CHAPTER/REGIONAL TECHNOLOGY AWARD APPLICATION SHORT FORM

(Revision January 2016)

INTRODUCTION:

This Short Form has been developed to stimulate more participation in chapter and regional competition. ***This form is not intended to replace the full Society Technology Award Application form.*** *Regional winners using the short form will be required to complete the full Technology Award Application form before their applications can be forwarded for Society Competition. (This form does not require extensive narrative, plans or photographs.)*

INSTRUCTIONS:

A. The individual submitting the Technology Award Application must be a current member of ASHRAE who had a significant role in the design or development of the project.

B. Complete the "Short Form" and use it as the cover page.

C. Provide a system schematic/diagram not larger than 11" x 17" in size. In addition, attach a brief narrative (maximum of 2 pages). The narrative should include the gross and net building areas applicable to the project, a description of the major building areas (i.e.,operating rooms, laboratories, computer rooms, industrial processes, offices, warehouses) and a brief discussion regarding the following six criteria (if a criterion is not applicable, state accordingly):
   - Energy Efficiency
   - Indoor Air Quality
   - Innovation
   - Operation & Maintenance
   - Cost Effectiveness
   - Environmental Impact

D. Submit your schematic, brief narrative, and completed form to your Chapter Technology Transfer Committee Chapter (CTTC) Chair for judging at the chapter level in accordance with their instructions.

E. The ASHRAE Technology Award program is intended for built projects. First place winning projects should be eligible for submission to the Society level competition on September 1st of the following Society calendar year. Therefore, a project submitted to a Chapter or Regional competition shall be occupied prior to September 1st of the current Society year in order to satisfy the Society level competition requirement of one full year of occupancy.

   First place winners in each category from chapter competition will be submitted by the CTTC Chapter Chair to the CTTC Regional Vice Chair for judging in the Regional Technology Awards competition. At the discretion of the CTTC Regional Vice Chair, this may require completion of the full Society Technology Award Application form if the chapter submission was done on the Short Form Application.

   The CTTC Regional Vice Chair will invite first place winners in each category from regional competition to submit them for judging in the Society level Technology Awards competition. The regional winners will be given the opportunity to incorporate new information or otherwise improve their submittal before submitting it to the society level competition (e.g., by addressing comments from regional judges). At the discretion of the judging panels at the chapter and regional competitions, more than one first place winner may be awarded in each category.

   For the regional competition, submit the number of copies requested by the Regional CTTC Vice Chair. The CTTC Regional Vice Chair may require entries into the regional competition to be done on the full Society Technology Award Application form. In any case, all submissions to the Society level competition must be done on the full Society Technology Award Application form.

F. It is highly recommended that each entrant confirm by letter (and retain a copy for record) to the owner that the owner has granted permission to submit this project to competition.

NOTE: ASHRAE Technology Awards are the HVAC&R industry's most prestigious honor for efficient energy use in buildings and environmental system performance. While the awards do not certify responsible charge or professional license status, they do recognize outstanding design innovation and successful implementation.

CHAPTER/REGIONAL TECHNOLOGY AWARD - SHORT FORM

1. Category - Check one and indicate New, Existing, or Existing Building Commissioning (EBCx)

☒ Commercial Buildings	☐ New	☐ Existing or	☒ EBCx
Institutional Buildings:			
☐ Educational Facilities	☐ New	☐ Existing or	☐ EBCx
☐ Other Institutional	☐ New	☐ Existing or	☐ EBCx
☐ Health Care Facilities	☐ New	☐ Existing or	☐ EBCx
☐ Industrial Facilities or Processes	☐ New	☐ Existing or	☐ EBCx
☐ Public Assembly	☐ New	☐ Existing or	☐ EBCx
☐ Residential (Single and Multi-Family)			

2. Name of building or project: Medline Industries Retro-Commissioning

City/State: Northfield, IL

3. Project Description: Retro-commissioning of newly acquired headquarters building

Project Study/Design Period: 06/2017 (Begin date (mm/yyyy)) to 08/2018 (End date (mm/yyyy))

Percent Occupancy at time of submission: 80%

4. Entrant (ASHRAE member with significant role in project):

a. Name: Binstock, David (Last, First, Middle)

Membership Number: 8276127

Chapter: Illinois

Region: VI

b. Address (including country): 333 North Michigan Avenue

Chicago (City) IL (State) 60601 (Zip) USA (Country)

c. Telephone: (O) 312-899-1000 d. Email: dbinstock@siebenenergy.com

e. Member's Role in Project: Project Coordinator

f. Member's Signature:

5. Engineer of Record: N/A

By affixing my signature above, I certify that the information contained in this application is accurate to the best of my knowledge. In addition, I certify that I have discussed this entry with the owner and have received permission from the owner to submit this project to the ASHRAE Technology Awards Competition.

Retro-commissioning Project

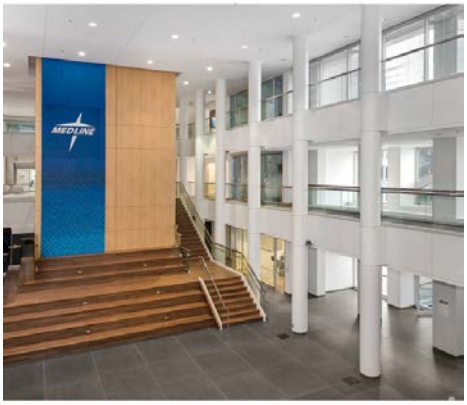
ASHRAE Chapter Technology Award Narrative

Medline Industries
Northfield, IL

Project Description: The Medline Industries Northfield, IL headquarters is a multi-structure facility consisting primarily of an interconnected office building complex; the facility first opened in 1989 as the Kraft Corporation HQ.

Medline Industries is the largest privately-held manufacturer and distributor of medical supplies, positioned to provide products, education, and support across the continuum of healthcare.

Following its acquisition of the Kraft HQ site at the end of 2015, Medline began occupying the facility in 2016 and has reached stabilized occupancy by Medline employees in 2018. The total floor area for the facility is 760,000 ft2 and features a total of seven (7) buildings that are physically connected to each other, each 4-story tall.



Percent Annual Electricity Reduction: 21%
Percent Annual Natural Gas Reduction: 18%
Project Duration: Fourteen Months

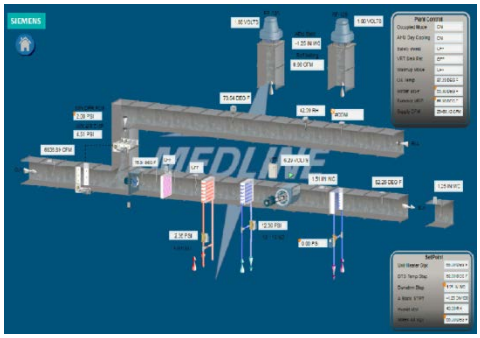
Electric Savings Target: 950,000 kWh (~10%)
Natural Gas Savings Target: 15,000 therms (~3.75%)
Projected Electric Savings: 2,003,000 kWh
Projected Natural Gas Savings: 71,000 therms

Retro-commissioning Project

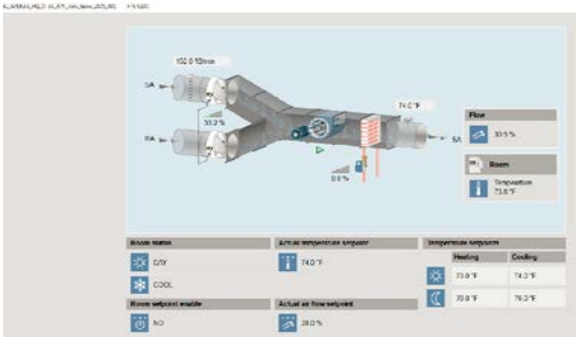
Facility System Description

Ventilation Systems:

- Sixteen (16) air handling units (AHUs) supply fresh outside air to the facility.
- Two (2) of the 16 AHUs are constant volume units; the remaining 14 AHUs are VAV units.
- The supply fans on the AHUs are each rated between 7,800 to 49,000 CFM with the total building air-flow capacity of ~ 405,000 CFM.
- The AHUs feature separate minimum and main outside air dampers and bring in approximately 10-20% minimum outside air at all times when not economizing.
- Supply fans on all AHUs are equipped with variable frequency drives (VFDs) that modulate the fan speed and air flow to maintain a static pressure set-point of ~ 1.25 inches of water column; when present, the return fans are also equipped with VFDs.
- The AHUs are operated based on a predetermined time schedule on the BAS; the AHUs are operational 7-days a week from 5:00 AM – 6:00 PM.
- Typical summer season discharge air temperature set-point is 48 ºF and typical winter season mixed air temperature set-point is 54 ºF.
- The AHUs feature steam humidification coils; OA dampers, mixed air dampers, return air dampers, and chilled-water coil valves are pneumatically controlled.
- The core areas on all floors feature DDC fan powered boxes (FPB) without reheat and the perimeter area FPBs feature hot-water reheat; the perimeter areas also feature a hydronic hot water baseboard heating system.
- Overhead hot water heaters in AHU mixed air chambers are used for freeze protection.
- The FPBs are controlled via the BAS; occupant spaces feature thermistors for measuring space temperatures which are reported back to the BAS.
- AHUs operate in economizer mode bringing in outside air (OA) when OA temperature is < 55ºF.



Sample AHU

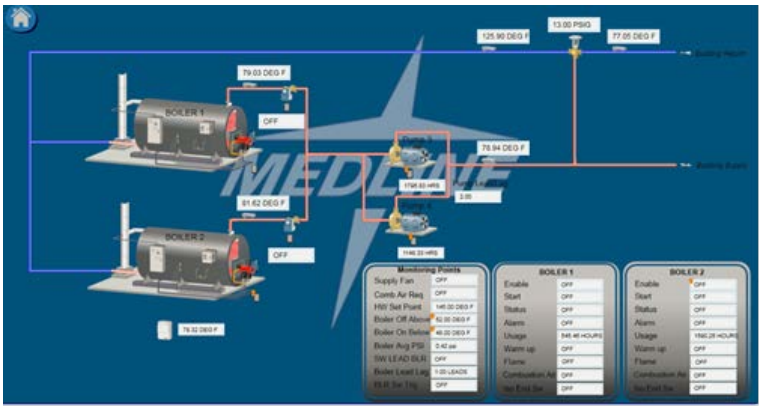


Sample Fan-Powered Box

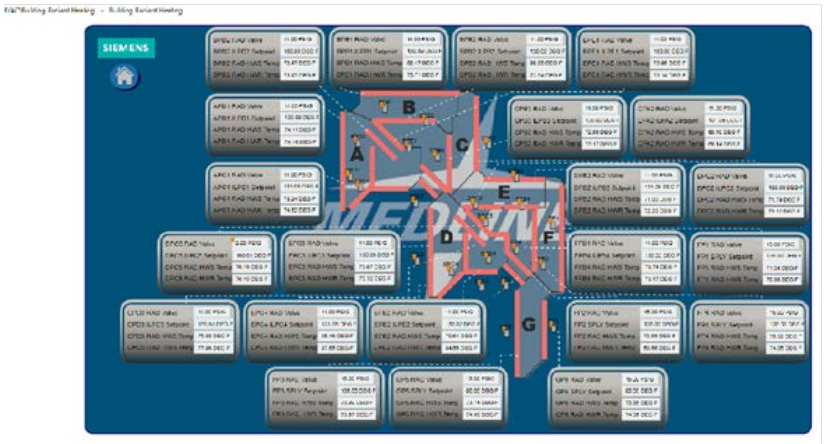
Space Heating and DHW:

- Two (2) natural gas boilers produce hot water at 190-210 ºF for comfort heating (radiant baseboard heating).
- HW temperature is raised to 240 ºF to produce low-pressure steam for humidification purposes in the AHUs.
- Domestic hot water is provided by several natural gas-fired hot water heaters.

Comfort Hot Water System



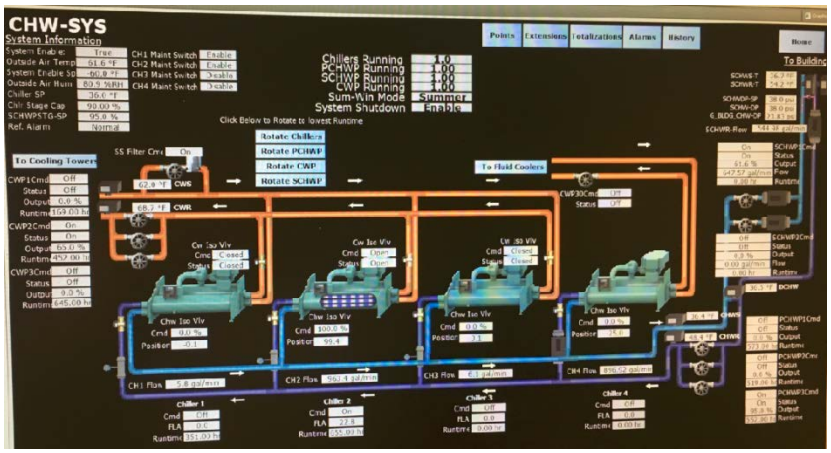
Radiant Hot Water System



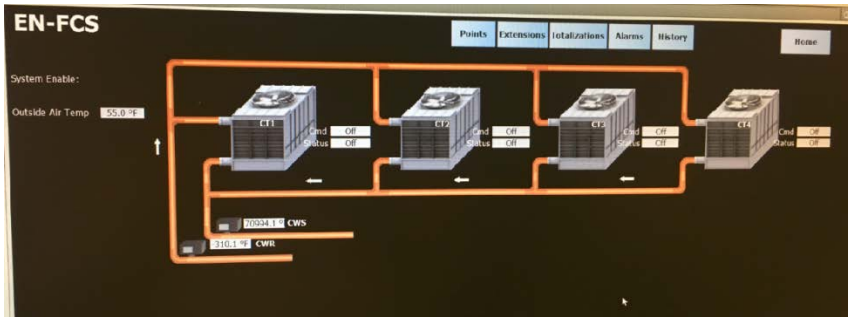
Space Cooling:

- The facility has a total of three (3) centrifugal chillers (1,000 tons each) that were recently installed in spring 2017; an older unit was retained for emergency use.
- The chillers are operational and feature new primary chilled water pumps (3 x 30-HP); two (2) 200-hp variable flow secondary CHWPs were retained from the old chiller plant.
- Chilled water is generated at 36 ºF in summer and at 46 ºF in winter.
- Three (3) new cooling towers that serve the chiller condensers were recently installed in spring 2017.
- Each CT fan features one (1) cell with a 30-hp motor equipped with VFD.
- Three (3) 125-hp variable flow condenser water pumps were installed as a part of the new chiller plant.
- Condenser water is generated between 78-89 ºF in summer and at 58 ºF in winter.

Chilled Water System



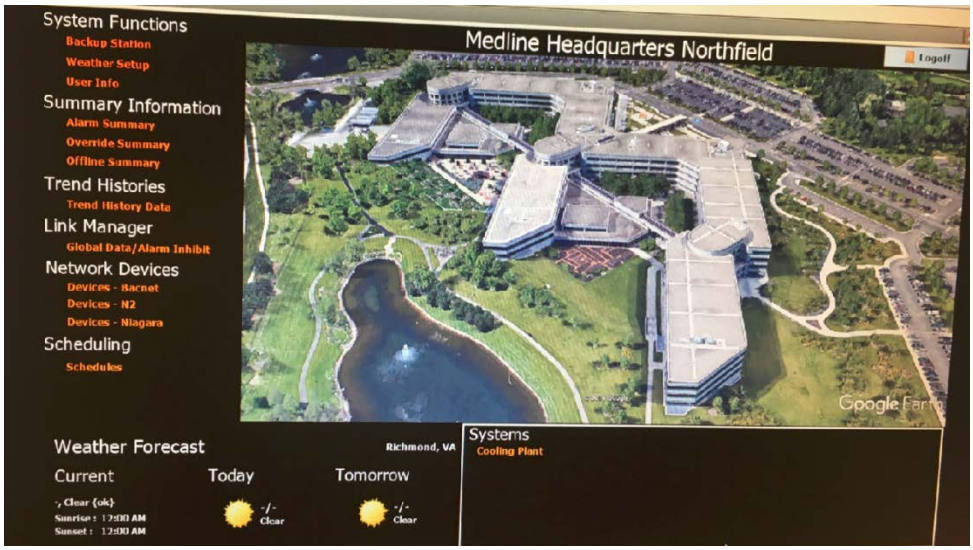
Cooling Tower System



Retro-commissioning Project

Building Automation System and Controls:

- The facility upgraded its Siemens Apogee BAS with Siemens Desigo BAS in 2017 that now controls the HVAC equipment serving different floors of the building.



Building Automation System Screen

Lighting Systems:

- Lighting in spaces and common areas is generally T8 linear fluorescent type fixtures with electronic ballasts.
- Facility lighting is controlled via the occupancy sensors and BAS.

The Retro-Commissioning Project

The Medline Industries facilities and engineering team was seeking guidance to optimize HVAC system operations following acquisition and renovation of its late-1980's vintage office facility. Medline had experienced benefits and value from an earlier retro-commissioning project of its then-headquarters facility in Mundelein IL and wanted to assess its new HQ for similar energy saving opportunities. A significant effort had been invested in re-fitting the building for Medline's relocating and newly hired workforce. Medline recognized it was also time to fully reevaluate system operations to wring out every opportunity for smarter, more efficient operation. General Mechanical Services personnel served as in-house engineering staff.

Retro-commissioning Project

In early summer 2017 Medline Industries engaged Sieben Energy Associates (SEA) to assist the building with a retro-commissioning program application under the aegis of the ComEd energy efficiency program. At time of application the facility had not reached stabilized occupancy but it was understood that the workforce would significantly increase in 2018.

The initial Planning Phase of the project was performed during at the start of the 2017 cooling season and demonstrated that the facility offered opportunities for system optimization. Medline recognized that the facility incurred most of its energy expense in the heating season; consequently the next phase of the project was designed to extend over winter 2017-18 to capture as much information about heating season operations as possible. The project was highly collaborative with site engineering personnel.

SEA undertook extensive data collection and on-site field testing for the Medline Industries retro-commissioning project in order to identify savings opportunities and quantify potential savings. The primary source of data was Building Automation System (BAS) trends, supplemented and supported by strategically deployed data loggers and onsite investigation and functional testing.

The initial phase of the project included site walkthroughs, interviews with site personnel, and high-level analysis of BAS trends to identify areas for further investigation. The subsequent phase of the project included a more detailed investigation of building systems. SEA spent significant time onsite performing functional testing on equipment to verify equipment operation and control sequences as well as to ensure proper calibration of sensors and actuators, etc. SEA also collected extensive BAS trends for mechanical equipment including AHUs, FPBs, unit heaters, CHW and CW pumps, and exhaust fans. Additionally, data loggers were deployed onsite to collect trends either not available through the BAS or to confirm the accuracy of BAS trended values; e.g. return, mixed, and discharge air temperatures and humidity, return air CO2 levels, and lighting levels.

Some measures were found by inspecting equipment and analyzing trended data; some were identified during onsite visits (e.g. lighting opportunities were identified during a night walk-through). Others were brought to SEA's attention by site personnel. Ultimately, however, all measures were investigated through trending (BAS or Data Loggers) and onsite functional testing which became the basis for calculations and savings projections.

Sieben Energy Associates presented its analysis to the building engineering team to achieve consensus, worked with the building engineering team and its controls contractor to implement each measure, and then measured and verified the results of each project. All of SEA's engineering calculations were peer-reviewed by ComEd's project administrator, Nexant, before begin recognized as valid and final.

Retro-commissioning Project

Applicability to ASHRAE Technology Award Criteria

1. **Energy Efficiency:** The twin goals of the project were to 1) identify and correct operational elements that adversely affected HVAC system performance and 2) to assess system performance relative to load requirements and optimize scheduled, set-points, and sequences of operation to drive energy efficiency and cost savings. The project identified, supported implementation, and verified results of eight significant energy reduction measures. All identified, implemented, and verified measures represented opportunities to improve the building's mechanical system efficiency and reduce HVAC and lighting energy consumption.

2. **Indoor Air Quality:** The measures implemented were all in compliance with ASHRAE 62.1.

3. **Innovations:**

   This retro-commissioning projected depended less on innovation than it did on thoroughness and a sufficiently broad scale of review to capture relevant energy saving measures.

   The project schedule was modified after identifying initial project results in the early months of the 2017 cooling season, for an extended assessment period during the 2017-18 heating season in which represented the greater weight of annual energy use. This schedule modification paid off handsomely with far greater than targeted natural gas and electricity savings resulting from a comprehensive assessment of heating season HVAC system operations. The heating season assessment dovetailed with more opportunity to evaluate lighting energy saving opportunities during the period of greater lighting load.

   Without the flexibility demonstrated by all project stakeholders to achieve the greatest attainable project success, the Medline Industries project would not have achieved the significant result reflected in these project outcomes.

4. **Operation and Maintenance:** The project employed an approach of working closely with operational personnel in a collaborative effort whereby site personnel presented the RCx team with ideas for evaluation and the RCx team challenged the site team with new strategies for system operations. After-hours walk-throughs were incorporated into the assessment process to identify opportunities during periods of reduced loads. Questions that surfaced throughout the assessment required added BAS trends for evaluation. A very engaged site engineering staff combined with the RCx team to identify and help implement many of the resulting energy reduction measures.

5. **Cost Effectiveness:** The Medline Industries RCx project was extraordinarily cost effective. The project set out to identify energy saving opportunities that offered a simple payback of 18 months or less. The energy cost savings realized from the project's $61,000 investment in energy reduction measures resulted in a simple payback on investment of 5 months. Additional ComEd incentives to the project owner reduced the simple payback on investment to less than 3 months.

6. **Environmental Impact:** The measures implemented in this RCx project resulted in approximately 20% reduction in the building's carbon footprint.

Retro-commissioning Project

The following table provides a summary of all measures identified, implemented, and verified in the Medline Industries retro-commissioning project:

ECM No.	Measure Description	Peak Demand Savings (kW)	Electrical Energy Savings (kWh/yr)	Electrical Costs Savings ($/yr)	Gas Energy Savings (therms/year)	Gas Cost Savings ($/year)	Implementation Cost ($)	Simple Payback (years)
1	Schedule AHUs	-	198,922	$ 9,475	21,746	$ 11,274	$3,508	0.2
2	Optimize AHU Economizer Control	-	-	-	-	-	-	
3	Lower OA Fraction for AHUs	-	-	-	-	-	-	
4	DSP Reset	-	12,399	$ 591	0	$0	$690	1.2
5	CHW Reset	-	-	-	-	-	-	
6	Schedule FPBs	-	1,022,424	$ 48,698	0	$0	$ 11,558	0.2
7	Optimize Pump Control	-	233,775	$ 11,135	0	$0	$ 15,796	1.4
8	Optimize Ceiling Plenum Heaters	-	47,176	$ 2,247	18,793	$ 9,743	$ 720	Immediate
9	AHU Mixed Air Plenum Heater Control	-	0	$0	33,376	$ 17,304	$ 9,889	0.6
10	Reduce Lighting Operating Hours	-	356,952	$ 17,002	(1,661)	$(861)	$ 18,731	1.2
11	Integrate Hallway Lighting into BAS	-	131,424	$ 6,260	(757)	$(392)	$690	0.1
Totals		**-**	**2,003,072**	**$ 95,408**	**71,497**	**$ 37,068**	**$ 61,582**	**0.5**