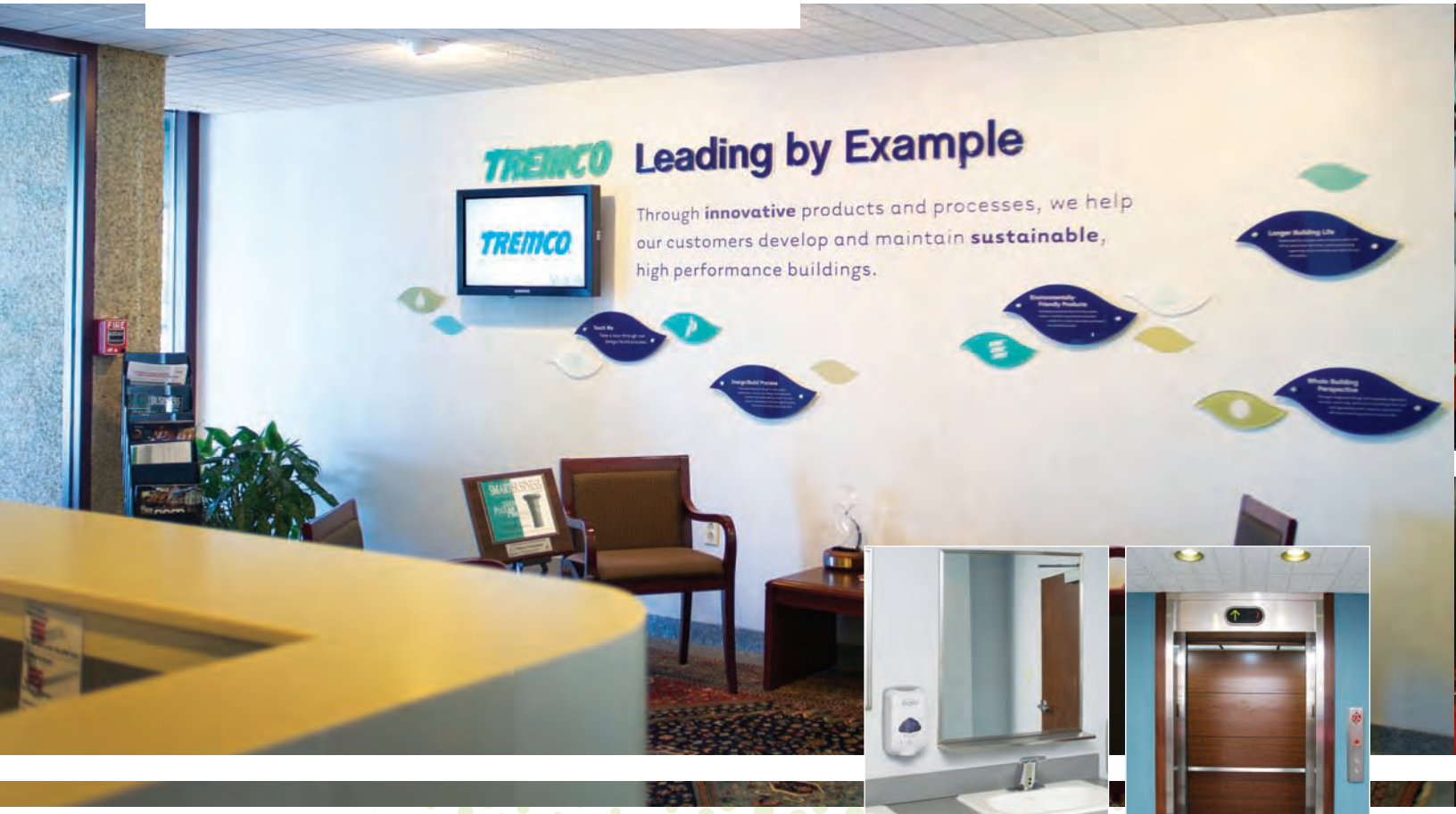
ENTRANCES A new interior vestibule was constructed at the employee entrance to keep unwanted outside air from infiltrating. Power-assisted doors, an ADA upgrade, were installed at the main entrance.

WALKWAYS New concrete walkways were installed, including durable custom-designed decorative concrete by Increte Systems®, a division of The Euclid Chemical Company.

SOUTH BUILDING On the headquarters campus' "south building," a new outside stairwell features a skylight to provide natural light, slip and corrosion-resistant Fibergrate® stairs, and a lightweight Dryvit façade that matches the building's brick beautifully.

Interior Improvements

Both energy efficiency and aesthetics were considered in the numerous updates made to the interior.



LIGHTING SYSTEM RETROFIT The installation of infrared occupancy sensors meets mandatory control requirements and keeps lighting energy consumption to a minimum.

LOBBIES Stonhard installed a beautiful and durable new lobby floor. New wall and door finishes were achieved with products from Carboline and Modern Masters.

MECHANICAL ROOM Inside the penthouse mechanical room, Tremco sealants were used to seal off numerous air leaks. The return air system was modified with Tremco sealants to eliminate air loss. The floor was given a facelift with a durable Carboline Sanitile® 555 floor.

The renovation of the mechanical room created significant additional space that allowed a conference room to be added adjacent to the vegetated roof.

RESTROOMS REMODELED Mandatory water use reduction was achieved by installing water-conserving fixtures in all restrooms and the kitchen area. Upgrades also made the first floor restrooms ADA compliant.

ELEVATOR MODERNIZED The elevator's operating system was optimized; ADA upgrades included the installation of audible and visual signals, Braille and lower call buttons.

The building's heating and cooling requirements changed dramatically after the proper sealing of the building envelope. Old equipment was replaced with energy-efficient components suited to the new demands of the renovated building.

HVAC System Upgrades

HVAC HEATING SYSTEM Two variable speed heating pumps were installed for more efficient operation. The piping system of the existing boilers was modified to achieve variable hot water flow. The entire perimeter radiation system was removed as a result of the increased performance of the building envelope.

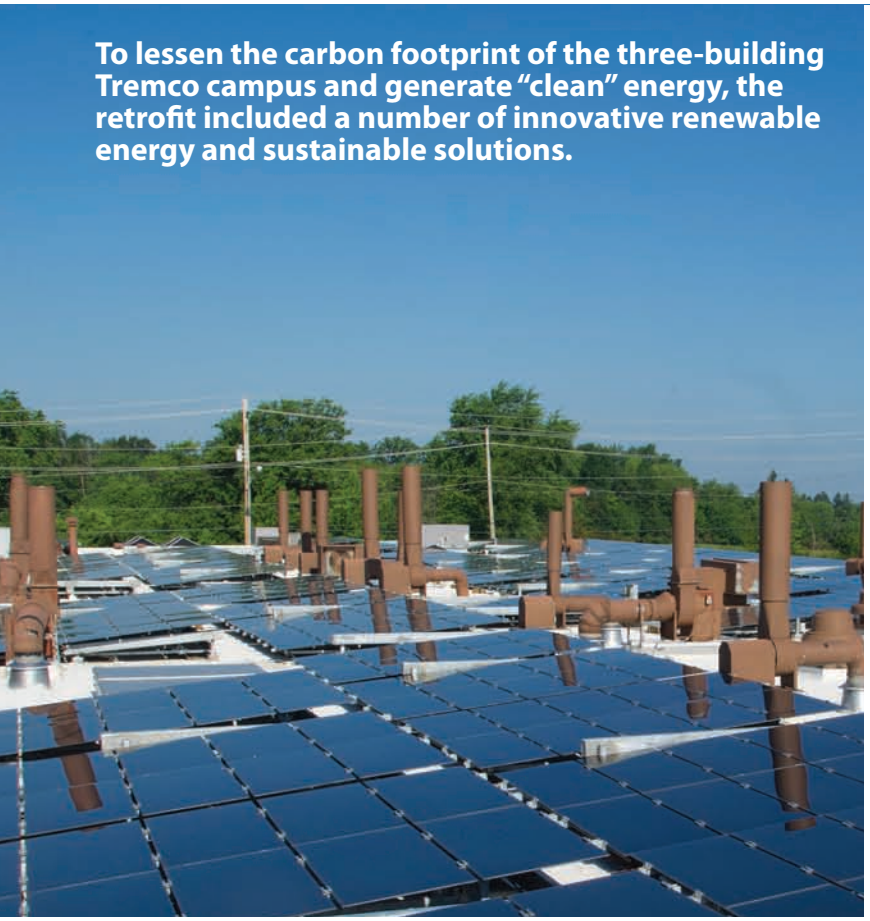
HVAC COOLING SYSTEM The cooling system received an overhaul with the installation of a new, variable speed, dual cell cooling tower; two new variable speed chillers; and new, variable flow pumping systems. This equipment allows for greater energy efficiency by modulating flow and capacity and is precisely matched to the building's new cooling requirements.

HVAC AIR DISTRIBUTION Distribution system components were converted to variable flow for more efficient operation. An energy recovery ventilator, communication network and occupancy sensors were also installed to meet mandatory energy requirements and improve operational efficiency.

HVAC CONTROL SYSTEM A facility-wide Building Automation System that incorporates "open protocol" communications controls and monitors all HVAC, lighting and renewable energy systems was installed. "Revenue Grade" submetering is utilized to monitor the energy contributions of the renewable energy resources.

Renewable Energy and Sustainable Solutions

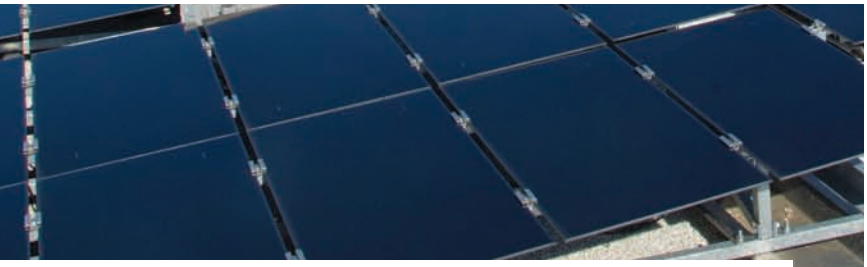
To lessen the carbon footprint of the three-building Tremco campus and generate "clean" energy, the retrofit included a number of innovative renewable energy and sustainable solutions.



PHOTOVOLTAIC Two solar arrays were installed, one on the roof of the south building and the other atop the new carport, and are expected to generate a combined 100,000 kWh annually. The carport includes four solar-powered electric vehicle charging stations, with room for additional stations, and funnels power to the headquarters building when the charging stations are not in use.

WIND TURBINE Up to 6,000 kWh per year is expected from the wind turbine installed on the campus. The turbine has an instantaneous power rating of 1.8 kW at winds of 25 mph.

VEGETATED ROOF The four unique environments planted on Tremco's vegetated roof help to cool air through evapotranspiration, lessen the heat island effect, and improve air quality by lowering greenhouse gases and airborne particulates, all important environmental considerations. Included in the plantings are the award-winning BioTray™ Vegetated Roof Delivery System and herbs grown for use in Tremco's cafeteria. The roof also provides a habitat for a wide range of insect and bird life.



RAIN WATER HARVESTING A 3,000 gallon reservoir placed under the parking lot is the collection point for Tremco's onsite rain water harvesting system. Collected water is pumped to a two-part filtration system and stored in one of six storage cisterns which collectively hold 12,000 gallons of water. The water is used to irrigate the building's ground level landscaping and, when necessary, the vegetated roof, eliminating the use of city water for irrigation and reducing the volume of water flowing into the storm drainage system.

DAYLIGHTING The deep-well skylight on the south building's new staircase diffuses natural light, reducing dependence on electric lights.

Recycling

In a project of this magnitude, generating more than two million pounds of construction debris, it is amazing that every bit was recycled, reused or burned for energy. This included: slate, wood, asphalt, concrete, non-ferrous metal, glass and other window materials, as well as built-up roofing system components such as insulation and gravel. Asphalt from the built-up roof was combined with asphalt from a road project and used for parking lot repairs. Sinks, blinds and other reusable items were donated to Habitat for Humanity.

WTI General Contracting

The elaborate phasing plan for the approximately five month renovation project was orchestrated by WTI's general contracting division. Employing its signature engineering, procurement and construction management method, WTI was responsible for all facets of Tremco's sustainable makeover. As experts in whole building retrofits, WTI was responsible for everything from schematic design and material selection to on-site project management to implementing innovative sustainable technologies and renewable energy solutions. WTI specializes in integrated repair, restoration and retrofit services and is dedicated to improving building performance while reducing life-cycle costs. It offers turnkey financial analysis for program payback, specification development, system installation and ongoing maintenance of green building retrofits.

Retrofit Yields Savings & Accolades

In the first full fiscal year after construction was complete*, we reduced gas use by 67% and electricity by 33%. Supported by earlier plumbing changes, we used 32% less potable water (saving more than 250,000 gallons).

Renewable energy sources are playing a part as well; the solar arrays and wind turbine help power the headquarters building. With the building envelope sealed and the HVAC system optimized, employees are enjoying an increased level of comfort. In addition, the company expects the property value to rise upon reassessment. Ongoing commissioning will ensure that the building will continue to function as designed, maintaining its high performance.

Businesses considering renovating commercial facilities for greater performance should first determine how much energy they use annually per square foot (called the Energy Utilization Index). Plans can then be developed with a goal of saving 20 to 25% annually in energy use and achieving an ENERGY STAR rating of at least 75. Subsequent savings can be re-invested in further improvements or maintenance. Tax credits and low interest loans are often available to help fund the renovation.

An important part of any high performance project is sanctioning by the U.S. Green Building Council's LEED (Leadership in Energy and Environmental Design) program. In February 2012, the U.S. Green Building Council certified the Tremco building as LEED Gold, its 72 points far surpassing the minimum requirement for Gold status. The renovation was so extensive that the certification is for new construction, making the building LEED-NC.

*Figures compare our fiscal year 2012 use with the average annual use for fiscal years 2008-2010; fiscal year 2011 was excluded due to construction.

Awards

The business community has taken notice of the retrofit with the following awards:

- 2011 Crain's Cleveland Business Emerald Award, honoring organizations which have successfully implemented strategic sustainable priorities
- The 2011 International Roofing Expo named BioTray (used on the vegetated roof) "Best Green Product"
- BioTray was also deemed one of the 67 best money saving products by *Buildings* Magazine
- Tremco Roofing & Building Maintenance won five 2011 RoofPoint Excellence in Design Awards for sustainable roofing projects, one of which was for the vegetated roof on Tremco's headquarters
- The Cleveland Engineering Society's Design and Construction 2012 Award for Renovation, Small Projects
- An Ohio Chemical Technology Council 2012 Award for Excellence

Living the Vision for *Global Sustainability*

The Tremco building retrofit demonstrates how building components work in concert as changes to one component inevitably affect another. As organizations around the globe begin to improve their aging facilities to reduce their energy consumption and greenhouse gas emissions, a whole-building approach delivers the greatest opportunity for achieving sustainability goals. We encourage customers to tour the facility and see for themselves how the combined expertise of the RPM Building Solutions Group can help them attain their unique sustainability goals.

The RPM BSG is committed to developing the world's most innovative integrated products and services that contribute to high-performance, operationally efficient outcomes for the built environment.

If you are interested in learning more about high performance solutions from the RPM Building Solutions Group, call 1.800.852.9068 today to schedule a meeting with a sales representative.

Scan here to view a video about the renovation of Tremco's headquarters building.

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