HVAC Edison Optimization Programs

Kohl Ashton Kreutziger
California Polytechnic State University
San Luis Obispo, California

Heating, ventilation and Air-Conditioning (HVAC) is the single biggest energy consumer of a building's energy cost. Ever since the shutdown of San Onofre nuclear power plant, there is now 10% less power available. In order to counteract that energy loss, California is trying to strive towards having more efficient commercial HVAC systems. Southern California Edison works with the ASHRAE Standard 180: Standard Practice for Inspection and Maintenance of Commercial Building HVAC Systems. Southern California Edison came up with a plan to include HVAC contractors, including Control Air, to clearly illustrate where commercial buildings HVAC programs needs to be concerning quality maintenance (QM). Edison also wants to offer QM maintenance agreements that follow each aspect of the ASHRAE Standard. Edison wants to check the cost that would be attached to maintaining the QM program, and to obtain information from various contractors involved in the QM program to see what aspects they like or dislike. This senior project paper is to inform the reader about the new push for energy efficiency by changing the level of service to conform with the ASHRAE 180 standard. The Goal that Edison has for this program is a win/win/win for the customer/contractor/and SCE.

Keywords: Quality Maintenance (QM), Early Retirement (ER), Energy Savings, Efficiency, Performance, Optimization

Introduction

According to Edison(see figure 1.1), “44% of a commercial building’s energy consumption (In Southern California) is attributed to its HVAC systems.”

Edison has been working with the top leading companies in HVAC to change the standards for maintenance of these systems.

Because HVAC systems represent 44% of the electrical consumption SCE wanted to focus on this area in order to save as much as possible on the grid. According to SCE, “HVAC systems are the main energy consumers in commercial buildings. They account for approximately half of all the energy used in U.S. buildings.” HVAC systems also can both harm or hurt the building occupants’ health, comfort, and productivity. More often than not, HVAC systems are not reaching the units full potential of their efficiency because of maintenance. This means that the end user is paying more money to operate their HVAC system as well as not getting the quality that they could be achieving.

Discussion

The Standard 180 maintenance program when done properly saves the customer Energy which in term saves them money as well as reduces energy consumption our ever growing energy demands on the grid. According to PECI, “The program is equipped to offer benefits to a wide range of stakeholders, including building owners who maintain
their own units, national maintenance firms that service national retailers, universities, municipalities and multi-site companies.” By allowing the program to reach such a broad spectrum we as a nation would be able to cut energy costs and allow a lower demand of energy day to day.

**QM and ER Edison Program Details**

The two programs that Edison is offering to help reduce energy consumption is the early retirement program and the quality maintenance program. The early retirement program incentivizes contractors to change out running but lower energy efficient HVAC units while the quality maintenance program ensures that all maintenance is kept to the ASHRAE 180 standards. Below table is the revised ASHRAE 180 standard for the QM program for Condensing Units (Package Units) which is the majority of what is on the QM program.

<table>
<thead>
<tr>
<th>Inspection/Maintenance Task</th>
<th>Frequencya</th>
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<tbody>
<tr>
<td>Check control system and devices for evidence of improper operation. Clean, lubricate, repair, replace or adjust components as needed to ensure proper operation.</td>
<td>Semiannually</td>
</tr>
<tr>
<td>Check fan belt tension. Check for belt wear and proper alignment. Replace if necessary to ensure proper operation. Replace if necessary to ensure proper operation. Check sheaves for evidence of improper alignment or evidence of wear and correct as needed.</td>
<td>Semiannually</td>
</tr>
<tr>
<td>Check control box for dirt, debris and/or loose terminations. Clean and tighten as needed.</td>
<td>Annually</td>
</tr>
<tr>
<td>Check motor contactor for pitting or other signs of damage. Repair or replace as needed.</td>
<td>Annually</td>
</tr>
<tr>
<td>Check fan blades and fan housing for balance and particulate buildup. Clean, repair or replace as needed to ensure proper operation.</td>
<td>Annually</td>
</tr>
<tr>
<td>Check refrigerant system pressures or temperatures. If outside of recommended levels, find cause, repair and adjust refrigerant charge to achieve optimal operating levels.</td>
<td>Annually</td>
</tr>
<tr>
<td>Check for fouling, corrosion or degradation. Clean or repair as needed. Check for evidence of buildup on or fouling of heat exchange surfaces. Restore as needed to ensure proper operation.</td>
<td>Annually</td>
</tr>
<tr>
<td>Check open drive alignment, wear, coating and operation. Couplings, bearings and seals for evidence of wear or alignment problems. Lubricate and repair or and replace as needed. For direct coupled fan/motor. Assemblies, check bearings and lubricate field serviceable or replace motor if needed.</td>
<td>Annually</td>
</tr>
<tr>
<td>Inspect air-cooled condenser surfaces for damage or evidence of leaks. Repair or clean as needed.</td>
<td>Annually</td>
</tr>
<tr>
<td>Check low ambient head pressure control sequence for proper evidence of improper operation. Repair or replace components or modify software/algorithm to ensure proper operation.</td>
<td>Annually</td>
</tr>
<tr>
<td>Check refrigerant oil levels for refrigerant systems with oil pressure/level controls. Repair, replace or adjust as needed to ensure proper operation.</td>
<td>Annually</td>
</tr>
<tr>
<td>Check variable frequency drive for proper operation. Correct as needed.</td>
<td>Semiannually</td>
</tr>
</tbody>
</table>

Note: a. Refer to 4.2.2.4 for procedure to modify frequency.


The goal for Quality Maintenance (QM) program is to optimize rooftop units for commercial HVAC systems. The key to the success of this program is to achieve a high level maintenance program that follows the ASHRAE 180 standard. In doing this there are lots of check and balances that SCE has put into place to make sure that all contractors are following the guidelines. This ensures that the customer will receive a timely and very detailed maintenance program of the highest standards. It also ensures that the customer will not miss any necessary maintenances or the contractor will not receive their rebate. When the customer agrees to a contract, then it allows a relationship between the utility, contractor, and the customer.
Each maintenance plan is a little different due to the dynamics of the buildings HVAC equipment as some are much more complex, larger in size, different in design, and scope. You must also take into consideration of the end user and the objectives that he or she has for the HVAC system such as if they are manufacturing cakes, purses or something else. Both buildings would need to be running at different temperatures due to the product they are making but many things are the same including keeping air filters clean, refrigerant testing, testing and calibrating thermostats to make sure all are working, etc.

**Early Retirement Program**

Early Retirement (ER) is the program that is designed to incentivize the contractor in order to try and upgrade their clients currently working units to higher efficient and newer ones. This Program was able to offer $400 per ton to the contractor for participating in this program. Later on, the incentive reduced to $350 dollars per ton and in an interview with Control Air I was told Just last week this finally dwindled down to 0. This is because the program was such a huge success that it ran out of funding.

During my internship I was able to assist in setting up the various clients into the portal as well as help the technicians out by surveying all the equipment and installing the SCE stickers on the units as seen in the picture figure 1.3.

**Benefits for Customers**

There are many benefits to customers for participating in this program such as cutting costs. As far as cutting costs, end users save money on energy savings but also reap the benefits of lengthening the life of their HVAC system, and the assurance that their unit is working at maximum performance. In addition to saving money, customers will also like the fact that their building is running cleaner and their carbon footprint is less on the environment. Other benefits include the air quality and added productivity at work. Also, being able to catch small problems with your HVAC system before they turn to bigger problems that can lead to down time or having to replace the HVAC unit entirely.

**Benefits for Contractors**

This program will create more jobs because the program requires more work than a standard program and also allows for additional training for the contractor. In addition to creating jobs for others, it also would allow competition to increase among QM providers. This will allow the people that are far below in price to get eliminated by simply requiring the company to comply with the ASHRAE Standard 180. Contractors may have a hard time on selling their QM to the customer but there are incentives set in place to address the added cost of the program. The incentive is roughly 30 percent of the cost of the program.

**Benefits for Edison**
Edison benefits from this program in more ways than one might think. Not only do they reduce the strain on the power requirements of the city, but now gains great public relations by saving the end user money on their energy bills. Southern California Edison also will benefit because when more and more customers participate in the program it is a domino effect as people will want to sign up. This program increases greater awareness of how much HVAC systems use and also hopefully allow the worker in that building to look into saving energy costs at his house by setting the thermostat to a higher temperature.

**Some Facts from a Union Contractor Perspective on the SCE QM Program.**

Cost of the program Initially was roughly 2 times more than a standard program to the end user. The reason for this is that the program was heavily documented and each piece of new equipment had to be thoroughly inspected and tested and hit a baseline parameter. This was to ensure that the equipment was operating at its maximum efficiency and also that all equipment was operational. Additional time was also necessary due to how the program was implemented and the smart field devices needed to be able to document on the online portal. The iPad’s and field devices were fairly new to the industry so there was a learning curve for this technology as well. The other issue was that the connectivity into the portal was not perfect and technicians were dropped off from the portal from time to time causing frustration and delays. The contractor later went to paper logs that could be imputed in the office by the staff in order to save time and money. This seemed to work out better.

The SCE program documentation required double the time in the field for the Technician to perform the same program due to documentation. The advantage was that some of the NON Union contractors that were never performing the ASHRAE 180 standard maintenance program had to increase their scope and their prices up to 3 times more than their standard program. This was for the mere fact that several of the non-union companies standards were below the ASHRAE 180 Standard. This leveled the playing field for the scope aspect of the work to what the union contractors were already performing.

Since this was a contractors rebate the rebate went to the contractor and not the customer. The only way the program was profitable was by the rebate coming back to the contractor.

**A Union Contractors perspective**

The Union Contractors are not typically seen in this work space as package unit maintenance is primarily done by non-union contractors due to the simplicity of them. It is difficult for Union Contractors to Compete as there are both Union Contractors and Non Union Contractors (Lower Burden) bidding on the same scope of work. Initially in the SCE program they asked that the Union Contractor use a "Journeyman" level technician to do the work and only asked that the non-union contractor have a person with 5 years’ experience and different certifications. This created a huge Discrepancy of wages, years’ experience and skill set. The program later revised so that both the Union and Non Union companies could have a person of less experience do some of the tasks. The amount of points recorded and program questions that were asked from the field also went down so this saved some time in later years making the program more profitable.

**Several Industry Examples**

On Success i was told about was with one Owner/Operator that did the SCE HVAC maintenance program with their company run EPA certified workforce and they did extremely well with Revenue Gains of roughly $800,000. They felt the program took only roughly 20% more time after they hit baseline for years 2 and 3. They were certainly the best example of the success of the program. They also used the office to support the field in entering data versus having to have the techs in the field enter all the information.

One failure that I was told about was when one Non Union Contractor sold the program for the same price as the regular PM and had to cancel on the Customer due to losing money. The customer was a regional restaurant chain with more than 250 locations. The account went back to market as a regular PM as no one could do the SCE program for the same cost and did not make sense financially due to initial dollars being paid at the front end of the program when the mechanical Contractor got paid for hitting baseline.
Conclusion

This buy-in program is a relationship where the utility company connects to the end user through the contractor by creating energy saving goals as well as reducing the overall energy bill. The goal of the program is to reduce the energy use of commercial HVAC systems and to better optimize each HVAC system. This program follows the ASHRAE standard 180 program of Quality Maintenance.

I believe that this program is a great way for the end user to save money on energy costs yearly as well as save money on HVAC system repairs over the years. I believe that the HVAC system within the building is only as good as its weakest link and with following the ASHRAE 180 standard one can ensure success. The tenants deserve to have higher quality air standards so that they feel able and more willing to work. By having better air quality and temperature you will notice more productivity at work. All in all, the QM program is something that every commercial building should be involved in.

One reason reason that many of the contractors chose to be part of the program was to ensure that they would not lose clients to others offering it. Competition is also key to the success of these programs as well as the incentive. I believe that Edison did a great job starting up this program and basically forced the entire Market to become greater and to upgrade many people's equipment. It was unfortunate that the ER program ran out of funding because I really think that this program would have been able to then continually reducing energy consumption throughout California. I would like to see other Electric providers such as Edison throughout all of California and the United States to push for a higher energy saving standards on HVAC systems.

Through this case study Control Air was able to keep all of their clients except for one which was lost to a non-union contractor which they ended up gaining back after a year because the non-union contractor was unable to deliver of their promise to the QM program. The owner/operator in Southern California was able to gain a profit of $800,000 over a three-year period with only increasing 20% of their resources. Other private companies we're willing to pay double the price because they wanted the benefits of being on the quality maintenance program. This program was a win/win/win for customers/contractors and Southern California Edison.

References


PREDICTING HVAC ENERGY CONSUMPTION IN COMMERCIAL BUILDINGS USING MULTIGEAMENT SYSTEMS (n.d.): n. pag. Web.

