



Energy Savings and Maintenance and Operations Practices

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Operations & Maintenance (O&M)

- Operations and Maintenance are the decisions and actions regarding the **control** and **upkeep** of property and equipment. These are inclusive, but not limited to, the following: 1) actions focused on scheduling, procedures, and work/systems control and optimization; and 2) performance of routine, preventive, predictive, scheduled and unscheduled actions aimed at preventing equipment failure or decline with the goal of increasing efficiency, reliability, and safety.

Preventive Maintenance

- Reactive
- Preventive
- Predictive
- Reliability Centered

Maintenance Type	Avg Maintenance Breakdown*
Reactive	>55%
Preventive	31%
Predictive	12%
Other	~2%

**From a study in 2000 in the US*

Operations Efficiency

- *Operational Efficiency* represents the life-cycle, cost-effective mix of preventive, predictive, and reliability-centered maintenance technologies, coupled with equipment calibration, tracking, and computerized maintenance management capabilities all targeting reliability, safety, occupant comfort, and **system efficiency**.
- O&M department prime objective “keep things running and functional”

Energy Management

- “Energy management is the proactive, organized and systematic coordination of *procurement, conversion, distribution* and **use** of energy to meet the requirements, taking into account environmental and economic objectives”
 - Prime objective is to create policies and practices that aim to minimize energy consumption to the maximum extent possible.

Organizational Structure

- Organizational setup and hierarchy
 - Facilities/Public Works
 - M&O Department
 - Sustainability Department
 - Energy Manager/Department
 - Other

Typically, O&M Energy Savings Measures...

- Low-cost or no cost in nature
- Easily implemented with in-house personnel
- Quick paybacks

Examples – Lighting Systems

- Review Light Levels
- Inspect and Improve control of Interior and Exterior Lighting
- Replace incandescent and fluorescent lamps with LEDs
- Install LED Exit Signs
- Clean lighting equipment and document lighting levels
- Group re-lamping or de-lamping

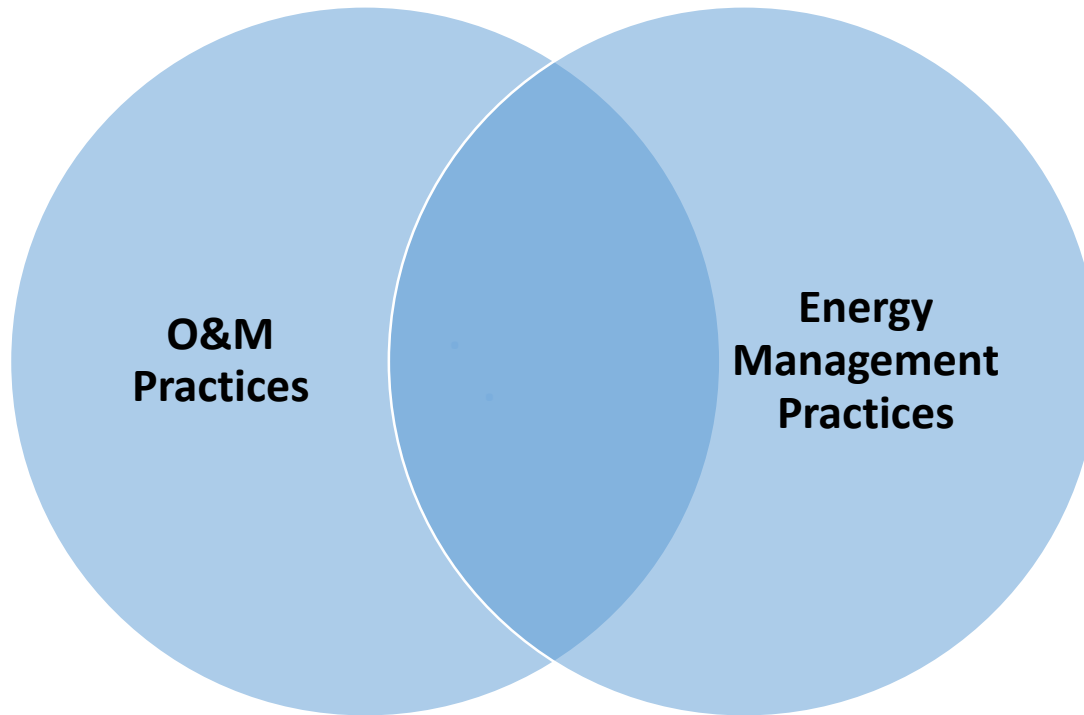
Examples – HVAC Systems

- Establish HVAC unit service schedules
- Maintain boilers/ furnaces
- Inspect cooling equipment
- Maintain economizers
- Test AHU's
- Inspect and clean coils, fans, air ducts
- Replace air filters
- Maintain controls
- Sensor Calibration

Examples – HVAC Systems (cont.)

- Schedule HVAC equipment operation based on building occupancy
- Avoid manual operation of equipment
- Separately schedule temperature control and ventilation
- Maintain optimum cooling, heating, and setback set points
- Hail guards on condenser coils
- Insulate Hot Water and Chilled Water equipment
- Repair leaking control valves
- Flush hot water fixtures

Nexuses between O&M and Energy Management Functions



Importance of Cross Training

Strategies to Reduce Energy Waste

Behavioral Practices

Practices that can be adopted by all building occupants; staff, students, etc.

O&M Practices

Practices that can be adopted by building custodians, operators, and managers

Both requiring very little to no capital investment!

Effective O&M Program Benefits

- Energy savings of 5%-20% of whole-building energy use (depending on building type, baseline, & use)
- Minimal comfort complaints
- Equipment that operates adequately until the end of its useful life or beyond
- IAQ maintained
- Safe working conditions for the buildings' operating staff

Temperature Setpoints

	Temperature Setpoints
Occupied Cooling	74°F - 76°F
Unoccupied Cooling	85°F
Occupied Heating	67°F - 69°F
Unoccupied Heating	50°F

- What is the impact of raising the space cooling setpoint by 1 degree Fahrenheit?
 - Approximately 1% reduction of HVAC energy consumption/year!

HVAC Scheduling

- Schedule HVAC Operation based on building occupancy
 - Cooling, heating, **outside air ventilation**, etc.
 - Occupancy sensors communicating with HVAC

- A facility in the NCTCOG region could save 15% of HVAC **cooling costs** by reducing HVAC operation by 2 hours
 - Assumptions: DFW Climate; 12 month operation; existing EFLCH = 1,267; proposed EFLCH = 1,078

Lighting

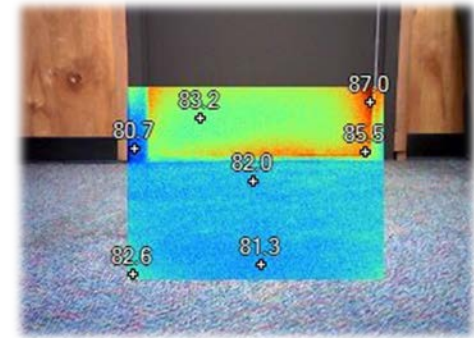
- Lighting makes up 20%-40% of electric bill
- Turn off lights when not in use!
 - Offices, common areas, kitchen, etc.
- Turning off the lights for even one hour of per day could result in approximately 10% reduction in lighting energy!



Outside Air Infiltration Reduction

- Reduce outside air infiltration
 - Weather stripping, leaky ducts, etc.

- An average exterior doorway without weather stripping could result in approximately \$25/year in cooling and heating energy costs!
 - Source: SECO Quick Calcs for DFW area



Discussion and/or Questions?

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