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Hot Water Recirculation Controls in Hospitality and Commercial Buildings

Characterization and Potential

Ben Schoenbauer

Senior Research Engineer

 cee
Center for Energy and Environment





Acknowledgements

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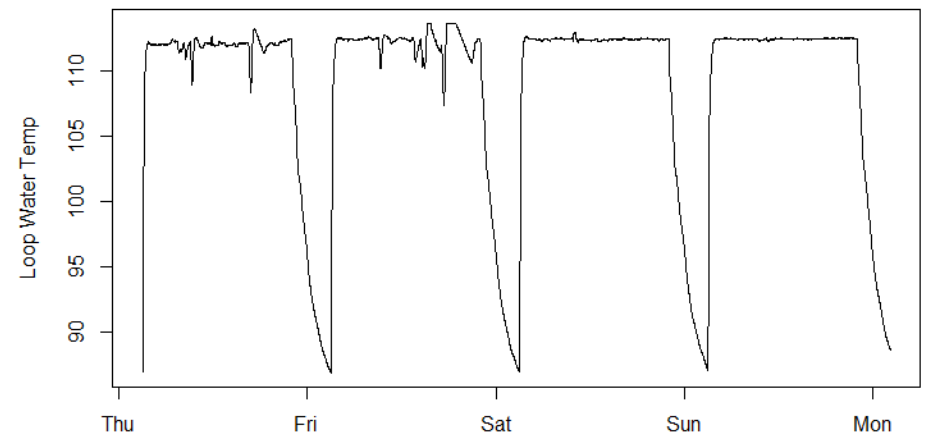
CEE Project Scope

- Phase 1: Characterization on DHW systems in Hospitality and Commercial Buildings [Complete]
 - Survey Systems
 - Monitoring and measurement in a subset of buildings
- Phase 2: Install Recirculation Controllers in at least 6 Buildings [Future work]



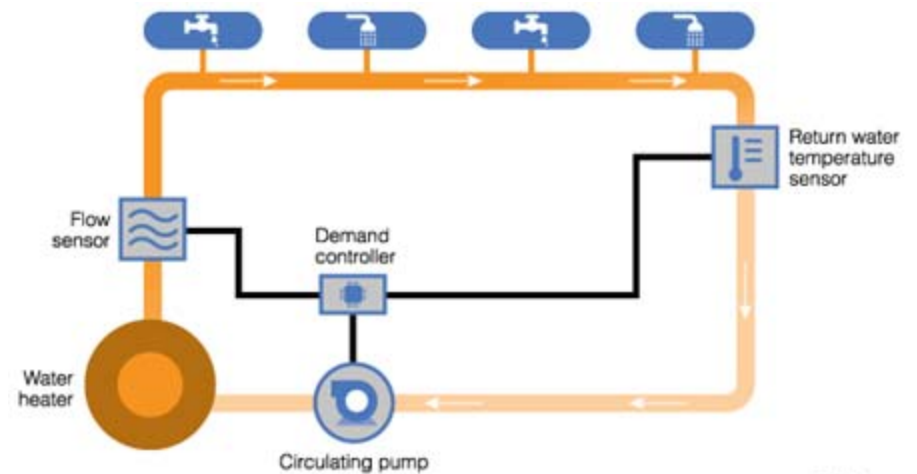
Controls: Time of Day

- Recirculation pumps controllers by building automation systems or timers to turn off in periods of low use
- Has the potential to increase hot water wait times when in an off period



Controls: Demand

- Controller measures real time loop temperature and hot water usage
- Uses both temperature and demand data to reduce runtime without impacting hot water delivery
- Reduces pumping costs and thermal losses from recirculation loops through reduced pump runtime





General Overview of Buildings

- 4.6 million commercial building in USA
- Exclude any buildings with less than 5,000 sq ft
- Of those buildings:
 - 75% have domestic hot water systems
 - 77% of buildings with DHW have some centralized system
 - 1.4 million buildings with centralized DHW systems





Hospitality

- All surveyed and monitored systems were on 24/7
 - One aqua stat installed, but set temperature too high to actually turn off pump
- Five stories and less had “simple” systems with <math><3/4</math> HP pumps
- Larger buildings more complex systems
 - Booster pumps
 - More loops
- Top priority occupant satisfaction





Schools

- Most systems (~66%) had time of day controls
- On average systems ran for 18.75 hours per day
 - One systems was shut down completely during summer months
- Most uses are small and concentrated
- Large variety of fixture uses
 - Locker facilities
 - Bathrooms
 - Dining/Kitchen
 - Classrooms





Commercial Buildings

- Half of systems had time of day controls
- On average systems ran for 16 hours per day when controlled
 - Several buildings with time of day controllers mentioned that they were adjusted or disabled due to early/late workers
- Large variety of systems
 - Buildings were older or had changing use
 - Multiple loops from same source were more common





Current System Operation

- Constant circulation, higher water temperatures, and large capacity systems kept loop temperatures very consistent
- The average temperature drop in the loop was 15 °F in idle periods
 - Even in small buildings temp drops reach 30F in some cases
 - In many cases these losses required higher set temperatures
- In about 1/3 of the measured systems return water temperatures were higher than 125F
- Loop losses expected to be 10% to 30% of total use

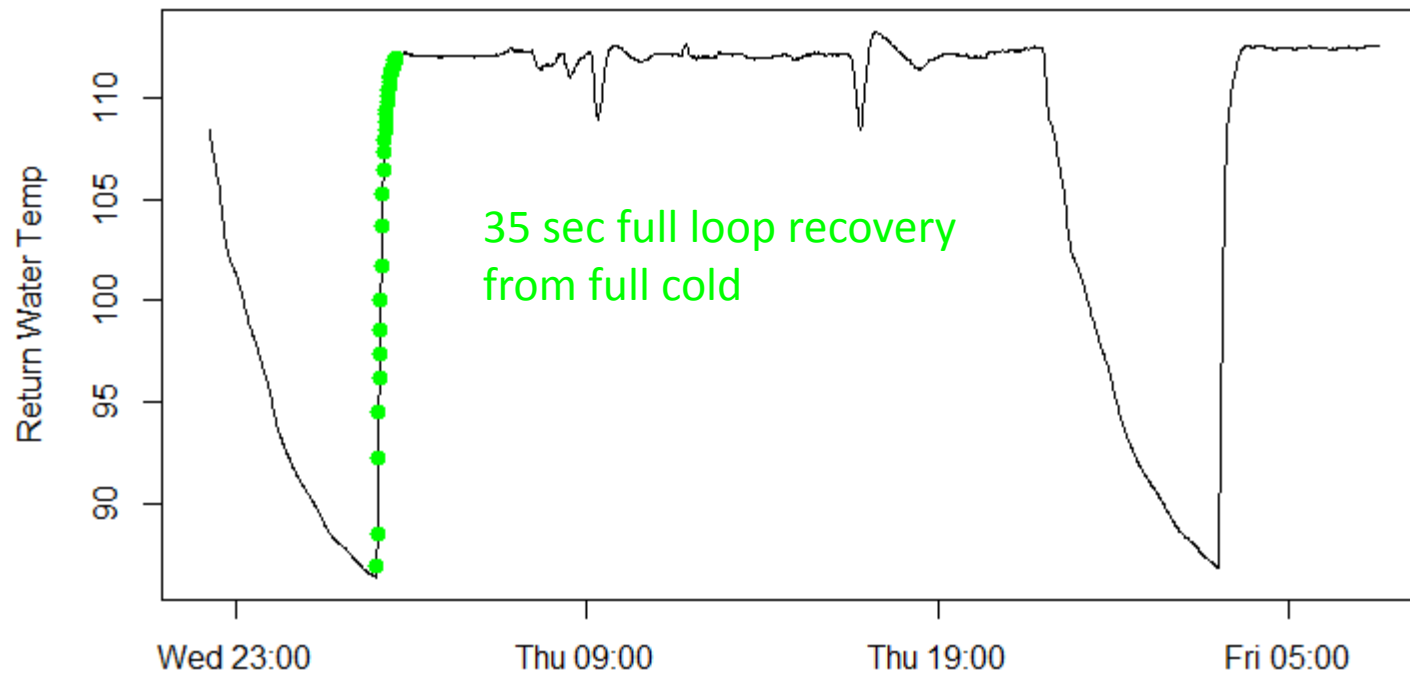


Potential Outcomes

- 10% to 30% reduction in hot water thermal energy use
- Up to 95% reduction in pump energy
- Lengthen the lifetime of valves, pipes, and pumps
 - Was seen as the biggest benefit by several building facility managers

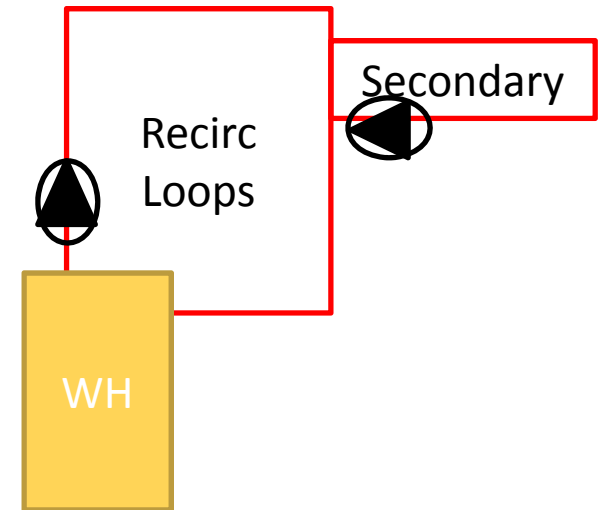


Recovery Time



• Complexity for Installations

- Secondary recirculation loops
- Penthouse suites in large buildings
- Interactions on systems with multiple loops on sharing a heating source



THANK
you!

Ben Schoenbauer

bschoenbauer@mncee.org

