

The Importance of Retro-Commissioning (RCx) Measures Identified or Greatly Modified Subsequent to the RCx Assessment

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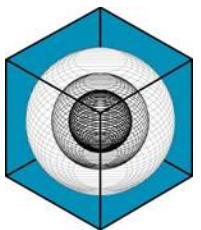
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Learning Objectives

- The importance of RCx measures identified/modified after RCx assessment
- Quantify the impact of RCx measures identified/modified after RCx assessment

Outline

- Background
- Eight Examples of RCx Measures Identified or Greatly Modified After the RCx Assessment
- Conclusions re Impact of Measures Identified/Modified After the RCx Assessment

Background

- The retrofit process –
 - Walk-through audit (measure-specific cost/payback, preliminary measure selection)
 - Utility grade audit (detailed measure cost/payback)
 - Design
 - Implementation
- The RCx process
 - RCx “assessment” (no measure-specific cost/payback)
 - Detailed measurements and investigation of specific measures focusing on implementation details while preparing implementation plan
- Some customers wish to make measure selection after the RCx assessment.
- Significant RCx measures often identified or modified after RCx assessment

Example # 1: Large Computing Facility in Texas

- High minimum steam consumption 500 lb/hr (~0.5MMBtu/hr) observed during initial assessment
- Source of high consumption could not be identified at this time, but linked to malfunctioning PRV during RCx process
- Repair of PRV resulted in savings of ~\$40,000/yr (~20% savings increase)
- PRV discovery led site to install local boilers instead of district steam supply, saving another \$100,000/yr
- This led to steam line analysis in adjacent site resulting in another \$250,000/yr savings
- Initial assessment recommendation to reduce excessive outside air turned out to not be applicable, but savings from steam issue more than compensated for the over-prediction of savings from this measure

Example # 2: Large Medical Research Facility: Modify Measure During the RCx Process

- Initial assessment revealed air-to-air heat exchangers on 100% OA units not being used due to maintenance issues
- Maintenance performed on bypass dampers after initial assessment improved operation, but dampers still would not operate properly due to poor design.
- It was then recommended to leave dampers permanently open.
- This increased energy savings by at least 40% compared with what it would have been without this measure

Example # 3: Medical Facility #1

- Initial assessment identified opportunity to optimize operation of two chilled water loops (critical services loop and non-critical services loop)
- Further investigation revealed this opportunity more limited than anticipated
- Opportunities identified during more detailed investigation to reduce boiler pressure and modify standby operation
 - Increased project savings by ~10%

Example # 4: Medical Facility #2

- Several AHUs with VFDs operated at 57 Hz with many zone reheat valves 100% open through the cooling months
- Detailed investigation revealed adequate OA supplied at a fan speed of 30 Hz
- AHUs were placed on VFD operation during occupied hours, with speed control based on reheat valve position and varied from 30 Hz to 57 Hz
- RCx savings increased by approximately 15%

Example # 5: Airport Terminal Building

- Static pressure reset implemented after initial assessment
- After implementation, both supply and return fans observed to run at minimum speed during low occupancy
- Return fan cutoff point created to shut off return fan when supply fan speed below a certain level
- Thousands of dollars saved, but only 2%-3% of total project savings (>\$1,000,000)

Example # 6: Community College

- Initial assessment identified measures to improve chiller operations, implement ChW supply temperature reset, and optimize the HHW system
- Unable to implement CHW reset because minor controls upgrade not implemented
- More detailed investigation revealed opportunities to utilize 150 BHP boiler as primary with 500 BHP as backup, and to use 15 hp HHW pump instead of 50 hp
- Overall project savings increased by 25% - 40% due to these measures

Example # 7: University Central Plant: Condenser Water Pump

- Initial assessment found condenser water flow through one cooling tower too low => larger pump needed
- Detailed investigation revealed condenser water flow through chiller #1 insufficient and differences in requirements between chiller #1 and chiller #2
- A manual valve used to balance flow to ensure adequate condenser water flow to both chillers
- Energy savings small, but avoided cost of purchasing larger pump

Example # 8: Semi-Conductor Processing Facility

- An opportunity identified during RCx assessment required “minor” re-piping of ChW loops between a facility with critical loads and one with non-critical loads to implement reset schedules and utilize heat exchanger for non-critical side.
- Further investigation revealed re-piping cost higher than client willing to pay
- Major opportunity with boiler operation identified during detailed investigation phase.
- Boiler loading increased by reducing operating boilers by one
- RCx project savings increased by ~25%

Summary

Example	Increase in Project Savings
Computing Facility	20%
Medical Research Facility	40%
Medical Facility #1	10%
Medical Facility #2	15%
Airport Terminal Building	2% - 3%
Community College	25% - 40%
Central Plant Condenser Pump	2%- 3%
Semi-Conductor Facility	25%
Average Savings Increase	~18%

Conclusions

- 8 RCx projects had savings increased by an average of ~18%, with a maximum of nearly 40%, due to implementation of measures not originally identified.
- Significant benefit can result from allowing thorough investigation during RCx in addition to initial assessment.

Thanks



References

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