THE KEMPER BUILDING
1 EAST WACKER DRIVE

BY

PHIL KEUHN

OF

SIEBEN ENERGY ASSOCIATES

CHAPTER/REGIONAL TECHNOLOGY AWARD - SHORT FORM

1. **Category (Check one and indicate New or Existing, if applicable)**

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

2. **Name of building or project:** Kemper Building, One East Wacker Drive

   City/State: Chicago, IL

3. **Project Description:** Retro-Commissioning

   Project Study/Design Period: 01/2011 (Begin date (mm/yyyy)) to 07/2012 (End date (mm/yyyy))

   Percent Occupancy at time of submission: 75%

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

   a. Name: Keuhn (Last) Philip (First) Lee (Middle)

   Membership Number: 8205532

   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: pkeuhn@siebenenergy.com

   e. Member's Role in Project: Lead Engineer

   f. Member's Signature: Philip Keuhn

   Digitally signed by Philip Keuhn
   DN: cn=Philip Keuhn, o=Sieben Energy Associates, ou=, email=pkeuhn@siebenenergy.com, c=US
   Date: 2012.10.08 10:21:07 -05'00'

5. **Engineer of Record:** Not Applicable

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.

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ASHRAE Chapter Technology Award Narrative

Introduction

The Kemper Building, a 41-story multi-tenant high-rise office building managed by CB Richard Ellis, was retro-commissioned in 2011-2012. The building is located at One East Wacker Drive in downtown Chicago, was constructed in 1960, has a gross area of 568,380 square feet, and net rentable area of 526,158 square feet. The building is primarily used as office space but also features retail and restaurant spaces and a parking garage. The owner is an occupant of the building.

The building applied and was selected to participate in the retro-commissioning program that is part of the ComEd Smart Ideas for your Business suite of utility incentive programs. Retro-commissioning projects are designed to assist in improving building energy performance and, in the process, capture energy and demand savings opportunities. Retro-commissioning analyzes existing building systems to determine if they are performing to their potential. Sieben Energy Associates (SEA) of Chicago led the retro-commissioning effort.

The total verified electric savings represented 10% of the base-building's annual electrical energy consumption and 12% of the building's annual natural gas consumption. Total verified annual energy cost savings were more than $62,000

HVAC System Description

Space cooling is provided by a central chilled water plant with three 750-ton centrifugal chillers. Space heating and domestic hot water is provided by three 750 boiler HP fire-tube, natural gas boilers. The facility has three air handling types. A hot deck/cold deck constant volume system is used to condition the first floor with mixing boxes used for zone control. Three constant volume AHUs supply induction units throughout the perimeter of the building. Two variable air volume AHUs supply VAV boxes distributed throughout the interior of the building.

The Retro-Commissioning Project

SEA used a heavily data-driven approach throughout the four phases of retro-commissioning (planning, investigation, implementation, and verification).

During the planning phase the building automation system (BAS) was used to collect HVAC equipment operating data at intervals ranging from one to ten minutes. This data was used to verify documented sequences of operation as well as identify potential opportunities for energy reduction. Due to improvements in control strategies and the increasing importance of energy efficiency the focus was less about ensuring that the building operated per the original design intent but instead assuring that energy efficient solutions were sought relative to the equipment in place.

The data collected during the planning phase of the project was used to generate a list of ten recommendations. Although the costs associated with implementing all ten measures exceeded the building's financial obligations associated with the *Smart Ideas for your Business* ® program the building owner opted to continue evaluating all ten measures in the investigation phase of the project due to their excellent investment potential and the building's commitment to energy efficiency.

The investigation phase provided an even deeper dive into the facility's operations. The BAS continued to trend data and by the end of the investigation phase more than four months' of equipment operation trend data had been collected. The data range covered weather conditions when the building was in heating, economizing and cooling modes. The BAS data was supplemented by temporarily installed data loggers as well as spot measurements such as "real" power and functional testing. Control contractor Anchor Mechanical's pricing was incorporated into the economic evaluation. At the end of the investigation phase the project's simple payback period was reduced relative to the planning phase and all measures were selected for implementation.

CBRE, SEA and Anchor Mechanical worked as a team to implement the ten retro-commissioning measures to ensure planned energy reduction and, at the same time, avoiding any adverse effects on occupant comfort or burdens on the operations staff. Collection of trends set up during the planning phase continued; they were used to confirm that sequences of operation were in place and that energy savings were being achieved. Adjustments were made as necessary before the formal measurement and verification process began.

Measurement and verification was performed by the retro-commissioning program's third-party administrator, Nexant. The project's verified results are presented in Table 1. The aggregate simple payback for the project was less than four months and the resulting annual energy cost savings totaled over $62,000, which is expected to continue into the future. In addition to retro-commissioning measures, several capital-intensive system improvements such as lighting retrofits and installation of VFDs were recommended as part of the project to provide the facility with additional tools for even greater energy savings.

With an estimated 23,000 commercial and industrial buildings in Chicago, projects focused on energy reductions in existing buildings are critical. The Kemper Building retro-commissioning project is being submitted for the ASHRAE Technology Award because it represents a highly successful project that fulfills this need. Updated and innovative control sequence strategies often compete with energy savings from equipment retrofit and replacement. In this case, highly cost effective energy savings were achieved through operational improvements yielding an extremely attractive return on investment.

Table 1: Verified Results of Installed Retro-Commissioning Measures

RCM No.	Measure Description	Electrical Energy Savings (kWh/yr)	Electric Cost Savings	Natural Gas Savings (therms/yr)	Natural Gas Cost Savings	Impleme-ntation Costs ($)	Simple Payback (years)
1	Freeze Protection Automation	171,223	$11,683	0	$0	$2,830	0.24
2	Freeze Protection Strategy	17,599	$1,201	0	$0	$290	0.24
3	Schedule Common Area Lighting	17,455	$1,557	0	$0	$522	0.34
4	Schedule Toilet Exhaust Fans	19,353	$1,742	0	$0	$584	0.34
5	Implement Optimum Start	120,146	$8,198	6,125	$4,777	$5,160	0.4
6	Implement Static Pressure Reset	26,271	$1,792	0	$0	$1,040	0.58
7	Implement DAT Reset	48,818	$3,331	19,836	$15,472	$2,080	0.11
8	Mixed Air Damper Optimization	0	$0	1,509	$1,177	$2,080	0.77
9	CO2 Damper Control	1,570	$107	7,058	$5,505	$2,390	0.43
10	Close OA Dampers during Unoccupied Hours	6,095	$416	6,899	$5,381	$2,080	0.36
		428,530	**$30,027**	**41,427**	**$32,312**	**$19,056**	**0.31**