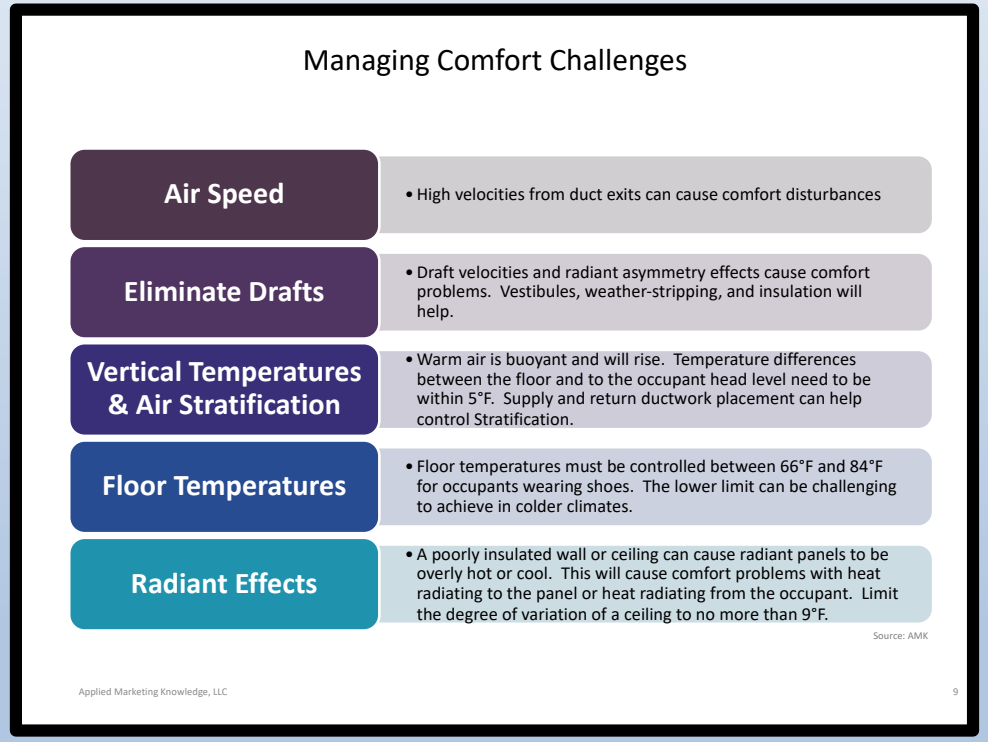
AMK HVAC Systems Training
Module 1: HVAC Fundamentals Topics

- Thermal Comfort
- Basic Air Conditioning Systems
- System Loops
- Zoning
- Psychrometric Chart Overview



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Module 2: Systems Selection Topics

- Collecting project input, including building use, budgets, and schedule, and project delivery type
- Understand Design Criteria That Affect System Selection Priorities
- Evaluating the trade-offs of different system choices
  - Preference of Owner – Own vs. Lease
  - Installed vs. Operational Cost
  - Size and Shape of Building
  - Schedule
  - Comfort and Noise
  - Codes - Energy Codes, Ventilation Codes
  - System Complexity
  - LEED Certification

ASHRAE 62.1 and 90.1 Requirements

For Manufacturing Offices

1. ASHRAE 62.1 – Ventilation
   a. Outdoor intake location (rooftop unit) located distant from source of contaminant (restroom exhaust fan and vent pipe)
   b. MERV 6 filters used upstream of wetted cooling coil
   c. Final design will need to verify outdoor intake airflow per multi-zone re-circulating systems calculations
   d. Minimum exhaust rates required for contaminant sources (restrooms)

2. ASHRAE 90.1 – Energy
   a. Minimum equipment efficiency must meet Table 6.8.1A (10.1 EER)
   b. Most energy requirements apply when equipment selections being made, not at system selection

Slide Courtesy: Carrier

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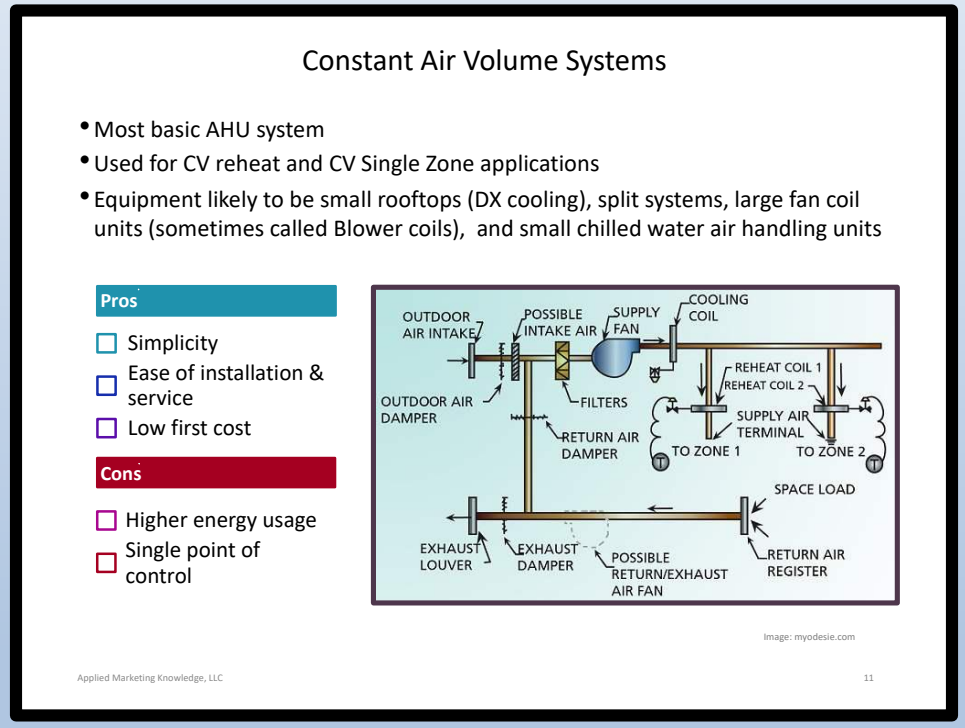
Module 3: Airside Systems Topics

- System Type Overview
- Comfort Control
  - Space Load Temperature Control
  - Humidity, Part Load Control
- VAV Systems
- Changeover/Bypass Zoning Systems



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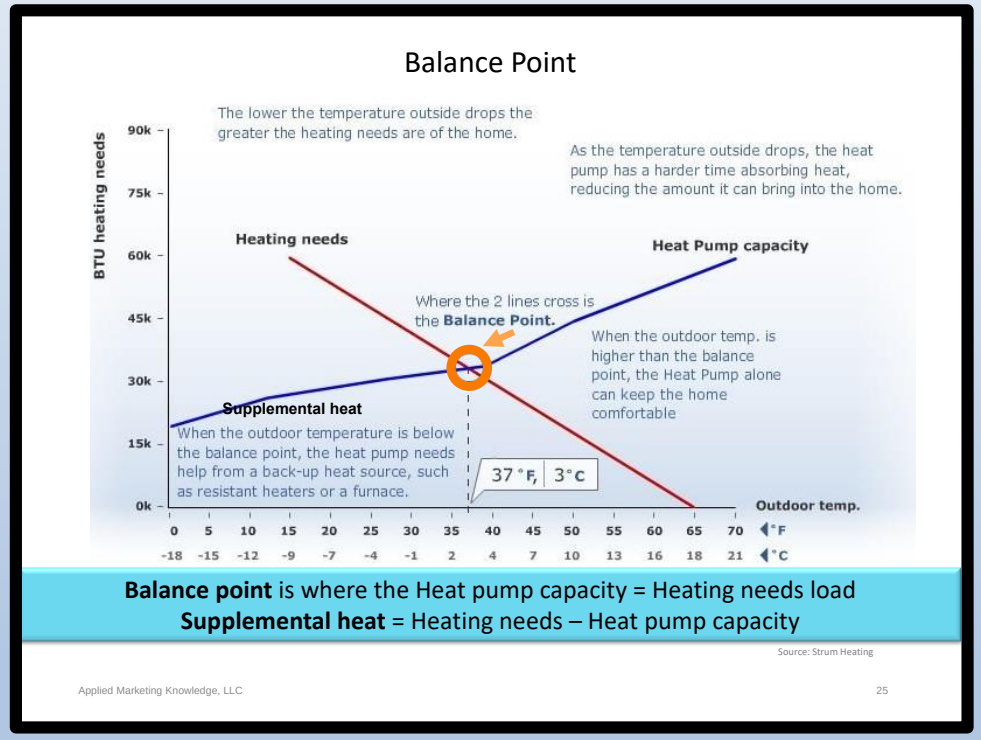
Module 4: Heat Pump Systems Topics

- Heat Pump Basics
  - Overview, What and Where
  - Heat Pump Advantages
  - Life Cycle Economic Examples
- Air Source Heat Pumps
  - Air Source Heat Pump Components& Cycles
  - Air Source Heat Pump Efficiency & Sizing
- Water Source Heat Pumps (WSHP)
  - Closed Loop and Open Loop Systems
  - Heat Transfer Modes & System Layout
  - WSHP Advantages
- Geothermal Heat Pumps
  - Geothermal HP System Designs
  - Geothermal HP Components
  - Water to Water HP Efficiency



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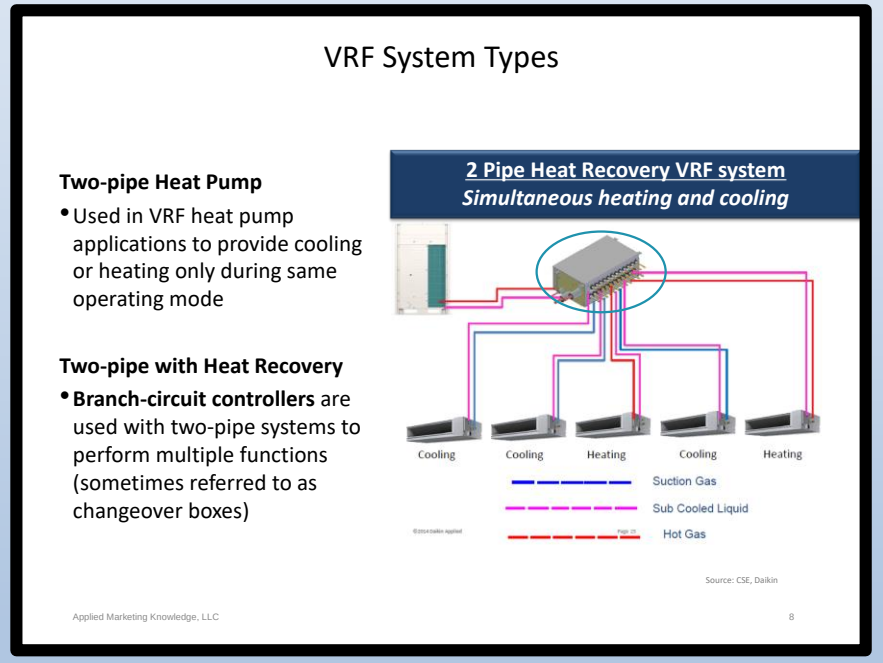
Module 5: Variable Refrigerant Flow Systems Topics

- VRF Technology, How it Works
- VRF Advantages & Opportunities
- VRF Components
- Design & System Layout
- Summary



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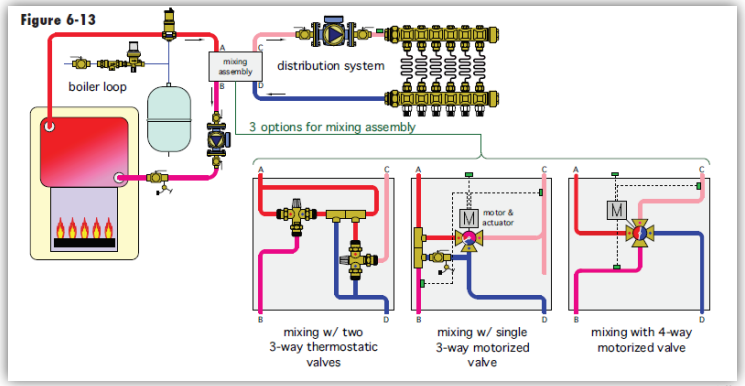
Module 6: Hot Water & Hydronic Systems Topics

- Heat Transfer
- Hydronic Heat Sources, Heat Emitters
- System Approaches
  - Temperature Designs
  - Zoning and Mixing
  - Controls
  - Distribution Piping Design
  - Circulators, Pumps
  - Air expansion and air elimination
  - Benefits
- Radiant Systems Overview

Systems: Zoning and Mixing



Mixing Options:

- Mixing with two 3 way thermostatic valves
- Mixing with single 3 way motorized valve
- Mixing with 4 way motorized valve

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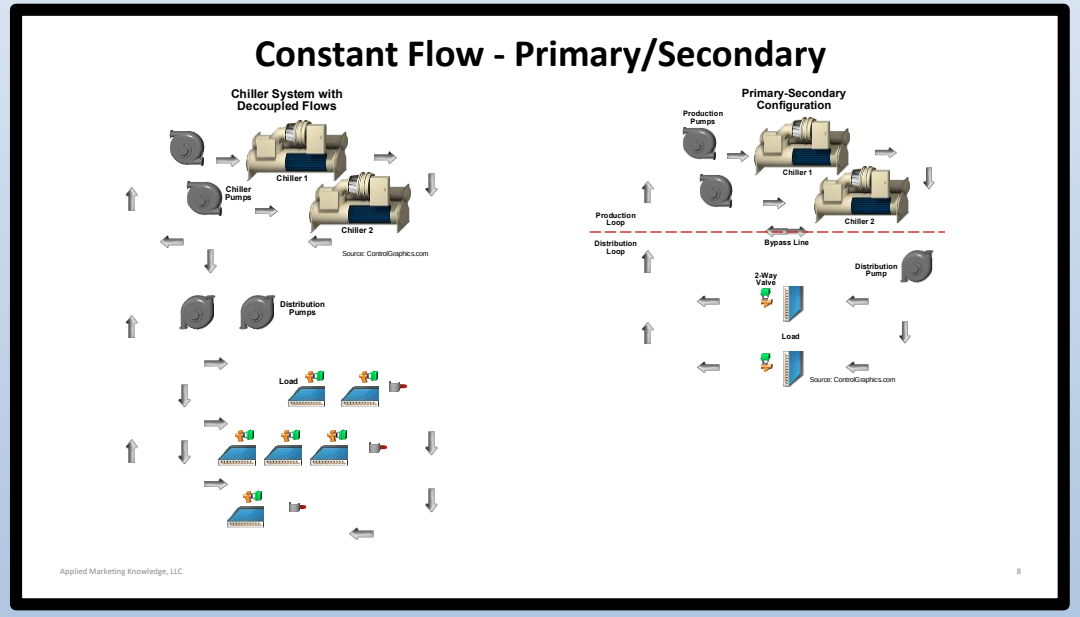
Module 7: Chilled & Condensing Water Systems Topics

- Chiller Equipment
  - Air Cooled
  - Water Cooled
  - Absorption Chiller
- Chiller Components
  - Evaporator, Condenser, Compressor, EXV
- Chiller Application Design Fundamentals
- Chiller Piping and Loop Design
  - Constant & Variable Flow,
  - Primary/Secondary Design
- Chiller System Variations
- Chiller Plant Optimization and Control



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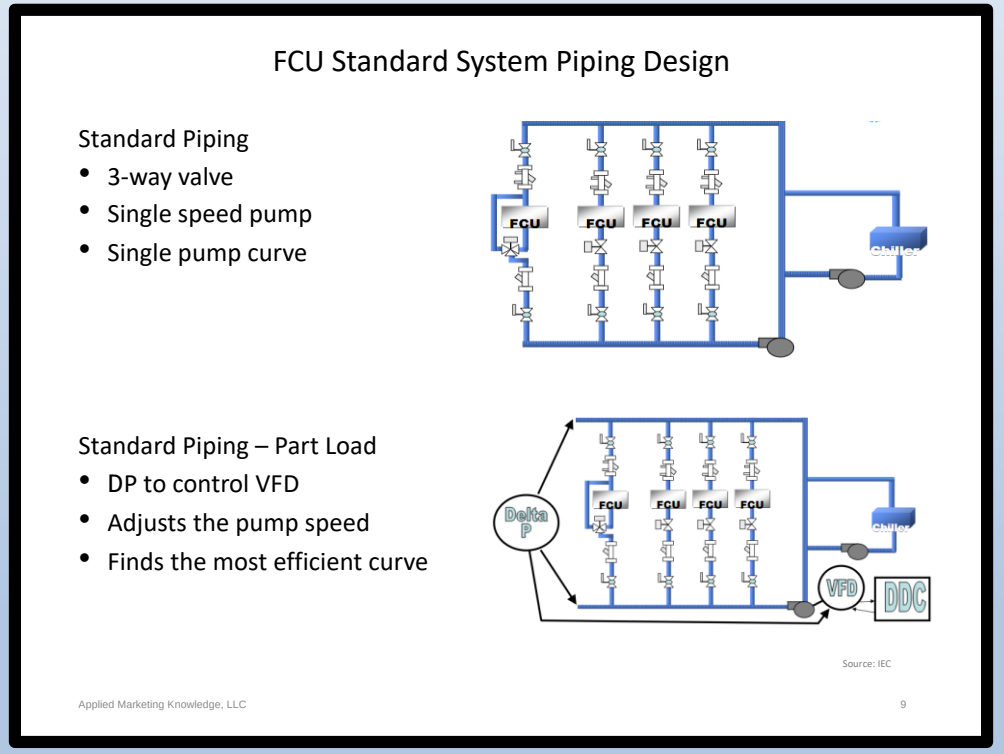
Module 8: Chilled Water Terminal Units

Topics

- Fan Coils
  - Features and Design Options
  - Standard Piping Design
  - On Demand Piping Design
  - Integrated Piping System
- Chilled Beams
  - Types of Chilled Beams
  - Operational Overview
  - Piping and System Layout



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Module 9: Automatic Temperature Controls Systems Topics

- Control Action Fundamentals
- DDC Components & System Architectures
- Unit Controller Examples, Specific Applications
- Building Automation Technology
- Control Points Classification & Engineering Design