

Steam Operations



Steam Best Practices: Reduce Your Overall Steam Consumption & On-peak Demand

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STEAM Conservation Tips

- S** Shield Pipes and Valves from Heat Loss
- T** Thermal Energy Recovery from Condensate
- E** Ensure Vacuum at All Times, If Intended
- A** Apply Outdoor Temperature Reset
- M** Maintain Steam Traps & Repair Leaks

Shield Pipes and Valves from Heat Loss (Insulate)

- Avoid excessive heat loss and condensate build-up
- Valves and fittings have large surface areas from which heat escapes
- Removable insulation jackets around valves and other components



Cost of Losses Due to Lack of Insulation

Annual Cost Savings *Per Valve* from Installing 1" Removable Valve Insulating Pads

Valve Size	3"	4"	6"	8"
Net Heat Saved with 1" Insulation (BTU/hr)	2,300	2,900	4,600	6,600
\$ Saved Per Year Per Valve	\$450	\$550	\$900	\$1,300

Annual Losses Per 100 Feet of Un-insulated Steam Pipe (15 PSIG)

Pipe Diameter	1"	2"	4"	8"
Heat Lost (MMBTU/Yr)	140	235	415	740
\$ Wasted Per Year	\$3,200	\$5,400	\$9,500	\$17,000

Thermal Energy Recovery from Condensate

- **Maximize heat recovery from condensate using a 2 stage approach:**
 1. Outdoor air preheating OR recovering condensate heat for secondary water loops
 2. Recovering condensate heat to preheat domestic water
- **This reduces steam consumption and also amount of city water required to dilute condensate before discharging it**
- **Many Con Edison steam customers already recover heat (but not all)**
- **Depending on site conditions, paybacks may be 3 years or less**

Other Ways to Reuse Condensate

- **Include cooling tower make-up, washing sidewalks, and watering plants**
- **Condensate heat recovery and reuse guidance sketches are available at www.coned.com/steam**
- **Why reuse condensate?**
 - Steam and water savings
 - The DEP charges for discharge into sewers. If you reuse condensate, you can apply to the DEP for a discount
 - Resulting water savings may help gain points if your building is looking for LEED certification

Ensure Vacuum at All Times, If Intended

- **If your steam system is designed to operate under vacuum, maintaining vacuum will ensure optimal operation**
- **Loss of vacuum may occur if:**
 - Steam traps are not maintained
 - Leaks in piping are present
 - Vacuum pumps are not working properly

Apply Outdoor Temperature Reset

- Reduce circulating hot water temperatures on milder days and increase them on colder days
- If you already reset water temperatures, consider shifting the reset schedule down (i.e. instead of having water at 160°F when it is 20°F outside, set water to 150°F)

Maintain Steam Traps & Repair Leaks

- Maintaining steam traps will not only save steam, but will help ensure safe operation
- Visually inspect steam systems for leaks
- Ensure that relief valves are not leaking



Cost of Losses Due to Leaking Steam Traps

STEAM PRESSURE (150 psig)	TRAP SIZE INCH	STEAM FLOW		LOSSES		
		Hourly	DAILY	\$/M#	\$/DAY	\$/YEAR
150	½	105	2.5M# / (lbs)	\$22.	\$55.	\$20,000
150	¾	152	3.6M# / (lbs)	\$22.	\$79.	\$29,000
150	1"	230	5.5M# / (lbs)	\$22.	\$121	\$44,000

Improving Summer Steam Efficiency

- **Install a plate frame heat exchanger connected to your cooling towers for “free” cooling during mild days**
- **Open fresh air dampers for night or early morning pre-cooling**
- **Shut down chillers earlier than normal but prolong chilled water circulation. It may take some time for chilled water to warm up**

Ways to Reduce On-Peak Demand (6 a.m. – 11 a.m., weekdays; 4 months)

- **Storage of Thermal Energy in Existing Mechanical systems (STEEMs)**
- **Start up some of the fans earlier**
- **Stagger fan start-ups if starting up after 6 a.m.**
- **Do not raise circulating water temperatures during the on-peak period**
- **Reduce space air temperature set points**

Storage of Thermal Energy in Existing Mechanical systems (STEEMs)

- **Con Edison developed STEEMs in conjunction with Goldman Copeland Associates**
- **Tested at 2 customer buildings**
- **No effect on comfort conditions & no increase in overall steam consumption**
- **Good candidate buildings have**
 - Induction, fan coil, or other terminal units with local thermostats
 - Circulating hot water
 - A programmable building management system

STEEMs at One Penn Plaza

- Between 33rd & 34th Street and 7th & 8th Avenue
- 2.6 million square feet
- 57 stories
- Completed in 1970
- Interior fans w/steam heating coils
- Perimeter fans w/steam heating coils serving induction units
- All fans have returns
- STEEMs testing performed during last 2 winters



STEEMs - Operating Steps by the BMS

1. Thermal Charging

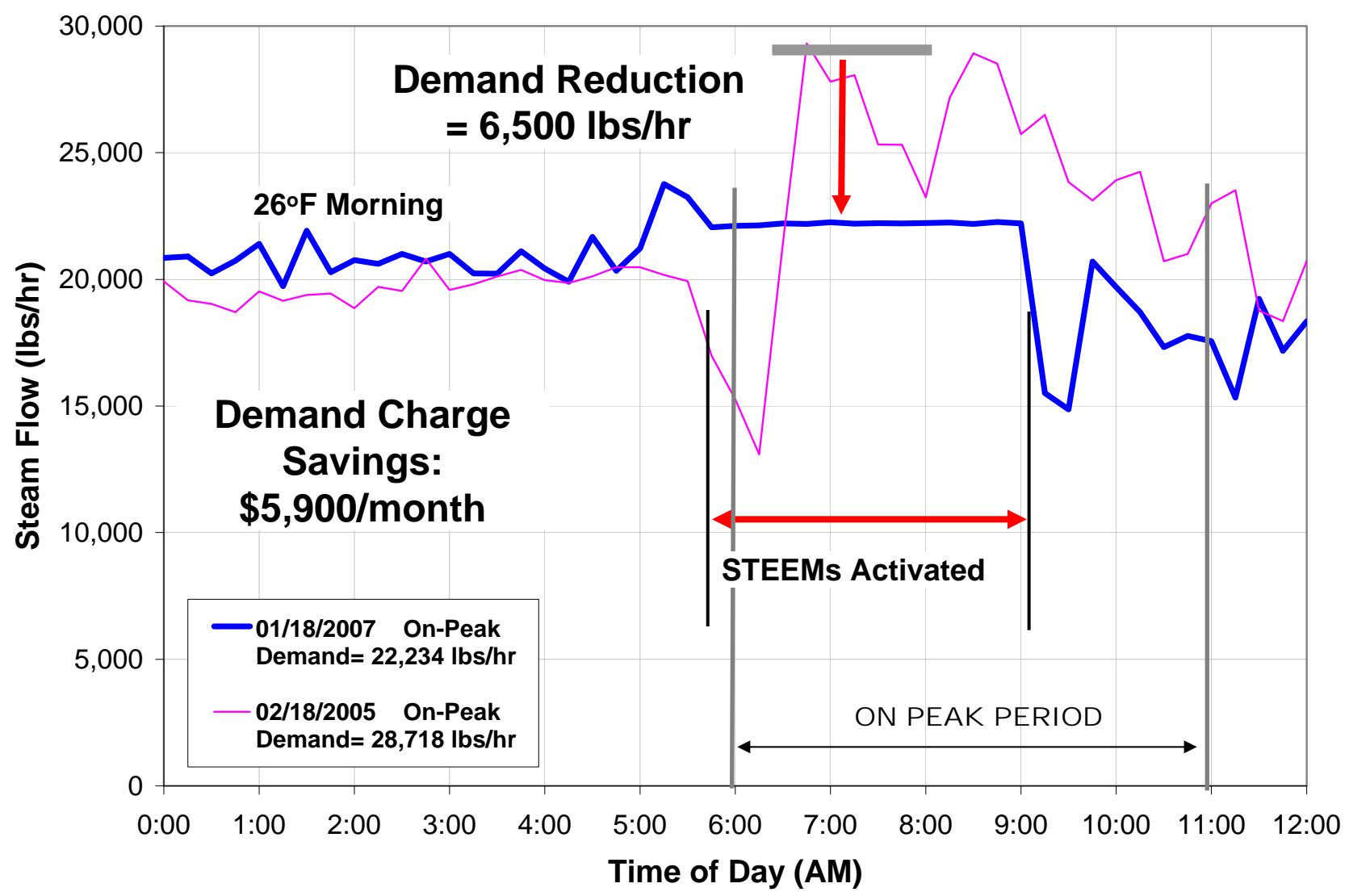
- Prior to 6 a.m. slowly (over a 2 hour period) ramp up temperatures in all the circulating hot water loops to a design maximum temperature (no greater than 190°F)

2. Automatically calculate steam flow rate set point using outdoor air temperature, at 5:30 a.m.

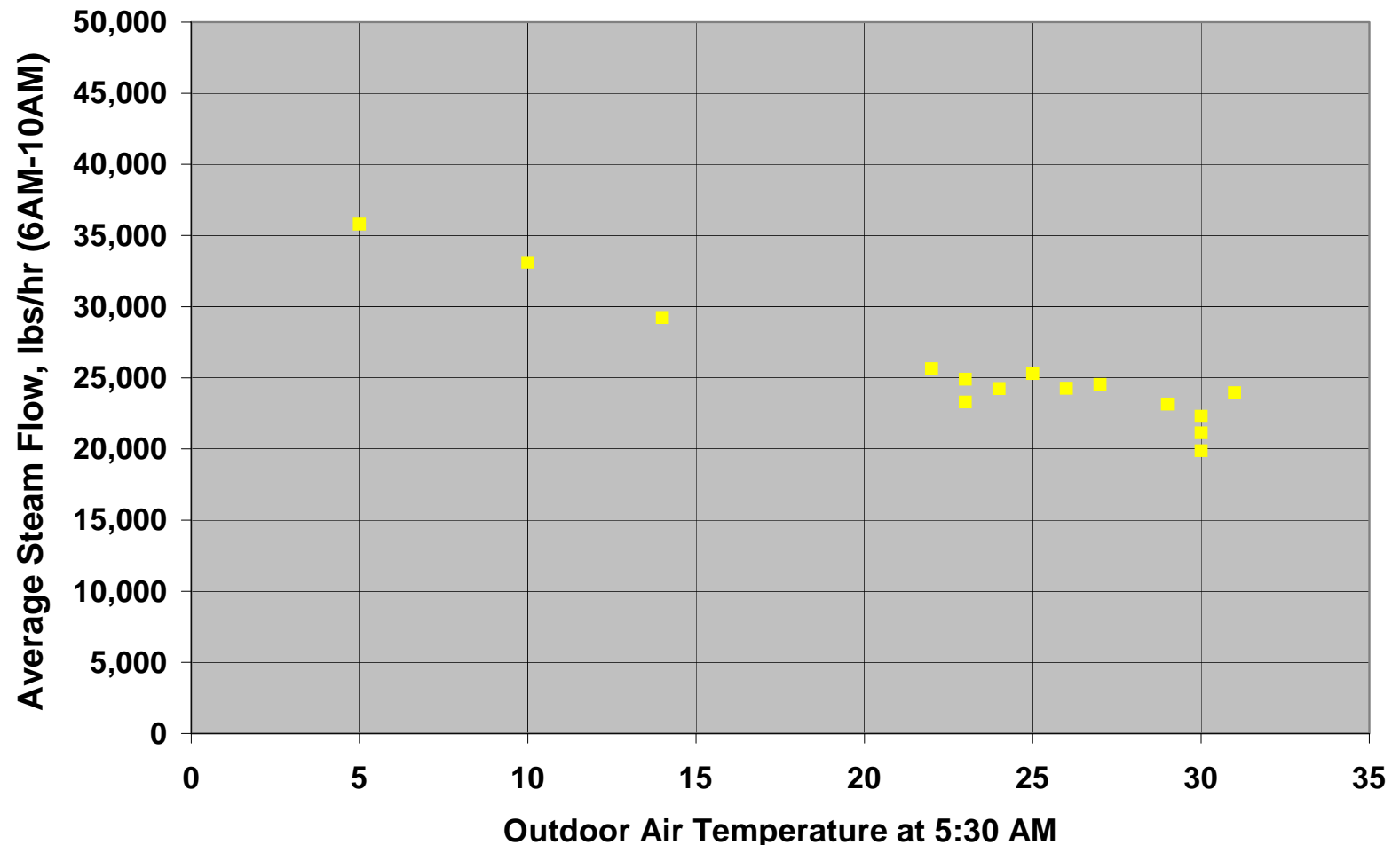
3. Starting at 6 a.m. modulate all the hot water temperature control valves in unison to maintain the steam flow set point

- Once water temperature reaches the minimum temperature limit in any loop, disengage that loop from STEEMs operation
- If water temperature reaches the maximum temperature limit in any loop, shut the valves in that loop until a minimum temperature is reached, then disengage that loop from STEEMs operation

STEEMs Result at One Penn Plaza

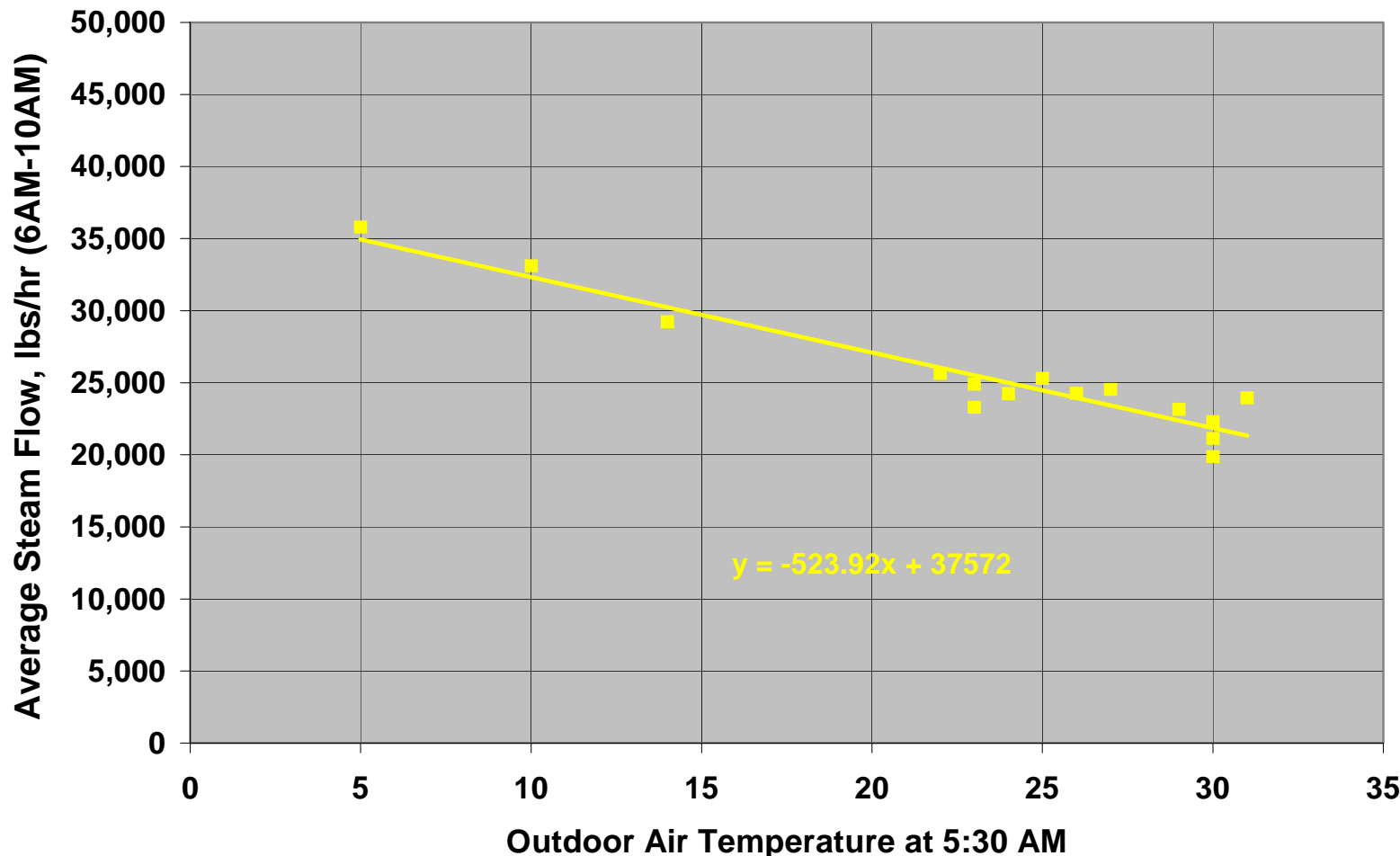


STEEMs - How Can the BMS Predict the Flow Set Point for a Given Morning?



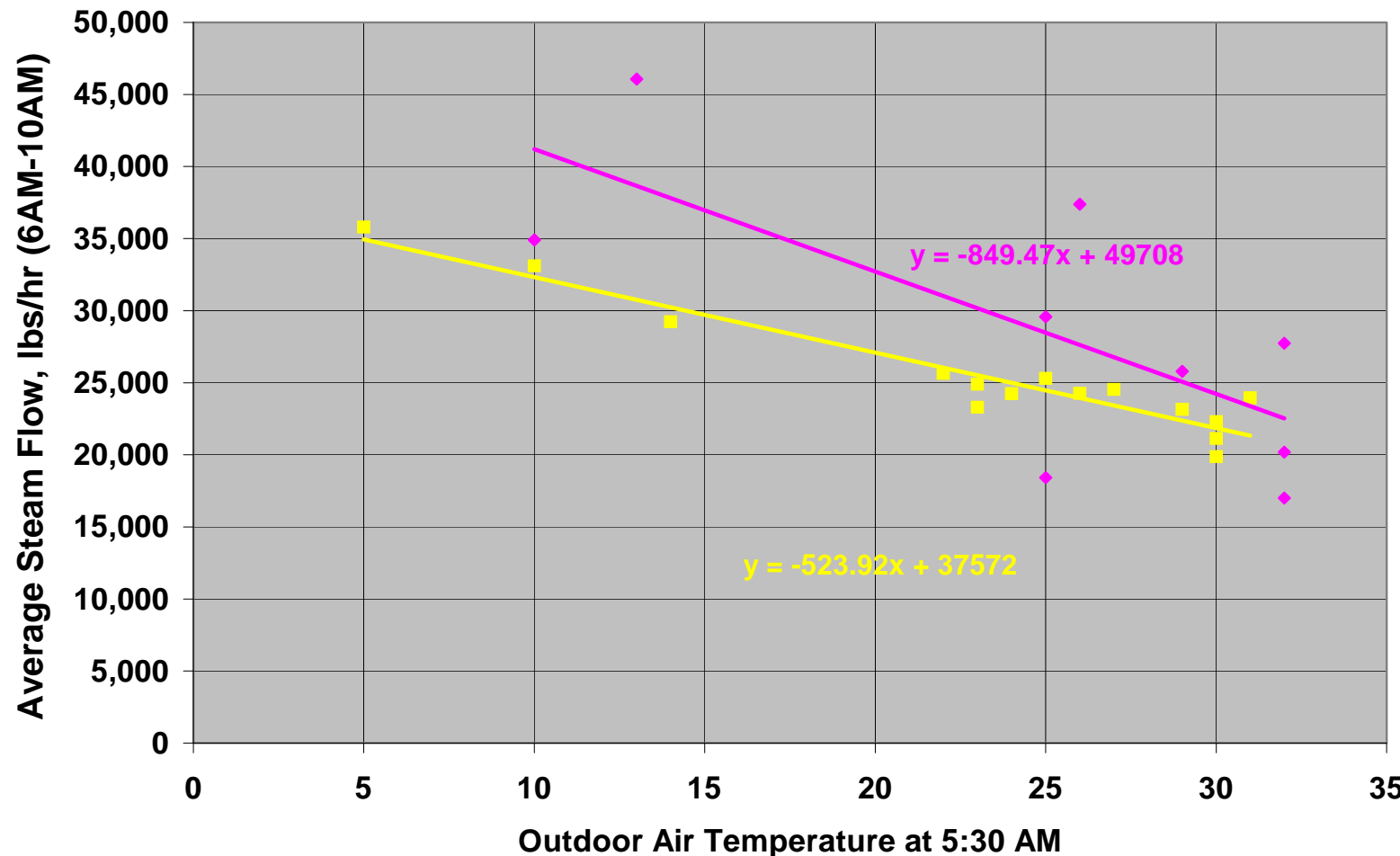
■ Non-Monday Weekdays

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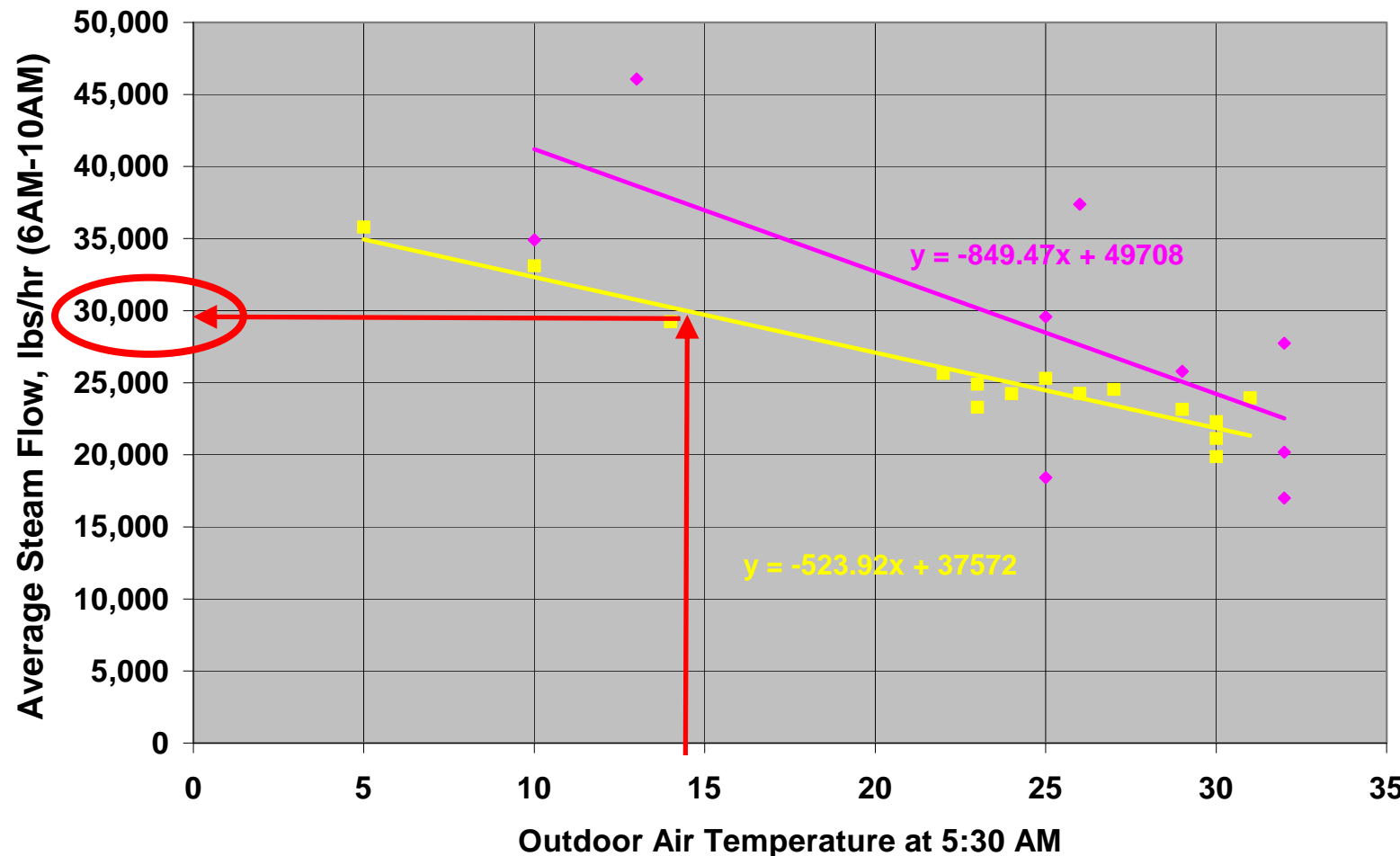
■ Non-Monday Weekdays — Linear (Non-Monday Weekdays)

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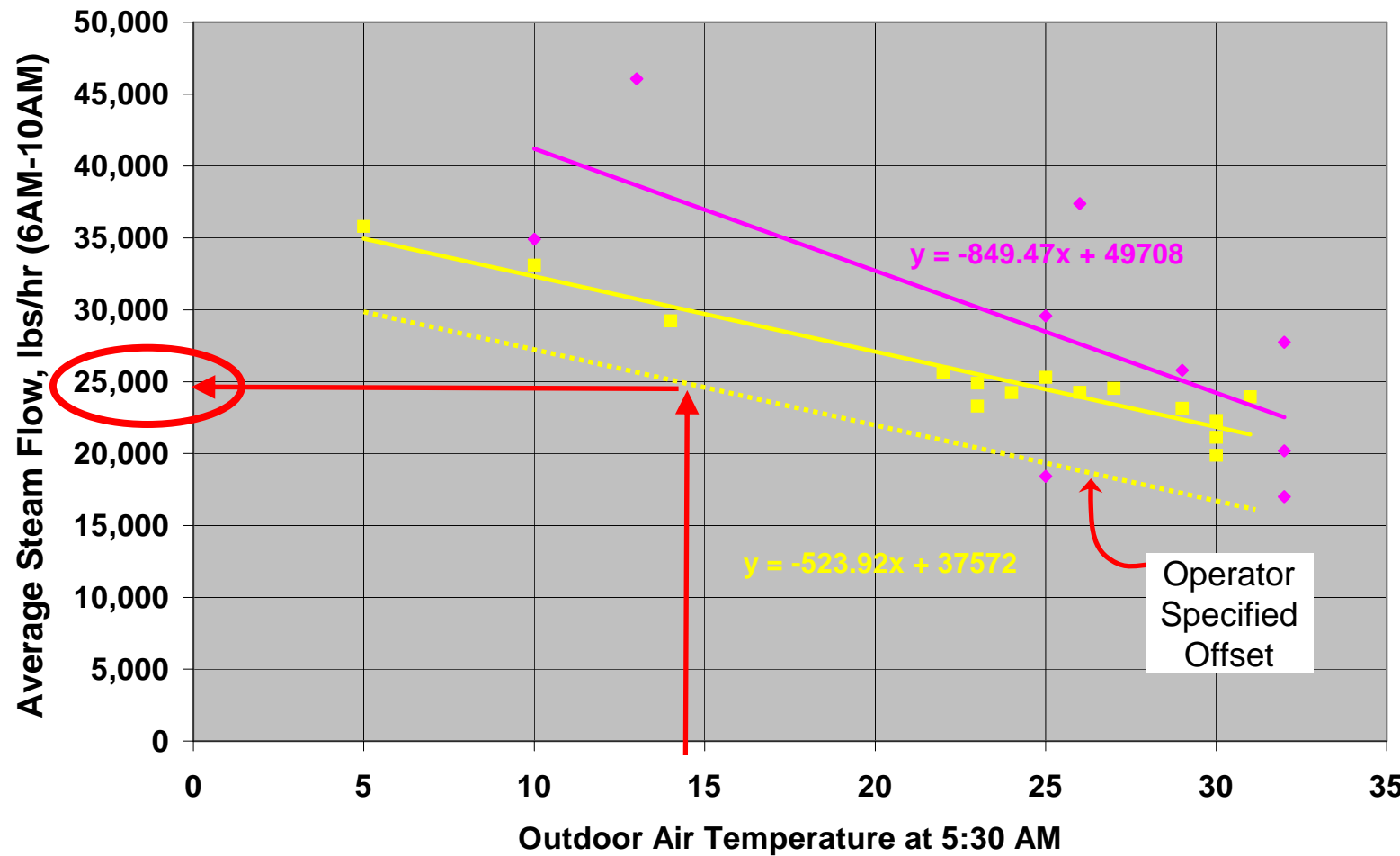
- ◆ Mondays
- Non-Monday Weekdays
- Linear (Non-Monday Weekdays)
- Linear (Mondays)

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STEEMs: Advantages and Challenges

Advantages:

- Automated operation
- No effect on comfort conditions

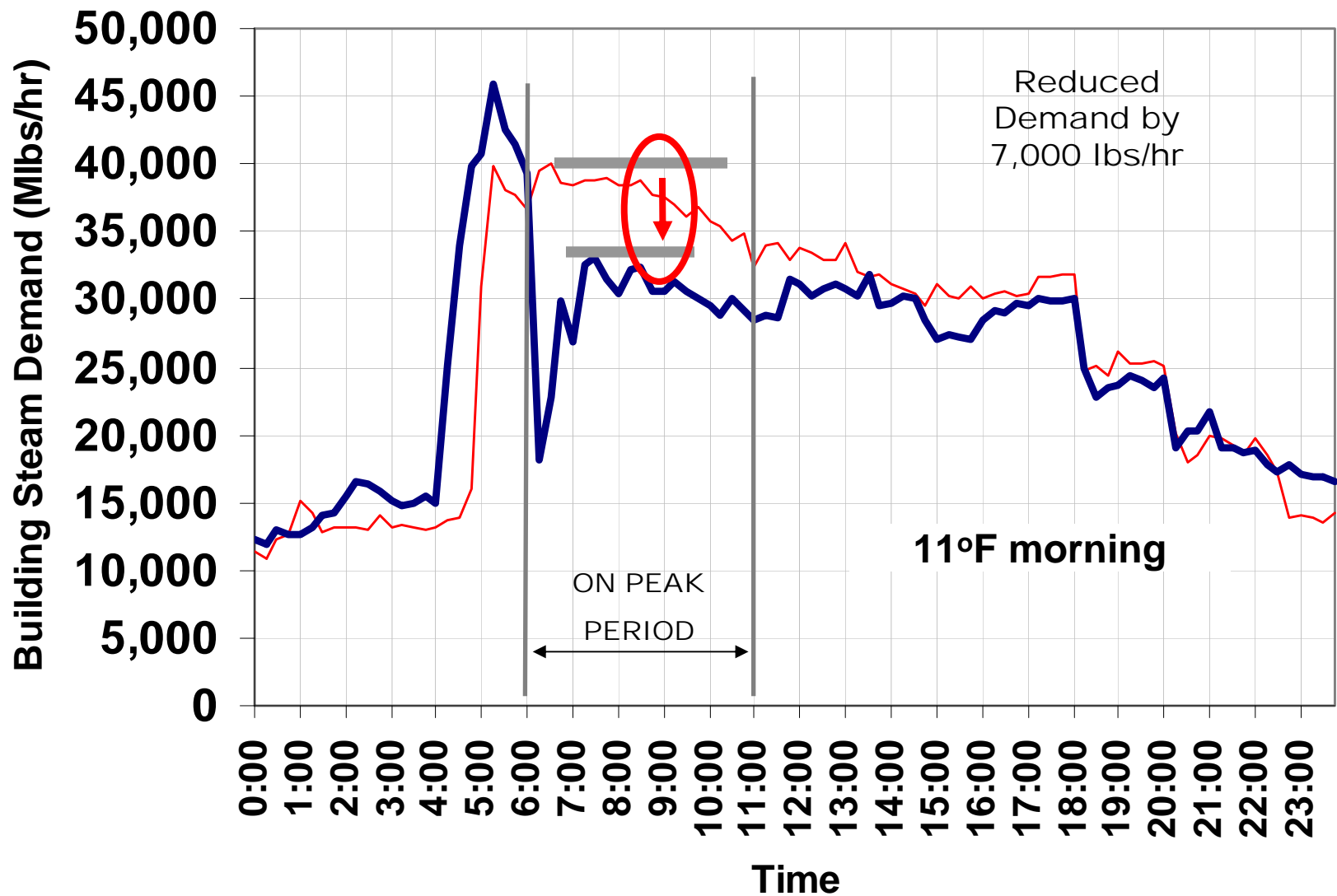
Challenges:

- Tuning the valves correctly to maintain steady steam flow rate is critical

Starting Up Fans Earlier

- **At an earlier hour, start up only those fans that serve the coldest spaces to ensure that increase in electric costs is not higher than steam demand savings**
- **To heat up spaces as fast as possible before 6 a.m., set the discharge air set point to maximum and, if the building is unoccupied, close fresh air dampers**
- **After 6 a.m., reduce the discharge air set point to normal**

Result of Starting Fans Earlier (Midtown Office Building)



— Normal Operating Day 02/06/07 — Occurrence Day 01/26/07

Conclusion

- **Follow STEAM Conservation tips**
- **Identify ways to reduce your on-peak demand**
- **Share your ideas with us!**
 - Call the Steam Business Development Group at **212-460-2011** to let us know how what you did to reduce your demand