

## Sustainability Excellence Awards 2018



### 1. Description

#### Energy Conservation at the Missouri Historical Society

The Missouri Historical Society is a proud steward of sustainable practices in the St. Louis community. We strive to be educators at the forefront of sustainability, and we are constantly finding new ways to reduce our energy consumption and greenhouse gas emissions. In 2009, MHS took its first steps toward increased sustainability through employee and community engagement. Three years later in 2012, in partnership with the U.S. Green Building Council, Missouri Gateway Chapter, we took a pledge to reduce our energy usage by 25% by the year 2020. That pledge led MHS to take a closer look at our energy consumption and consider how we can better serve our community, our donors, and our world. We recognized that we needed to make fundamental changes to fulfill our promise, so we commissioned an energy audit of the Missouri History Museum. Its results compelled us to honor our commitment to minimize consumption of energy and materials and reduce our operational costs associated with energy usage.

Following a Siemens energy audit, an assessment of our HVAC system and its associated infrastructure was conducted and completed in spring 2017. The assessment sought to improve the Missouri History Museum's infrastructure and increase its energy efficiency in a cost-effective manner without having a negative impact on the organization's current and future capital and operational budget. Siemens' audit team identified 11 "facility improvement measures," that is, areas where our energy efficiency could be enhanced. All facility improvement measures were evaluated and

analyzed through a cost-benefit analysis. Under the guidance of Karen Goering, the Museum's managing director of administration and operations, and Ronald Woodcock, the Museum's director of general services, MHS tackled 5 projects outlined in the preliminary phase of the energy study in 2017.

Siemens cited the following ways to improve our HVAC system and related infrastructure:

- Energy recovery wheels set points
- Air handling unit economizer
- Air handling unit pressure reset "Siemens Demand Flow" solution
- Air handling unit outside air reduction
- Desigo and infrastructure upgrade
- Fault detection
- LED lighting retrofits
- Kitchen hood controls
- Building envelope solutions
- HVAC coil protection/cleaning
- Gamma lighting controls

In 2017, 5 out of the 11 facility improvement measures were implemented by Woodcock and Siemens. One of the first was the energy recovery wheels set points. This measure conserves energy through programming, so the heat wheel operates only when necessary. Installing variable frequency drives (VFDs) in connection to the heat wheel allows its motor to operate at different speeds. Energy is conserved, the heat wheel and motor will last longer because they operate less often, and MHM's heating and cooling costs were reduced. Before the energy recovery wheels set points were used, the heat wheels in the Museum's air handling unit spun continuously, which needlessly increased MHM's energy consumption. Thanks to local energy incentives, the simple payback for installing the VFDs was immediate. This single facility improvement measure is projected to have an energy savings of 70,341 kilowatt hour (kWh) for cooling and 1,617 kWh for the heat wheel motor. The projected energy savings will be analyzed and calculated in 2018 by comparing our energy usage prior to the implementation of each facility improvement measure with the energy usage after each facility improvement measure was installed.

Improvements were also made to the Museum's building automation system (BAS) by establishing set points to help economize the "Theatre" air handling unit located on the Museum's lower level. The BAS set points for the "Theatre" unit modulates the dampers, rather than having them in a single fixed position that is unable to adjust to the Museum's external environment. As a result less energy is needed to cool the Museum's lower level, and the life of the equipment is also extended. This implementation has helped the Museum reduce its greenhouse gas emissions and operational costs. Thanks to local energy incentives, the simple payback for creating set

points in the BAS was immediate. By placing set points in our BAS, the facility improvement measure is projected to have an energy savings of 12,052 kWh from cooling.

MHM's building automation system was upgraded to improve how the institution manages its energy usage through its HVAC operations. With support from Siemens' technical team, the Museum's BAS was upgraded to the Desigo CC platform—which now manages the HVAC systems—and in 2018 will expand to also manage the Museum's additional operational systems. This upgraded platform allows for a single point of entry for users to operate, monitor, and optimize building automation. By upgrading the Museum's BAS, operations management is streamlined and creates a central point to identify, modify, and maintain systems. The upgrade also allows the Museum to respond to the external environment, resulting in greater control of its overall energy consumption.

The installation of light-emitting diode (LED) retrofits began in 2017 and will continue into 2018. As an institution, we were well aware of the increased reliability, life span, and quality of LED lighting, and we welcomed the many associated operational and environmental benefits. Though it was a challenge to find LED lights for the Museum's older fixtures, it was determined that the long-term benefits of retrofitting these fixtures would be cost effective. These benefits include fewer costs related to energy, electricity, and maintenance, and improved lighting levels and quality. The simple payback for LED retrofits is estimated at 2.4 years with local energy incentives.

Lastly, the Missouri Historical Society began implementing gamma lighting controls through our building automation system. These controls allow the BAS to better communicate with our new lighting system, and it gives our operational team greater jurisdiction over it. This facility improvement measure reduces the total amount of electricity consumed by allowing MHS staff to adjust energy usage and lighting according to the Museum's occupancy and hours of operation. As with the aforementioned facility improvement measures, a complete analysis of the simple payback along with the reduction of kWh will be performed in 2018 so MHS can see how it is benefitting from these conservation efforts. With this in mind, our objectives for energy conservation were clear and our projected outcomes were positive.

## **2. Objectives**

- Energy conservation
- Energy reduction
- Greater control of the building's operational systems
- Reduction in operational cost due to energy usage
- Improvement of the building automation system (BAS)
- Reduction of environmental impact from building operations
- Continued community leadership in sustainability efforts

- Accountability through sustainable practices

After analyzing the results of the Siemens energy audit and implementing 5 of the 11 suggested improvement measures, MHS met all of the above objectives. Although we have made considerable progress in 2017, the Missouri Historical Society will continue to work toward greater energy conservation. The 25% by 2020 pledge encouraged us to take an honest look at our energy conservation efforts, and we recognized that there was room for positive change. We set out with the objectives to conserve, reduce, improve, and increase accountability, and we have been successful so far. As our efforts continue, MHS looks forward to streamlining our internal operations and improving the community through our conservation efforts.

### **3. Outcomes**

- Decrease in energy use
- Decrease in operational cost
- Increase in equipment performance
- Increase in accountability within the St. Louis community
- Implementation of sustainable projects by taking advantage of local energy incentives
- Sharing of our sustainable practices with other cultural institutions in connection with regional energy conservation efforts

The Missouri Historical Society decreased its energy usage, which led to lower operational costs associated with our energy consumption. From January 2016 to August 2016 our energy cost of operations was \$310,567.46. The energy cost over the same time period in 2017 was \$285,014.10. That accounts for a decrease in operational costs of 8.23%. (The 2017 operational costs of 2017 do not take into account the total savings because several projects are ongoing.) Because MHS is using its operational equipment more thoughtfully, the equipment will last longer. These savings will extend throughout 2018 and beyond.

As a result of our energy conservation and sustainability efforts, the Missouri Historical Society has been recognized as a leader in the St. Louis community. Our commitment to these practices was rewarded with the St. Louis Green Business Challenge's highest honor in 2017, out of a field of 65 participating nonprofits, businesses, and governmental entities.

The Missouri Historical Society ensures its steadfast commitment to sustainable practices by making our reports on energy usage available to the public. Reporting our energy usage was a requirement of the 25% by 2020 pledge. Angela Moore, MHS's LEED green associate, benchmarked and reported the institution's energy usage through the Energy Star Portfolio Manager. MHS then shared the data with the community in an effort to increase the institution's transparency and make measurable improvements in conservation. The benchmarked data also served as an educational opportunity. The

Missouri Gateway Chapter of the U.S. Green Building Council invited Moore to share a case study so others in the community could learn how to conserve energy through benchmarking.

Our desired outcome was also reflected in the ways the Missouri Historical Society invested in energy conservation. Local energy incentives allowed us to increase our energy conservation efforts with minimal cost once the payback rate was factored in. We took advantage of local incentives for 3 out of the 5 facility improvement measures. The set points for energy recovery wheel, the economizer for the dampers, and the LED lighting retrofits had an estimated implementation cost of \$14,137. These 3 improvements netted \$15,061 in local energy incentives, helping MHS lower the cost of implementation. Though MHS did not implement all of the suggestions set forth in the Siemens energy audit, we look forward to taking advantage of more incentives in 2018. We are pleased with our energy conservation efforts so far and are eager to find more ways to decrease our energy footprint while increasing our environmental awareness through sustainable measures.

#### **4. Team**

- Karen Goering, Managing Director of Administration and Operations

Karen Goering oversaw the operational costs associated with the Siemens energy audit and implementation projects. She also took into account the organization's sustainability goals and capital budget by ensuring that the energy audit and its recommended implementations were feasible.

- Ronald Woodcock, Director of General Services

In partnership with Siemens, Ronald Woodcock completed an energy audit of the Missouri History Museum to improve the effectiveness and efficiency of its HVAC system and related infrastructure. Woodcock also oversaw all preliminary projects associated with the energy audit during the preliminary/investigation stage, and he managed the facility improvement measure projects during the energy audit's implementation stage.

- Angela Moore, LEED Green Associate, Facilities and Sustainability Coordinator

Angela Moore analyzed the Missouri Historical Society's measurements from the energy audit at the Missouri History Museum, which included benchmarking the organization's energy usage in association with the facility improvement measures. Moore also reported the benchmarking numbers to the U.S. Green Building Council, Missouri Gateway Chapter, to fulfill the Missouri Historical Society's pledge to reduce its energy consumption.

- Siemens Building Technologies

Siemens Building Technologies assessed the Missouri History Museum's HVAC equipment and related infrastructure to help the Missouri Historical Society improve upon its energy efficiency and its conservation efforts.