

A Framework for Improving Building Operating Decisions

Summary of Current Practices, Challenges and Needs of Maintenance and Energy Management Programs Survey

Between May 4 and 26, 2009 data was collected from survey respondents in the United States, Canada and Mexico to complete a Survey of Current Practices, Challenges and Needs of Maintenance and Energy Management Programs. This survey is part of the PhD thesis, *A Framework for Improving Building Operating Decisions* being written by Angela Lewis. This document briefly summarizes the survey findings.

Goal of Survey

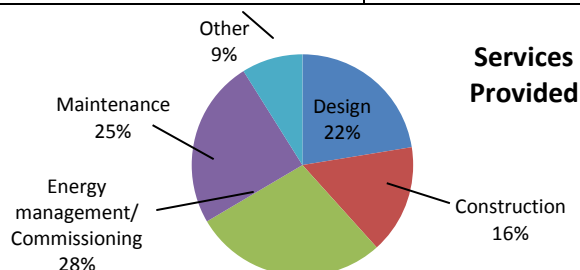
Goal: To identify current practices, challenges and needs of energy performance and maintenance programs for existing buildings through a survey distributed to participants across the design-build-operate spectrum.

Survey Demographics

The demographics of the 168 completed surveys are summarized within the two tables and pie chart.

Professions of Respondents

Profession	% of Respondents
Facility Manager	37
Mechanical Engineer	14
Energy Engineer	12
Commissioning Agent	5
Maintenance Service Provider	5
Engineer (not Mechanical)	3
Architect	2
Maintenance Technician	2
Vendor/Manufacturer	2
Other	12



Building Types Respondents Provide Services To

Building Type	% of Respondents
Office (not medical office)	14
Public Assembly	10
Labs	8
University w/labs	8
Hospital	7
Manufacturing	7
Dormitory/Barracks	6
K-12 School	6
Medical Office Building	6
University w/o labs	6
Lodging/Hotel	5
Restaurant	5
Multi-family housing	4
Retail	4
Supermarket	2
Other	2

Energy Findings

- It is not standard practice to set energy performance goals during design (66% of respondents set energy performance goals during design)
- Normalizing data is more important (76%) than collecting data at change in value (COV) conditions (24%) to quantify energy performance
- Archived data is more important (94%) than low cost storage methods (6%)
- Archived data (70%) is more important than short-term storage (30%)
- Although most buildings have a building automation system (87%), they are underutilized. For example, generating reports from the building automation system (BAS) and the use of advanced control strategies are not standard practice.
- It is not standard practice to monitor energy performance over the building life (40% or less of facilities monitor energy performance, as stated by 62% of respondents)

(#%) indicates percentage of respondents

Maintenance Findings

- It is not standard practice to set maintenance management goals (56%) or goals of how the computerized maintenance management system (CMMS) will be used during design (43%).
- It is very important (49%) or important (42%) that financial benefits be quantified before implementing a new maintenance management strategy.
- It was found that although financial savings are important to CMMS implementation, an inverse relationship does not exist between cost savings and the use of the CMMS to automation of information. The goals of the maintenance team must also be addressed, with specific attention paid to the most frequent users of the data.
- Goals of the facility management team are the most commonly used (29%) criteria to determine if a new maintenance management strategy should be implemented
- Continual tracking of maintenance activities over the life of a facility was found to be very important (51%) and important (41%) to nearly all respondents.
- Most facilities have a CMMS (78%)
- The most commonly used CMMS modules are those that do not require a database to be populated with information, such as the work order request module. Less commonly used modules include: inventory, maintenance contracts, labor hours and equipment condition tracking

Standardization of Energy and Maintenance Management Practices

Survey respondents directly and indirectly stated that a lack of standardization of energy and maintenance management practices increased facility operation costs. Indirectly, lack of standardization negatively impacted operation costs because:

- Equipment does not work correctly
- Lack of performance data
- Inaccurate data from the BAS
- Lack of clearly defined goals

Statistical Analysis

- Reliability analysis was calculated by determining Chronbach's alpha
- Exploratory factor analysis was completed to determine patterns and relationships within the dataset

Action Items

Many practical, implementable findings resulted from this research, including:

- When starting a new project, emphasis should be placed on energy and maintenance management goal setting. The team should be encouraged to revisit the goals over the entire duration of the project.
- In order to gather energy performance data, a sufficient number of sub-meters and sensors must be installed. Proper planning of how the data will be used and collected, and who will perform these tasks, is critical to successful energy performance tracking.
- Although cost savings from proactive maintenance is important, the needs and motivation of all facility management team members, including facility executives, facility managers, and technicians, must

Summary

A survey of 168 architecture, engineering, construction and facility management practitioners was conducted. The key findings of the survey include:

- Goals for energy and maintenance management need to be clearly set and adhered to across the project team and over the entire project duration.
- CMMS and BAS are both underutilized.
- The existence of sub-meters and sensors are used to collect energy performance information is only part of energy management. Process decisions about data format, exporting data from the BAS, who will collect the data, and the time required to collect the data must also be addressed.
- Tools are needed to help plan and implement energy and maintenance management decisions.

For More Information

A conference proceeding about the survey for the 6th Annual International Conference on Innovation in Architecture, Engineering and Construction has been written. The proceeding will be presented June 9-11, 2010.

A research journal and trade journal article about the survey will also be published.

Questions and comments are welcomed and should be directed to Angela Lewis.