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Good Operations and Maintenance – the First Steps in an Existing Building Commissioning Program

Good Operations and Maintenance – the First Step in an Existing Building Commissioning Program

By

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Outline

- What is Commissioning (Cx) and Retro-Commissioning (RCx) or Existing Building Commissioning?
- How does it (RCx) address O&M Issues?
  - 3 Case Studies across public and private facilities
- Summary and Conclusions

Factoid: Most Commercial US Buildings Operate Sub-Optimally

- Frequent “hot & cold” calls
- High energy use common
- Sub-Optimal operations & deferred maintenance contribute to:
  - poor indoor air quality & comfort
  - high energy use & equipment failures

Enhanced building performance technique, known as building Continuous Commissioning (CC) can detect & remedy most deficiencies at minimum cost.

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What is Continuous Commissioning?

(Texas A&M Version of Existing Building Commissioning)

- **Continuous Commissioning (CC)** – is an on-going, whole building approach to resolve persistent operational problems and optimize energy use in existing commercial, institutional buildings and physical plants
- **Other Names** – Retro commissioning, re-commissioning, building tune-up, etc.

Note: Existing HVAC and control systems are used for CC with no capital equipment purchased.

Factoid: *It is not traditional Operational & Maintenance (O&M), nor ESPC or Facility Energy Audit.*

Objectives of CC

- Identify maintenance issues
- Solve existing operating problems
- Improve building thermal comfort and indoor air quality
- Minimize building energy consumption and cost
- Provide knowledge-based and hands-on training to in-house facility management staff on operations and maintenance

CC Process Seven Steps

1. CC Assessment
2. Develop Performance Baselines
3. Develop Detailed CC Implementation Plan
4. Implement CC Measures
5. Document Changes
6. Train Staff
7. Keep Commissioning Continuous with Effective M&V and O&M

Technical Case for CC

- Determines optimum settings for building based on current operation – not design conditions
- Deferred maintenance items impacting energy use are readily identified and prioritized
- Premature equipment failures & costly upgrades can be avoided, with true energy retrofit opportunities identified

Current Work for Federal Government

- US Army Medical Command (MEDCOM) – 33 Hospitals Worldwide
- US Veterans Administration – 18 Hospitals in Texas, and other Southern States

Typical Problems Identified

- Non functional economizer operations
- Out-of-calibration sensors:
  - DAT sensors
  - Airflow Stations
  - ΔP sensors on chilled/hot water loops
  - RH sensors on weather stations
  - Static pressure sensors
- Leaking valves
- Clogged air filters/dirty coils
- Stuck/disconnected dampers

Three Examples

- Ft. Sill, OK, Reynolds Army Community Hospital (RACH)
- Private Industry
- VA Sites

Ft. Sill, OK (RACH)

Initial Phase of Continuous Commissioning Process – Point-by-Point verification of key sensors

- Static Pressure Sensors for AHU's
- Air Flow Stations
- All Temperature Sensors used for Control
- RH Sensors

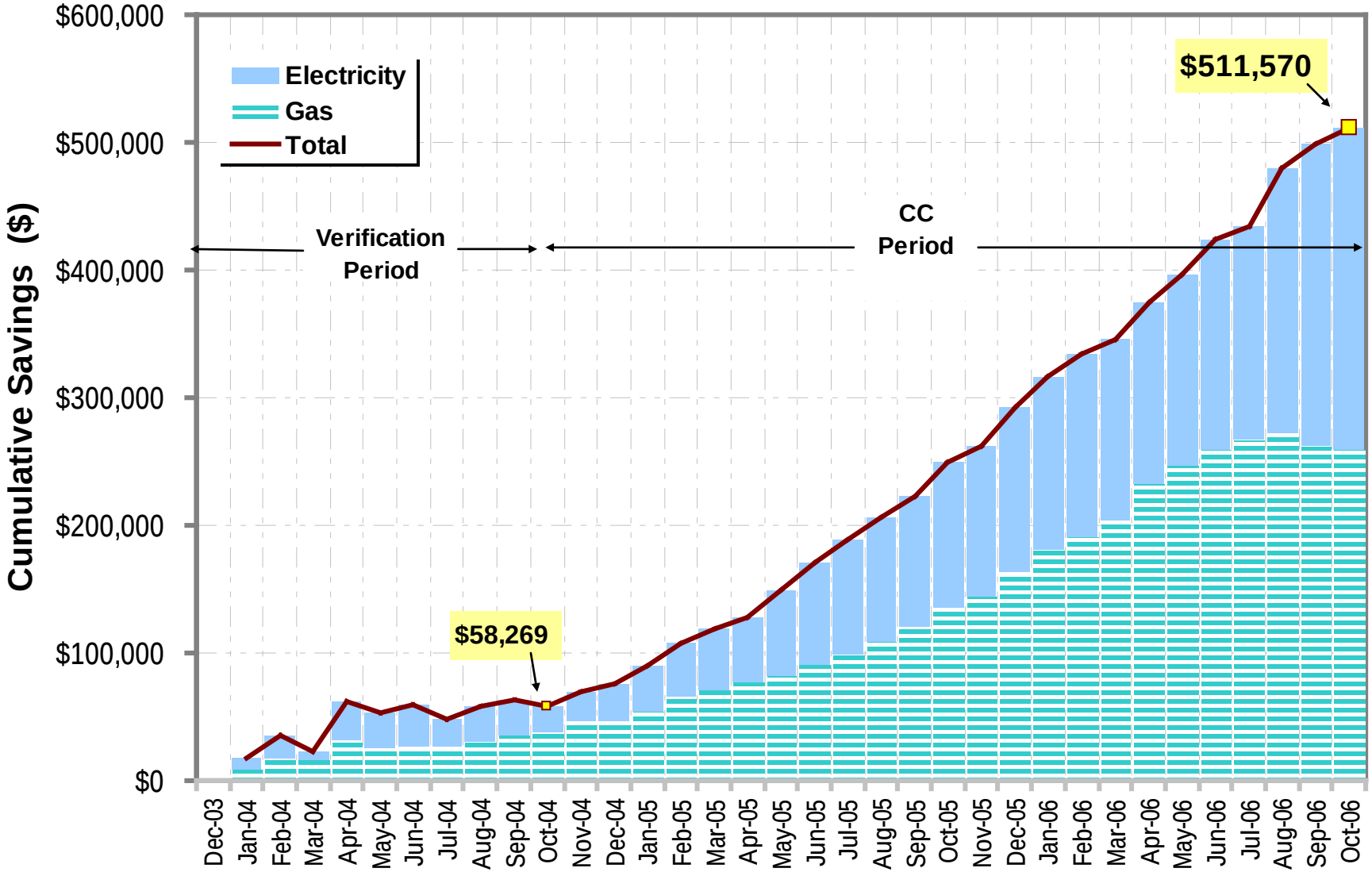
Ft. Sill, OK (RACH) Findings

- Static Pressure Sensors misconnected to sense velocity pressure, not static pressure
- Clogged Air Flow Stations
- Inaccurate RH and air Temperature Sensors
- Misplaced high and low tubes on Air Flow Sensors
- 40% of all sensors (brand new DDC installation) needed some sort of calibration

Does Good O&M Save Money?

Yes!

Reynolds Army Community Hospital



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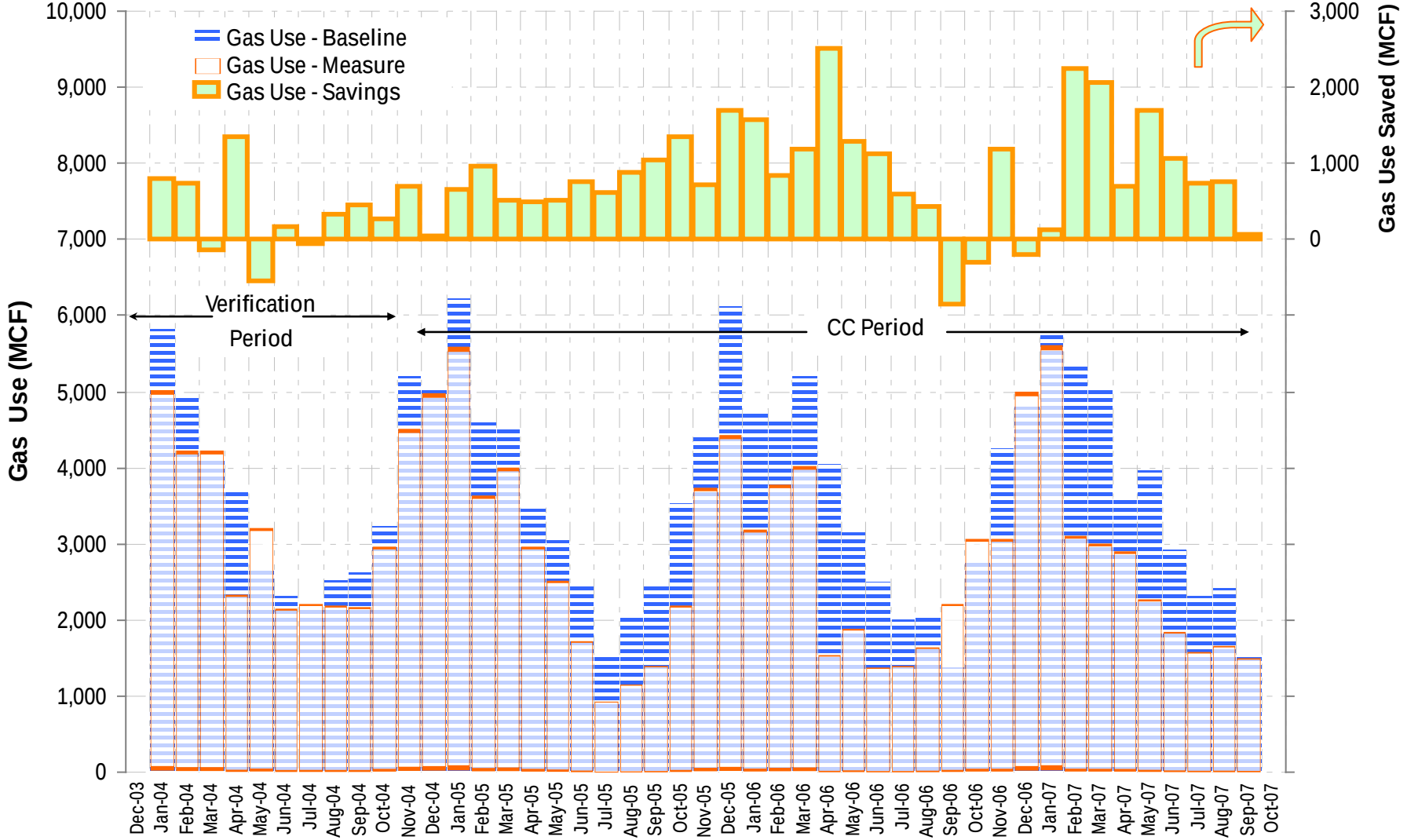
Reynolds Army Community Hospital



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Another Example: Fortune 100 Company

- One AHU (150-HP) with VFD had DAT sensor reading 12 F too high

Result:

  - 100% fan speed, 100% open ChW valve, 24/7 Operation
  - Over $100,000 annually in energy waste (electricity and ChW and HHW)

3rd Example: at a VA Site

OM #	Bldg #	Description	Priority
1	100	Verify all thermostat locations are proper and to relocate those if necessary.	1
2	100	Field check all AHU and terminal unit HHW coils and strainers and to clean those if necessary. Provide complete HHW water balance.	2
3	100	The HHW pumps are operating in HAND mode for an unknown reason.	1
4	100	Verify all AHU CHW and HHW control valves and fine-tune their PID loops to avoid hunting.	2
5	100	Ten of the twenty-one AHUs surveyed gained significant heat (4+ °F.) between the cooling coil and the discharge duct with the motor not in the airstream. Check all AHU casings for air leaks and repair them as appropriate.	3
6	100	Further investigate why CHW and HHW valves are couple controlled. The EMCS output to the heating and cooling valve actuators should be separated into discrete outputs to allow for CC optimization.	1
7	100	Verify all AHU duct static pressure sensors.	1
8	100	Many of the dampers on the AHUs surveyed did not operate properly. Recommend to very all AHU dampers and make correction needed.	1
9	100	On many of the AHUs surveyed, the EMCS did not properly coordinate with the AHU VFD. Recommend to re-commission all AHU VFDs and associated EMCS output.	1
10	104, 104A, & 105	Verify the minimum speed recommended by the cooling tower fan motor manufacturer and re-commission VFD as required to respond to the EMCS properly.	1
11	109	Verify all preheat control valves and temperature sensors and actuators	1
12	110	The HHW pumps are running in HAND. Need to correct whatever problem it might have and put back to AUTO mode.	1
13	110	Repair condensate return system and steam traps.	3

Summary

- Good maintenance practices essential to reliable and “somewhat” efficient operation
- A calibration program is highly recommended, with different calibration intervals for various categories of control sensors
- Building comfort will be improved
- Run to failure or replace when failed is not a good practice

Summary (Cont'd)

- For any type of existing building commissioning program, you have to get the building in good operating conditions to implement the energy efficiency optimization measures
- Training of maintenance staff will be extremely important in maintaining and operating the facility at optimum conditions

Questions?

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