Small/Medium-Sized Commercial Building Re-tuning Training

Introduction

A PRESCRIPTIVE APPROACH TO RE-TUNING SMALL/ MEDIUM-SIZED COMMERCIAL BUILDINGS
Small/Medium-Sized Building Re-tuning Training: Introduction

- The purpose of this training is to train students/technicians on how to make small/medium-sized buildings more efficient leading to energy savings and reduced operating cost.
- The knowledge and skills learned through the training will be highly valued by organizations and companies seeking to improve the performance of small/medium-sized buildings.
- It will also prepare the participating students/technicians for hands-on field training.
- It will also provide an opportunity for students/technicians to ask questions and get clarification on any aspect of the re-tuning process.
Small/Medium-Sized Building Re-tuning Training: Intended Audience

- Onsite employees (custodial staff) responsible for day-to-day building operations,
- Offsite contractors (retro-commissioning agents, service providers or control vendors) hired to improve a building’s energy efficiency, and
- People interested in entering this field, including college students and military veterans
Small/Medium-Sized Building Re-tuning: Definition

► Building re-tuning is a systematic process to identify and correct no/low cost operational problems that lead to energy waste

► Because small/medium-sized buildings will mostly have packaged units for heating and cooling with simple air distribution, and are controlled by a zone thermostat, many of the recommendations for efficiency improvements will be prescriptive

► Some of the topics covered in this building re-tuning training are often covered in training associated with energy auditing and retro-commissioning for small/medium-sized commercial buildings
Small/Medium-Sized Building Re-tuning Training: Approach

▶ It will use a four step approach

- **Initial data collection phase**: Collection of information about the building
- **Investigation phase**: Building walk-down to identify and characterize the building operations
- **Implementation phase**: Application of prescriptive re-tuning measures
- **Documentation phase**: Reporting of measures implemented and calculation of energy savings
Small/Medium-Sized Building Re-tuning Training: Major Focus Areas

- Building Envelope
- Heating, Ventilation and Air-Conditioning Systems and Controls
  - Packaged air conditioners and heat pumps
  - Gas furnaces
- Lighting and Lighting Controls
- Hot Water
- Office Equipment
- Indoor Environmental Conditions
- Air distribution system
- Meter Profile
Small/Medium-Sized Commercial Building: Definitions and Approach

► Small-sized Buildings:
  ■ 25,000 square feet (sf) or less
  ■ No building automation system

► Medium-sized Buildings:
  ■ Greater than 25,000 and generally less than 100,000 sf
  ■ No building automation system

► A prescriptive approach to identify and correct no-cost or low-cost building operational problems that lead to energy waste

► May include identifying other opportunities for improving energy efficiency that require investment
Small-Sized Commercial Building Characteristics

- Buildings less than 25,000 sf
  - Percent of total number of commercial buildings – 54%
  - Percent of total commercial building square footage – 22%
  - Percent of total commercial building energy use – 21%

- Even a 10% reduction in HVAC and lighting energy consumption will lead to 6 kBtu/sf/year or 150 mBtu/yr for a small commercial building

Source: 2003 CBECs
Medium-Sized Commercial Building Characteristics

- Buildings greater than 25,000 sf and up to 50,000 sf
  - Percent of total number of commercial buildings – 3%
  - Percent of total commercial building square footage – 6%
  - Percent of total commercial building energy use – 5%

- Even a 10% reduction in HVAC and lighting energy consumption will lead to 5.5 kBtu/sf/year or 275 mBtu/yr for a medium commercial building that is 50,000 sf in size

Source: 2003 CBECES
Small/Medium-Sized Commercial Building Re-tuning: Building Personality
Small/Medium-Sized Building Re-tuning: Basic Energy Management Principles

- If you don’t need it, turn it off
- If you don’t need it at full power, turn it down
- Make “smart” energy decisions when adjusting systems to the real building needs
- Learn and know your building’s personality
- Save energy without negatively impacting the comfort of the occupants
Small/Medium-Sized Commercial Building
Re-tuning Training: Understanding Building Personality

- Buildings start as children
  - Designed (parents)
    - By engineers with best guess information
    - For some weather conditions
    - Inside load conditions
    - For a specific number of occupants
    - For a specific solar gain and orientation
  - Built with (childhood years)
    - Low bid
    - Tight schedules
    - Limited inspections
    - Minimum or no commissioning
Buildings grow to be teenagers ... usage, constant change (teenage years)

- Weather impacts
- Staff changes
- Changes in internal loads, e.g., computer, printers, etc.
- Equipment malfunctions that are not repaired
- Design flaws that are not repaired
- Cubical and wall reconfigurations without moving diffusers, thermostats or light switches
- Poor maintenance on equipment
  - Working Dampers, Air Balance
  - Controls
  - Clean Filters, Clean Coils and Refrigerant Charge
Building Personality (cont.)

- Buildings grow to be adults … current conditions (adulthood)
  - High energy costs
  - High complaints
  - Small zones driving large systems
  - Poor operations based on complaint response instead of the bigger picture
  - Continuance of poor maintenance
Building Personality (cont.)

- Like children, you need to get to know your building
- When is the building truly occupied and how it reacts to occupancy changes
- What is its personality
  - How does it act or respond to changing internal conditions?
  - How does it respond to weather changes?
  - What is its balance point (a point where no heating or cooling is required to maintain comfort in the building)?
Small/Medium-Sized Commercial Building Retuning Steps
Small/Medium-Sized Commercial Building Re-tuning Steps

- Collection of information about the building: This is the **Initial phase** of building re-tuning
- Building walk-down to identify and characterize the building operations: This is the **Investigation phase** of building re-tuning
- Application of prescriptive re-tuning measures: This is the **Implementation phase** of building re-tuning
- Reporting of measures implemented and calculating of energy saving: This is the **Documentation phase** of building re-tuning.