

OBTAINING AND ENSURING PERSISTENCE OF O&M SAVINGS THROUGH RESOURCE CONSERVATION MANAGEMENT

WILL MILLER

ASSOCIATE DIRECTOR –
TECHNICAL SERVICESPORTLAND ENERGY
CONSERVATION, INC. (PECI)

PORTLAND, OREGON

ABSTRACT

Resource conservation management is a management program similar to financial management in that its success requires commitment by all levels of the organization to the process as well as an accounting procedure and auditing of critical components. Resource conservation management provides a framework for all elements of efficient building operations and maintenance. The savings connected with the program are principally connected with changes in the way buildings are operated and maintained. This paper discusses the evolution of the resource conservation management service and the savings associated with the two-year pilot effort with seven school districts as well as the critical components of a successful program.

The hope is that top-management will recognize the value of resource conservation management in keeping their overhead costs under control and will incorporate it into the management structure of their jurisdiction or firm.

PREMISE

Resource Conservation Management (RCM) is a management program based on energy management. As many in the energy efficiency business know, energy management is based on financial management; hence we have the terms energy audit and energy accounting.

Can anyone envision financial management without financial accounting? You might say that is an oxymoron. Yet, here we are twenty-five years into the business of trying to improve the energy efficiency of buildings without energy accounting being standard practice.

Over the last twenty-five years I have been on something of a crusade to try to make tuning-up buildings a recognized and legitimate energy efficiency measure. Utility staff and utility commission staff have resisted this effort based on the premise that operational and maintenance measures have a “short measure life”.

Acknowledging this fact of life, a counterpoint has been to institute energy management with its integral component – energy accounting which provides reports to the CEO and CFO.

The problem: how to introduce energy management into organizations.

The premise: if top management recognizes the value of energy accounting in controlling their overhead costs, they will incorporate energy management into the structure of their company.

An approach: using utility energy efficiency programs to market the service to their schools and municipalities within their service territory. This is happening in a good number of jurisdictions in the Pacific Northwest, Colorado, New York, and Massachusetts.

RESOURCE CONSERVATION MANAGEMENT

Resource Conservation Management (RCM) is a management program that all institutions should establish. The goal of RCM is to decrease the overhead costs of resource use by these organizations through reducing:

- the consumption of energy such as electricity and natural gas
- the production of solid waste
- water consumption

without impacting the operational level of the facilities.

The principal focus of RCM is to modify the operational and maintenance procedures so that energy and water are only used when needed. The solid waste stream is decreased by reducing initial use, reusing product when practical, and recycling as appropriate.

The key features of RCM are:

- commitment of top management,
- a resource conservation manager who is usually a reassigned employee of the organization,
- resource accounting which allows for analysis, tracking and reporting,
- selective metering of the more complex facilities and
- involvement of the occupants and operating staff of the facilities of the organization.

RCM is based on a program operated in seven school districts in Oregon from 1992 to 1995. In October of 1995, the program participants received a national award from the US Department of Energy as the best Energy Efficiency and Renewable Energy Program in the nation.

Average savings per school district in the first year were 13.6% (range = 10.6%-25%), well in excess of the 10% target. The average savings per district during the second year were 20.6% (range = 13.6 to 25%) This was determined using the resource accounting software. Total costs of the two-year pilot program were \$714,200. The total avoided costs for the two years were \$1,244,000 which clearly demonstrates the cost-effectiveness of the program.

Top management commitment

A critical element in a successful resource conservation management effort is the decision by the governing body to institute a new management procedure within their jurisdiction to better control their resource costs.

Top management needs to understand that energy, water, and solid waste disposal sites are limited resources similar to money, personnel, and material that can be and must be effectively managed. If properly managed, resource costs for the organization can be brought under control, thereby increasing the available money for other critical needs or simply reducing budget requirements.

Resource conservation manager

The key to successful implementation of the RCM is the resource conservation manager. The resource conservation manager is typically a person currently employed by the jurisdiction who knows the workings of the organization and is known by the staff. The salary of this person is usually more than covered by the cost savings.

The resource conservation manager is responsible for the four principal elements of the project:

- resource accounting,
- jurisdiction and facility resource conservation plans,
- resource survey and tracking, and
- involvement of office and custodial staff in resource conservation activities.

In carrying out these responsibilities, the resource conservation manager will:

- institute resource accounting,
- develop resource conservation plans for each facility,
- identify opportunities for immediate operational changes and monitor their implementation,
- prepare request for retrocommissioning proposals when appropriate,
- guide facility custodial and operating staff in developing specific procedures to reduce resource use,

- develop an awareness campaign with incentives,
- make compliance visits – both announced and unannounced,
- prepare reports which include an assessment of resource savings for various audiences – the facility manager, building staff and the appropriate director
- meet on a regular basis with the facility manager, building staff, and the appropriate director.
- attend resource conservation managers meetings.

The resource conservation manager is trained in the process and procedures of resource conservation management and given assistance in the initial setup of the accounting system.

Resource accounting

Resource accounting is as essential in the proper management of resources as financial accounting is to financial management. The energy manager of one large industrial firm has stated “The most important step in energy management and conservation is measuring and accounting for energy consumption.”

Resource accounting has several functions, it:

- allows for the regular recording of energy and natural resource use in facilities,
- enables the jurisdiction to compare like-type facilities thereby aiding in identification of energy inefficient facilities,
- measures changes in consumption and tracks costs from month-to-month and year-to-year, and
- provides management reports on the effectiveness of conservation efforts.

The first task of the resource conservation manager is to use the resource accounting software to develop a baseline of resource use. This is an arduous and time-consuming task. It is essential to get this task right to lend credibility to the whole approach.

Resources are defined as

- electricity
- electrical demand,
- natural gas
- fuel oil

- water
- sewage charges
- solid waste disposal fees.

Once the baseline has been established the resource conservation manager will continue to collect and input the resource data into the accounting software on a monthly basis. Reports will be generated on a timely basis and provided to the various interested parties.

Without resource accounting there is no resource management. Providing reports from the resource accounting system will be one of the main functions of the resource conservation manager.

Recording of data

Regular recording of energy and natural resource use in each facility is the foundation of resource accounting. It is the most arduous part of the process, but it is the most critical part. One of the values of this recording exercise is that it enables the jurisdiction to be sure they are being properly charged by the utility.

Analysis of data

The resource conservation manager will need to continually review the data reports for completeness and accuracy. If there are any large spikes or dips, the resource conservation manager should be alerted to possible data entry error. If the data is accurate, then the resource conservation manager should begin to find out what is going on with the facility to cause the unexpected variant.

Comparison of facilities

Analysis of resource use by facility also allows the jurisdiction to more quickly identify facilities that are not being operated at their optimal efficiency. This same analysis performed over time can track the improvement in the efficiency of operation.

Meter problems

Over the years it is more than possible for problems to develop with meters – problems that go undetected for substantial periods of time. Typical problems include: meters not located on the right buildings, meters no longer in use (yet meter service charges are applied monthly), incorrect multipliers being applied to

the meter readings. For instance, one water meter was off by a factor of 10, resulting in a \$36,000 settlement to a school district.

Measurement of change

Monthly resource avoided costs are calculated by multiplying the units of a particular resource reduced by the current cost per unit. The number of resource units saved is the difference between the current month consumption and consumption during the corresponding month in the base year, adjusted for changes in weather, in square footage, in equipment installation, and in occupancy when applicable. The base year is a twelve month period mutually agreed upon by the jurisdiction and the utility for each facility. The base year is representative of normal performance of a particular facility.

Reports

Reporting requirements

Several of the commercially available resource accounting software packages are capable of performing an assessment of conservation savings over a base year. They have numerous reports that can be generated by the resource conservation manager.

Each department within the jurisdiction and each facility within the departments should receive monthly reports on their progress. Specific reports should be addressed to the department head, facility management, custodial staff and the jurisdiction administration.

Yet another critical function of resource accounting is to report progress of the resource conservation manager effort. There are several audiences within the jurisdiction who need to be kept up to date:

- management and administration,
- custodial and facility staff
- facility operations and maintenance staff
- occupants.

Management and administration

Initially, a narrative report is provided summarizing the results-to-date of the RCM program. A pie chart showing the jurisdiction's cost per resource provides an overview of resource costs.

Report narratives indicate major activities, savings for the jurisdiction to date, planned activities in the future, and recognition of outstanding supporters within the organization. Periodic updates keeps the administration aware of the program's progress and impact on overhead costs. In conjunction with these updates the resource conservation manager provides graphs reflecting trends in the jurisdiction's resource consumption.

Reports to the department heads and facility management indicate how each facility is doing compared to the base year and compared to other similar facilities in the jurisdiction. Total resource use and costs are compared to resource costs during the base year. Resource savings for each facility are based on the avoided costs using the base year as the basis for comparison.

Custodial and facility staff

Monthly feedback is provided to the facility manager and custodial staff. The information provided is easy to understand and shows how their efforts impact operating costs.

Regular reports provide each supervising custodian and facility staff indicating the consumption trends of their facility's major resources. Graphs or tabular reports are developed to show current resource use compared to use during the same period of the base year. These reports give the custodial and facility staff useful feedback on their conservation activities.

In the first year, the resource conservation manager makes an effort to hand deliver the reports to discuss them jointly with the facility management and custodial staff. In subsequent years, the reports are usually sent without visit. In the out years, visits by the resource conservation manager occur when there is a drop in efficiency.

Operating and maintenance staff

Daily load profiles of more complex facilities is a great benefit to operating and maintenance staff once they know how to use this information.

The maintenance staff is informed on how all the facilities are doing and where any problems seem to be. The facilities are compared using

energy use indices (EUIs). A cost and savings report for the entire organization shows which facilities are saving and how much.

The resource conservation manager uses these reports to identify problem facilities. He then can ask the maintenance staff why certain facilities are not doing well and what might be done to bring them up to the standard being set by the other facilities.

Occupants

Newsletters to occupants have been successful in engendering a competitive spirit among facilities and even among departments. The newsletter can be used to report results-to-date of the program, share information about the efforts of others, and to recognize the achievements of specific people.

Metering

In larger complex facilities, whole building electronic metering provides for interval-data metering. While the advantages of interval-data metering are numerous, the most significant advantage to the resource conservation manager is daily load profiles.

The resource conservation manager can provide these daily load profiles to the facility management staff which can help the staff identify operational problems which have gone undetected. The resource conservation manager should provide daily load profiles to the operations and maintenance staff on a weekly basis, at a minimum, to assist them in better managing their buildings.

Staff involvement

An important role of the resource conservation manager is to involve the office staff as well as custodial and operational staff in resource conservation management. In this role the resource conservation manager needs to be a social psychologist.

The objective of staff involvement is to motivate them to fully participate in the RCM effort. The ways to reach this objective are multifarious and is a continuous effort.

The resource conservation manager should communicate the purpose and activities of the

RCM program to the staff of each facility to elicit their support. This can be accomplished in several ways: through an initial newsletter, in staff meetings, and one-on-one. In introducing the program the staff several items needs to be accomplished:

- inform the staff of the jurisdiction commitment to the process,
- familiarize the staff with the accomplishments of the RCM approach in other organizations,
- challenge the staff to come up with their own ideas and to develop their action plan to improve their operational procedures.

Incentive and recognition programs can help ensure the involvement of the staff.

Opportunities for resource conservation

Operational surveys

Consultants should conduct surveys of the jurisdiction's facilities for the purpose of identifying opportunities to reduce resource use through operational changes. When possible, the resource conservation manager should join the auditor on the survey.

The resource conservation manager should coordinate with the appropriate facility and custodial staff to make sure the recommendations are followed. He should know why any recommendations are not carried out.

Survey existing O&M procedures

The resource conservation manager with assistance from a consultant should survey the existing operational, maintenance and custodial practices.

Custodial practices

The resource conservation manager should meet with the supervising custodian for the jurisdiction to discuss the normal custodial practices. Part of that discussion is to get to know the custodial staff through the eyes of the supervising custodian.

Discussing facility by facility:

- how many shifts are there?
- who works what shift and why?
- what are the responsibilities of each staff member?
- what is the attitude of each staff towards their assigned facility?
- how long have the various staff been with the jurisdiction? with the facility?
- what are their major cleaning practices, e.g. team cleaning?
- how they recycle and dispose of solid waste?

Operational policies

The resource conservation manager will meet with the facility manager and appropriate staff to discuss facility operational policies and practices of the jurisdiction concerning:

- building start-up and shut-down procedures,
- temperature settings,
- special event operating procedures,
- lighting policy and practice, and
- exterior lighting policy and practice.

Maintenance procedures

The resource conservation manager should meet with the maintenance supervisor and appropriate staff to discuss preventive maintenance policy and practices. Issues to be discussed are qualifications of the maintenance staff, boiler logs, frequency of steam trap repair.

Establish relevant O&M procedures

The resource conservation manager should review possible operating and maintenance changes with the facility manager and maintenance supervisor. After a thorough discussion of the existing and possible procedures, the jurisdiction staff should develop new procedures.

A similar discussion should occur with the supervising custodian of the jurisdiction. Possible custodial actions should be reviewed and new procedures agreed upon.

The resource conservation manager should oversee the training of the jurisdiction staff on the new procedures and then he should monitor effectiveness of the implementation of the procedures by the staff.

Develop procedures for retrocommissioning

Commissioning is a process of ensuring that building systems perform according to the design intention and the operational requirements. This should be an integral element of any new construction or renovation project. Therefore the jurisdiction should determine that all new construction and renovation projects will incorporate commissioning procedures. Commissioning new construction is not within the scope of the resource conservation management program. However, commissioning is not restricted to new construction.

Commissioning should be considered in existing facilities which are not operating at their optimal level. This procedure is called retrocommissioning.

Retrocommissioning systems can provide impressive benefits towards not only reducing energy costs, but also improving building operations and increasing equipment life. Retrocommissioning should be done when the actions of the resource conservation manager and facility staff are not sufficient to bring the facility within a desirable range of energy use. Retrocommissioning should focus on equipment that uses the most energy and/or larger pieces of equipment. When the more numerous and small zone-level equipment is included in commissioning, however, commissioning can easily become quite expensive. For this reason, most commissioning efforts include only those systems and equipment that have the most opportunity for improvement without large capital outlays.

Resource policies, procedures & related guidelines

Operating and maintenance procedures

The resource conservation manager should arrange a jurisdiction-wide custodial and maintenance staff meeting to present and discuss the RCM.

The initial presentation should review actions and results of resource conservation management programs in other jurisdictions; outline incentives being offered by the jurisdiction to the staff to facilitate changes in their procedures; and guide the custodial and operating staff in developing specific procedures to reduce resource use.

Calendar review

The resource conservation manager should ascertain dates of extended shutdown and arrange time to meet with the custodial and maintenance staff to set up shutdown procedures. For breaks exceeding 3 days the business manager should be asked to adjust the garbage services.

The resource conservation manager should determine dates for initiating and discontinuing irrigation service and discuss shortening irrigation period with maintenance staff.

Garbage service adjustment

The resource conservation manager should calculate base year garbage costs to serve as the baseline. The resource conservation manager should clarify all of the garbage service rates and costs.

Determine current solid waste procedures

The resource conservation manager should review service contracts with waste haulers with regards to the actual need of each facility. He should survey actual garbage volumes at each facility prior to pickup to ascertain:

- if smaller drop boxes can be used or
- if less frequent pick up is a possibility.

The resource conservation manager should review recycling practices in the various facilities.

Implement new procedures

The resource conservation manager should suggest procedures for improving the cost-effectiveness of solid waste disposal. The resource conservation manager will document the savings.

The resource conservation manager should work:

- with the business office to develop new service contracts based on the need of each facility.
- to determine existing local market for recycled goods.
- with the business manager to consider purchasing alternative materials that can be used more than once.

Irrigation policies and procedures

The resource conservation manager should work with the facility management to develop new irrigation policies and procedures based on the need of irrigation.

CONCLUSION

While the program was very successful in the initial stages in reducing resource costs, it has been less successful in having resource conservation management become an integral part of the management structure of the jurisdictions. Of the initial seven pilot school districts in Oregon,

- four continued the accounting function to track their facilities;
- one dropped the effort altogether for a couple of years and started it back up when their energy costs began to rise;
- yet another is starting up their program again to meet the present situation.

In the state of Washington, there are at least a dozen school districts that have had on-going programs over the last six to eight years.

The program is at various stages of initial implementation in Sacramento, in Colorado Springs, on Long Island, NY, in Massachusetts and Manitoba.

Certainly, the jury is still out on the long-term impact of the program on operations and maintenance savings; but hope reigns eternal.

REFERENCES

“Resource Conservation Management” presented as part a symposium entitled “Documenting the Value of a Facility or Corporate Energy Manager” at the ASHRAE Winter Meeting in Chicago, January 1999.

Resource Conservation Management Handbook prepared for NIPSCO Industries and Puget Sound Energy. 1997

“Resource Conservation Management.” presented at 4th Energy-Efficient New Construction Conference in Vancouver, BC, October 1996.