

Save 16% on your Utility Bills by Retro-Commissioning.



By Greg Inman
Senior Mechanical Engineer, specialising in Energy & Sustainability

Every building can benefit from regular tune-ups to make sure the mechanical systems are operating efficiently to meet the needs of the occupants, at minimal costs. As buildings age and their occupancies change, the HVAC (Heating, Ventilation, and Air Conditioning) equipment can start to underperform, leaving occupants uncomfortable and the utility bills high. Retro-Commissioning (RCx) is the application of the commissioning process to an existing building, with the goal of identifying and correcting operational issues in the mechanical systems. RCx can resolve problems that have developed during the normal life and use of the building, as well as issues that were overlooked during the original design and construction. A thorough RCx program can significantly reduce the utility and operating costs for the owner, as well as prolong the HVAC equipment life and improve the interior environment for the occupants.

According to a 2011 *study performed by the Lawrence Berkeley National Laboratory, RCx reduced the annual energy costs across a sampling of building types by an average of 10%-20% for all buildings reviewed. The average commercial office building realized an annual saving of 16%, and some buildings saw reductions of up to 25% per year. Additionally, the study found that the average return-on-investment payback for owners who retro-commissioned their buildings was 1.1 years.

By Retro-Commissioning an existing building, Kaizon Engineering can functionally test the mechanical, lighting and control systems to find and correct performance issues, as well as identify potential Energy Conservation Measures (ECM). Even correcting something as simple as reducing equipment run-hours can significantly reduce annual utility consumption and extend the operating life of equipment by months or years. In fact, many energy conservation control strategies, such as supply air temperature reset control and modified run schedules, are relatively inexpensive to implement but result in impressive energy cost reductions.

Over the last 14 years I have retro-commissioned a variety of building types, including schools, office buildings, hospitals, and laboratories with a wide array of HVAC equipment and control requirements. The issues I've identified and corrected are varied, but they all have an impact in reducing the energy costs, improving the indoor air quality, or both. Another underlying theme for most of these issues is that the building owner wasn't even aware they had a problem. Here are just a few examples of defects I have found and helped resolve.

I recently worked on a Council building which had multiple variable-air-volume air handling units (AHU) where the fresh air intake dampers were locked closed. Not only was this preventing the AHUs from properly ventilating the building, but without the ability to modulate the outside air and return air dampers, the AHUs were incapable of operating in economiser mode to provide free cooling. Economiser operation is a simple control strategy where the AHU relies on cool outside air to cool a building instead of mechanical means, such as a chiller. Economiser is great during spring and autumn seasons when the outside air is cool, but our buildings still need cooling. This control strategy has been used for over 50 years, there's no reason it shouldn't be relied upon when appropriate.

*Building Commissioning, A golden opportunity for reducing energy costs and greenhouse gas emissions. Evan Mills, Ph.D. Lawrence Berkeley National Laboratory Berkeley, CA 94720 USA.

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Conversely, too much outside air can be very bad for efficiency when outside air is too hot or too cold. I've provided RCx on projects where the initial design incorporated CO2 control to minimise fresh air when not operating in economiser mode, only to have the CO2 sensor fall out of calibration, causing the air handlers to run on 100% outside air, 24/7, trying to bring the CO2 levels down. Running on 100% outside air when the outdoor temperatures are very high or very low will definitely increase your heating and cooling bill and put unnecessary strain on your mechanical equipment.

Another common control issue that is often overlooked is proper tuning of your Building Management System. If the software is not tuned correctly, it may react too quickly or too slowly to conditions in the building. Reacting too quickly leads to 'hunting', where your HVAC system overreacts, rapidly opening and closing valves and dampers, or causing compressors and boilers to cycle on and off repeatedly. This will lead to an uncomfortable space and undo wear on the equipment. If the system reacts too slowly, it can easily overheat or overcool a space, again causing discomfort.

RCx can also help rectify problems that were in place at hand-off after construction. I once RCx'd a building where a main lighting circuit was wired improperly, so the lights could not be turned off anywhere but at the main circuit breaker. Retro-Commissioning helped bring the issue to the forefront and get corrective actions executed. On another project I found hundreds of holes in the buildings air barrier, allowing cold air to migrate into the building during the winter and warm, humid air in during the summer, wreaking havoc with the occupant comfort and causing condensation to 'rain down' inside the ceiling spaces. By replacing the air barrier system, we stopped the infiltration and resolved the indoor climate conditions, resulting in major energy savings as well. It's an important reminder that the building envelope can have a huge impact on the performance and energy efficiency of a building.

We expect a lot out of our buildings. It's not surprising that most owners expect their buildings to last 50 years or more. But, much like a car, if you want your building to last the distance then regular maintenance and upkeep is a necessity. Retro-commissioning your building every 3-5 years can result in significant savings on utility consumption, as well as improve the maintenance performance and lifespan of the equipment and create a healthier indoor environment for your building.

If you would like to learn more about our Retro-Commissioning services, get in touch and we will organise a chat to discuss your building and goals.



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