The Continuous Commissioning® Process

What is the magic involved with Continuous Commissioning® and why does it produce such superior results? There is no magic; results are obtained through objective evaluations and the use of special purpose software that has been developed over the past ten plus years. CC® engineers find opportunities to make the building work better using minor system hardware changes, and by enhancing the building design and operation. For instance, designers typically put in "safety factors" that result in higher energy usage because oversized systems run at reduced part load. In one building, we found most air handlers were oversized by 30 to 50%. This is a common finding.

Figure 2 shows the key steps in the Continuous Commissioning® process. The CC® Assessment of Step 1 uses a visit that involves site staff and site measured data to develop a price proposal that identifies and quantifies potential measures and savings. It also identifies any additional energy monitoring that may be needed. Upon approval to proceed (Step 2), the CC® provider develops performance baselines for energy and comfort (Step 3).

Step 4 includes examining the building in detail to diagnose operating and comfort problems in the building, identifying specific component failures or degradation, and diagnosing specific causes of system inefficiency down to the AHU and/or terminal box level. The maintenance measures, control changes, balancing changes, or minor equipment improvements needed to improve efficiency are efficiently identified and prioritized. This step involves identification of changes needed to operate the mechanical equipment for optimum efficiency for the actual building use. This fundamentally differs from the traditional commissioning approach that focuses on bringing the building to design conditions that are usually over-designed and often rather different from actual use, resulting in built-in inefficiencies.

Step 5 involves implementing CC® measures, after discussing them with the building staff, and changing the measures as needed to fit the measures to staff expectations. The CC® engineers then work closely with the staff to implement the approved changes, and further fine tune the changes during implementation. Again, this fundamentally differs from retro-commissioning projects that deliver a report to the owner who has staff or a contractor implement the measures. The CC® engineers have the knowledge required to fine tune the measures and often double the savings obtained when others implement the changes. This tunes the equipment to deliver comfort with much improved savings. An important feature of Step 5 is that the building staff is deeply involved in the CC® process.

Finally, Steps 6 and 7 include documenting the changes in operating procedures for the staff as well as the energy savings and comfort improvements. Ongoing tracking of energy and comfort performance is essential to maintain the integrity of the energy savings. Experience has shown system components often fail or degrade in ways that increase operating cost by $0.50/sq.ft.-year. These losses usually go unnoticed since the controls compensate by using substantially more energy to sustain comfort set points. A dedicated CC® monitoring and analysis staff with software tools will identify degradation in savings more efficiently than a group for whom this is just one of their many responsibilities. This investment assures the long term survivability of the savings.

Figure 2. The Continuous Commissioning® Process.

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CONTINUOUS COMMISSIONING® STARTED
January 2002

COMPLETED
as of December 2002

PROJECT COST
$75,000

PROJECT SAVINGS
$73,000/year

PROJECT SIZE
420,000 sq.ft.

Continuous Commissioning® was performed by a team consisting of facility O&M staff, a Utah State energy engineer, a master controls technician, and Energy Systems Laboratory CC® engineers over a one-year period. Measured annual savings were $73,000/year (about 40% from electricity, and 60% from natural gas consumption). The 420,000 square-foot State Courthouse is located near the Utah State Capitol in downtown Salt Lake City. The state-of-the-art complex was opened in January 1998 with full DDC (Direct Digital Control) EMCS on its HVAC system, which includes 6 SDVAV AHUs (525,000 CFM total) and over 500 terminal boxes. Its thermal plant has one 800-ton chiller, one 400-ton chiller, and two 500-hp boilers. CC® measures ranged from optimization of chillers, boilers, and AHUs to underground garage ramp de-icing system operation. A "semi-occupied" mode was developed especially for the terminal boxes to eliminate unnecessary simultaneous heating and cooling, and outside air intake. Winter warm-up period and summer cool-down period operation were studied and optimized, as well as the economizer cycles (including both air side economizer and water side cooling tower economizer) and the primary-secondary chilled water distribution system, etc. Based on facility occupants and management personnel, building comfort has been greatly improved, and trouble-calls dropped significantly. The project simple payback was 1.03 years.

Features

- As one of the State of Utah's "Top Five" Energy Star Buildings before CC®, the Courthouse presented extra challenges to the CC® engineers and team.

- Designed to accommodate 37 courtrooms, a four-story glass rotunda and a two-story common gallery area, the Courts Complex is one of the largest public buildings in the state of Utah.

1 Continuous Commissioning and CC are registered trademarks of the Texas Engineering Experiment Station.