DOAS Systems

By: Jerry Cohen

Who is Jacco

- Established 1968
  - Hudson, Ohio
  - Columbus, Ohio
  - Toledo, Ohio
- Focused on the Engineered Environment
  - Systems Knowledgeable
    - HVAC Systems
    - Service & Maintenance
    - Parts

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Purpose Statement

The purpose of our Company is to solve our customers problems, in the most economical way, at all times optimizing the owning experience.

Full Circle Support

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Who is Jacco

- Owning Experience Operations
  - –Brenda Homjak
  - –Mike Spangler
  - –Chad Russell

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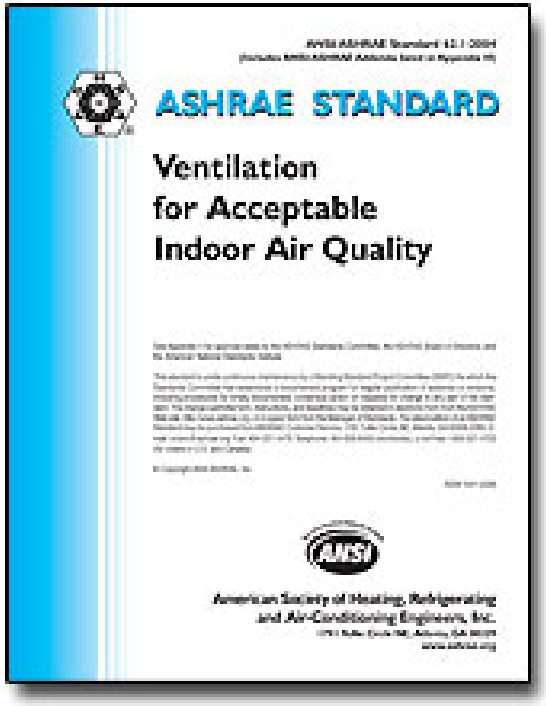
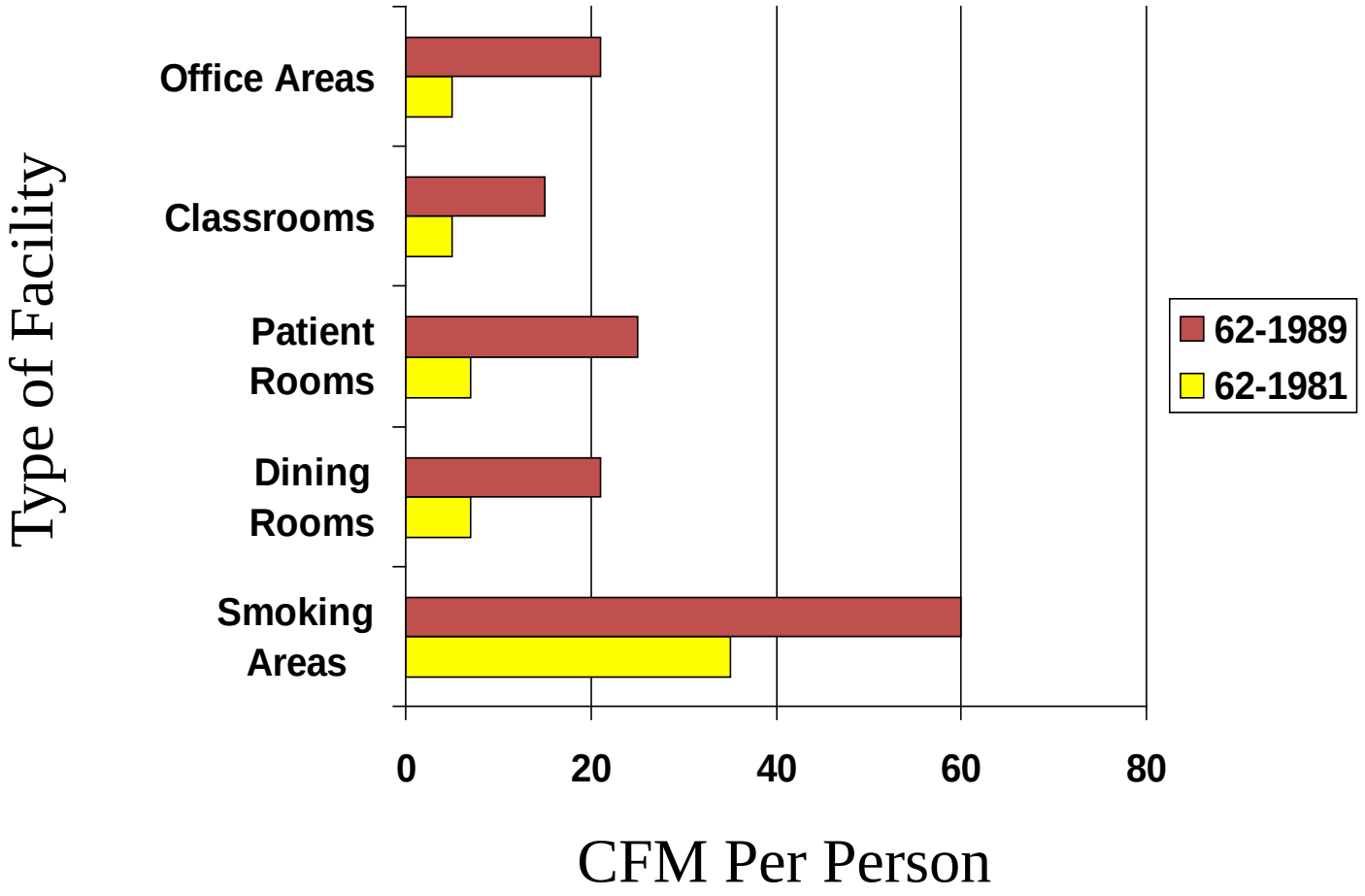
Why Dedicated Outside Air?

Why Outside Air?

- Dilute Contaminants (IAQ)
- Space Pressure Control
  - Achieve Humidity Control
  - Replace Exhausted Air
- Code Requirements
  - ASHRAE 62



Outdoor Air Requirements



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Rules for Dedicated Outside Air

- Positively dehumidify all makeup air to required dew-point
- Account for internal latent load
- Building pressure control
- Provide means for unoccupied dehumidification
- Energy recovery as required by ASHRAE Standard 90.1
- Reheat – required to prevent over-cooling the space

Why Energy Recovery?

Why Energy Recovery?

- Most Economical Solution
  - Lower operating expense
  - Payback

- Code Requirements
  - Ashrae 90.1

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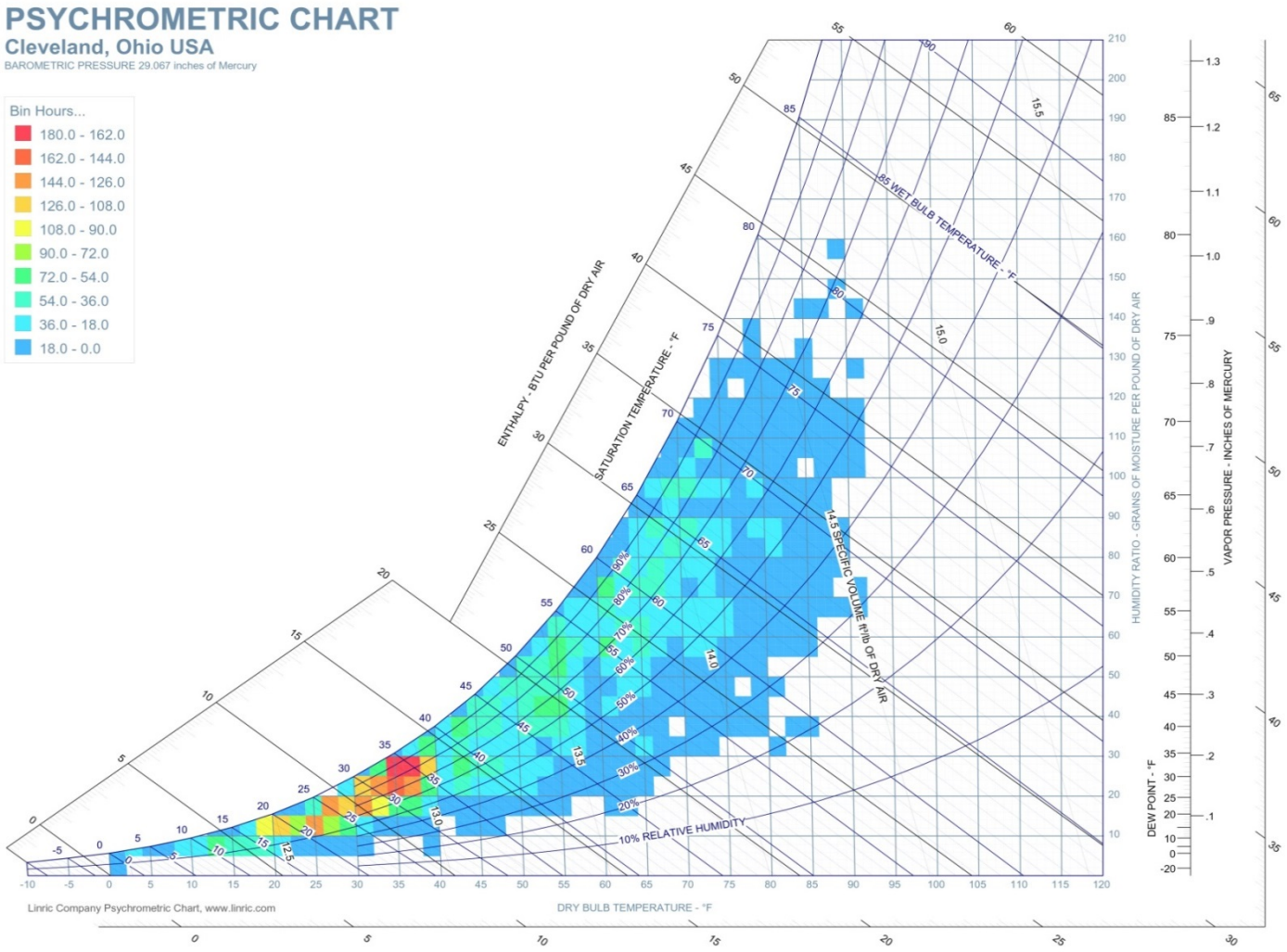
Bin Data – Cleveland Ohio



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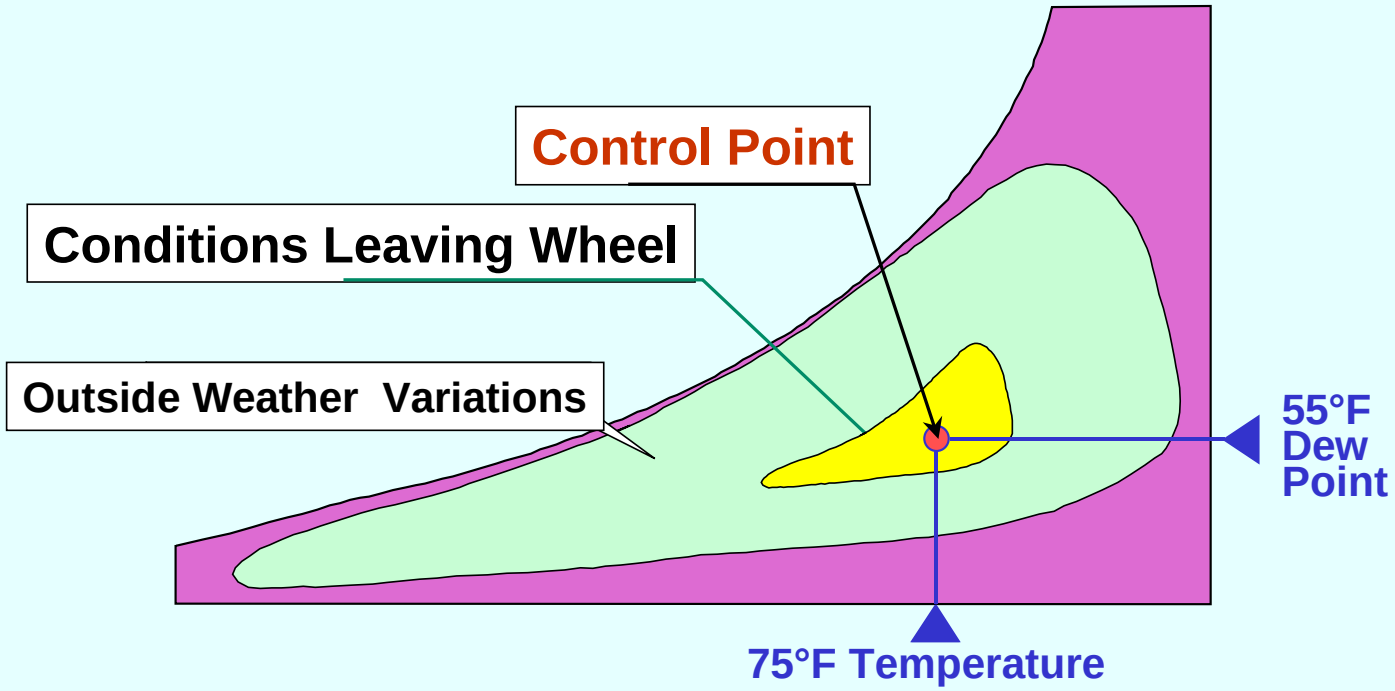
The Total Energy Recovery Wheel Benefit

Total energy recovery significantly reduces the variations in operating conditions.



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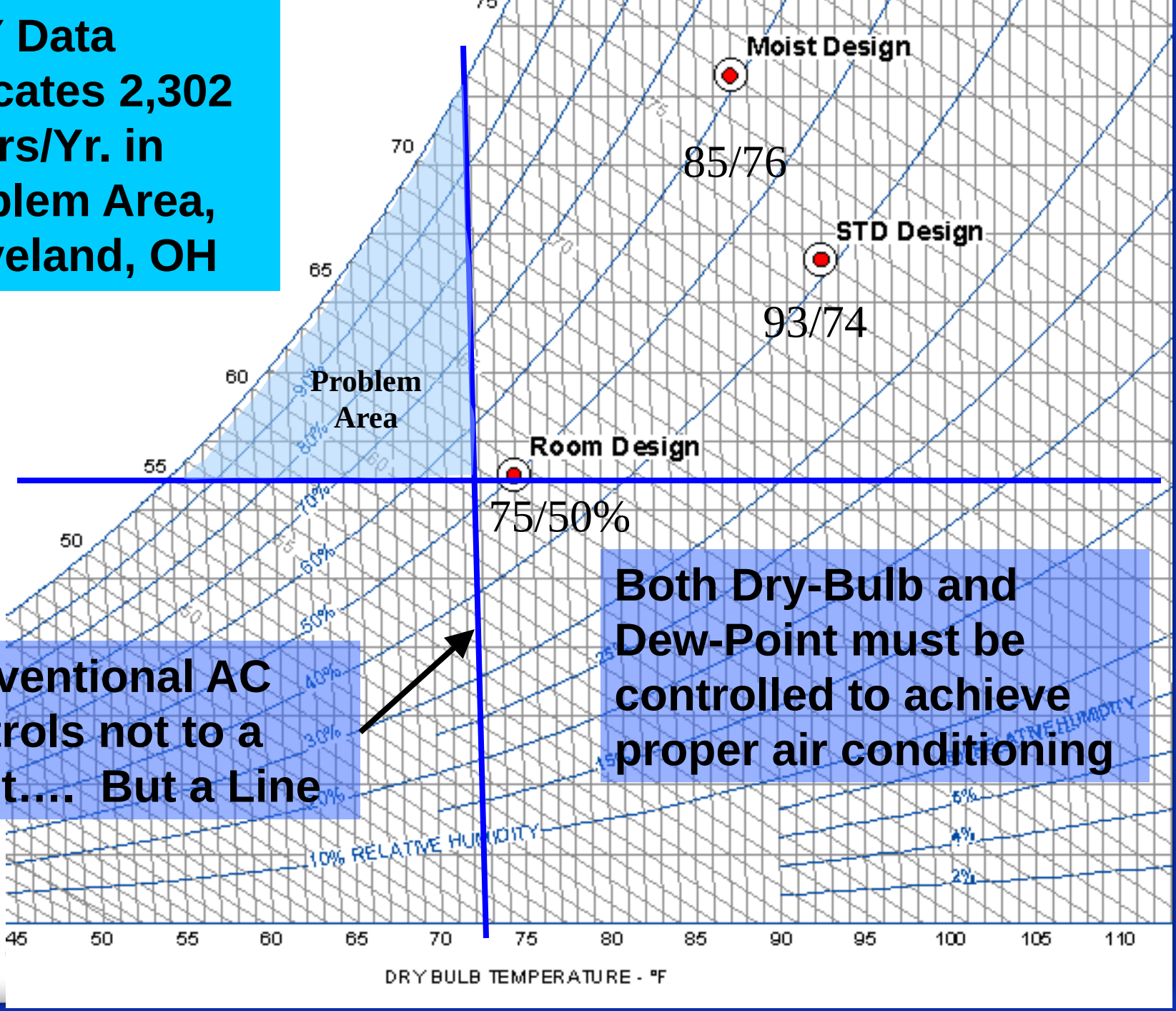
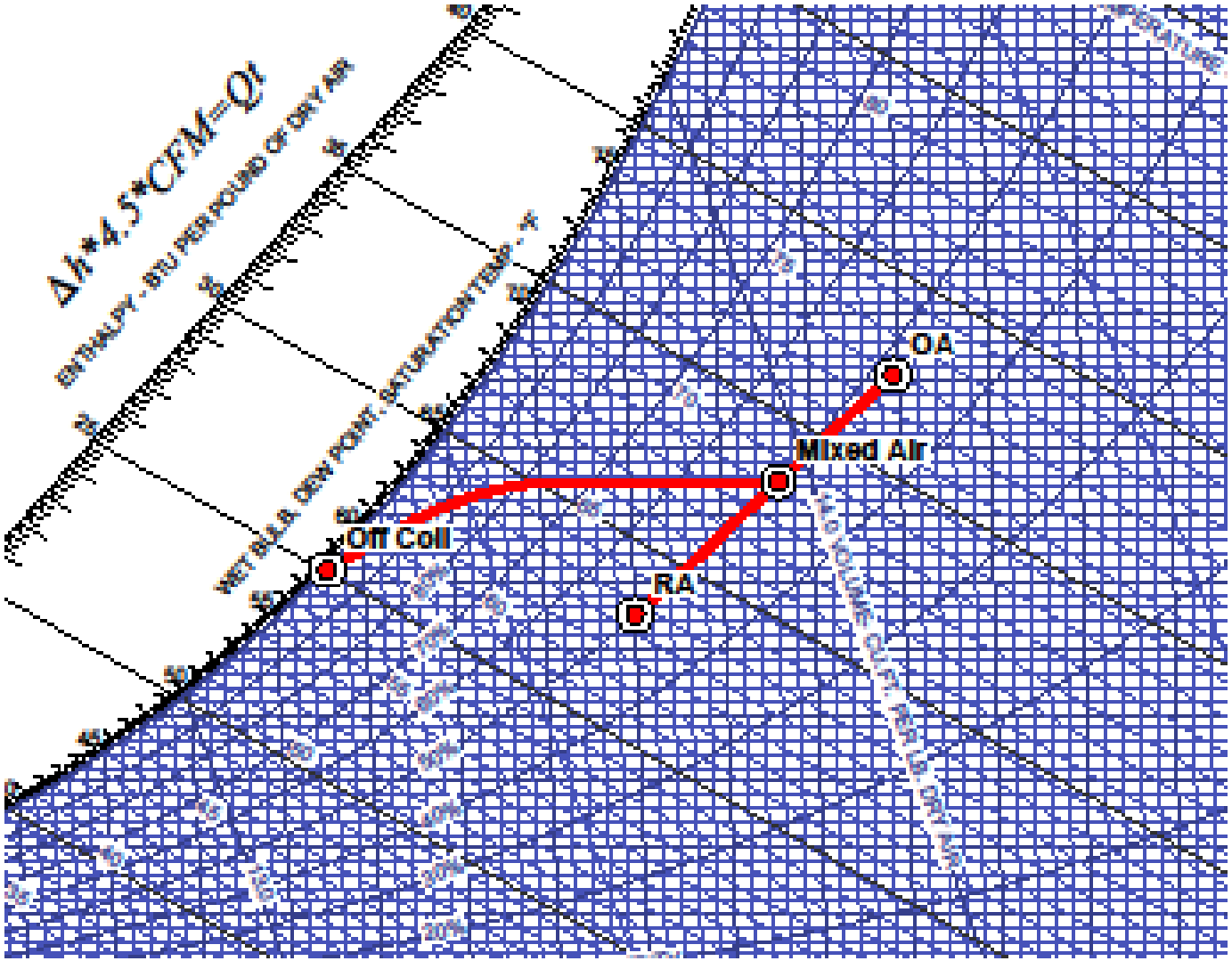
TMY Data Indicates 2,302 Hours/Yr. in Problem Area, Cleveland, OH



Conventional AC controls not to a point…. But a Line

Both Dry-Bulb and Dew-Point must be controlled to achieve proper air conditioning

Is this Dehumidified?



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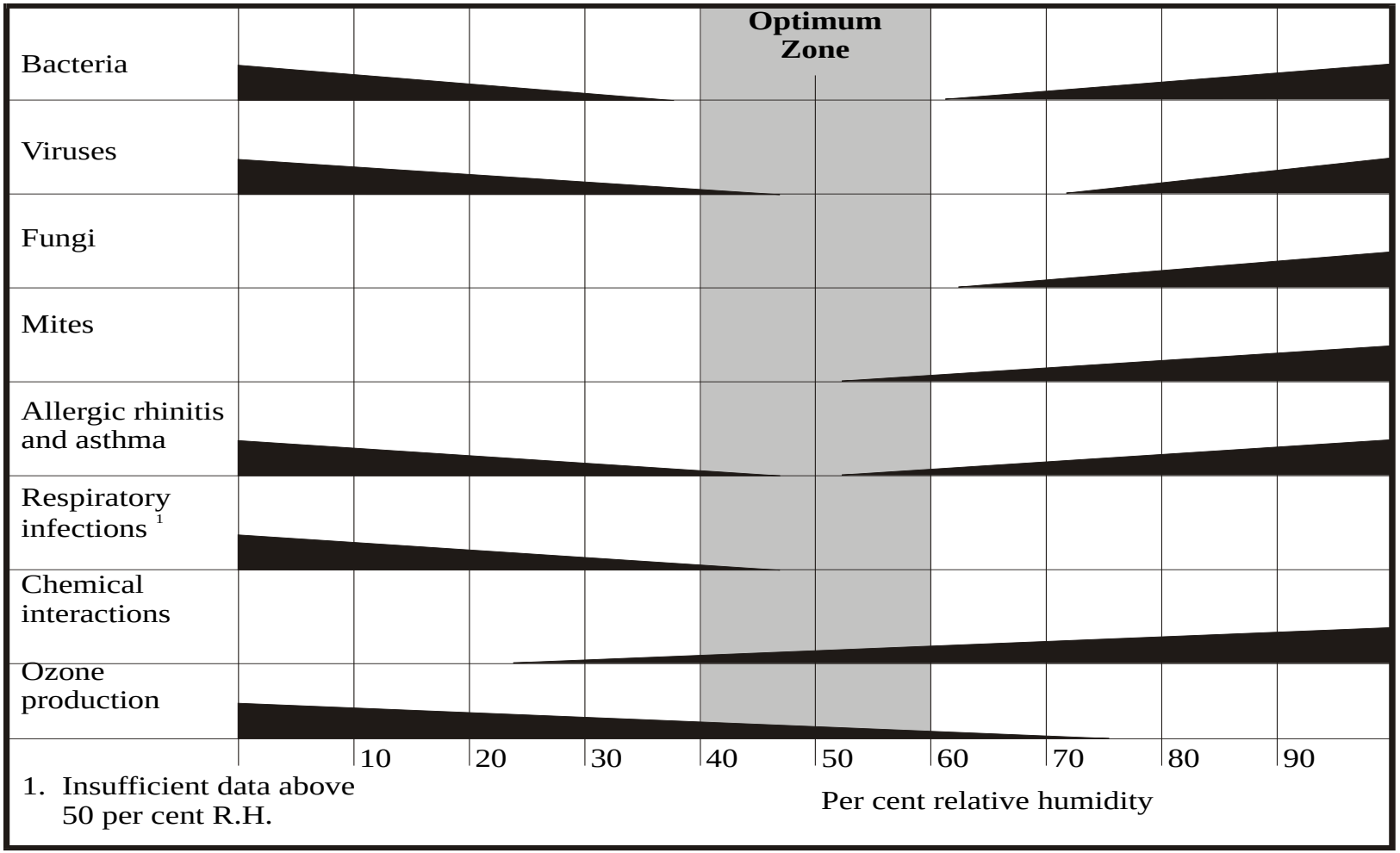
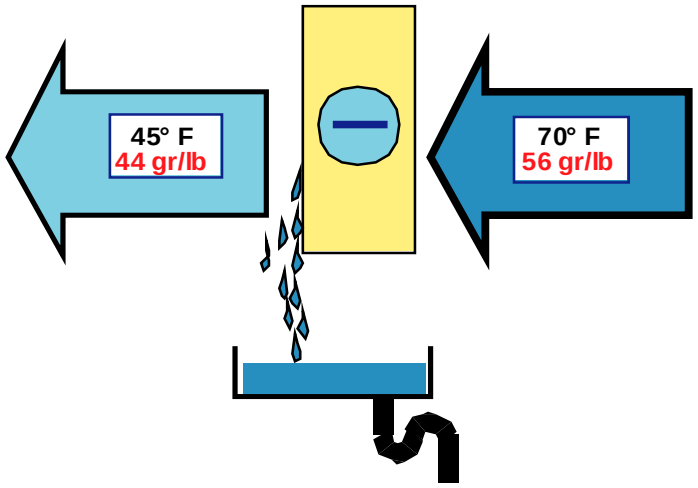
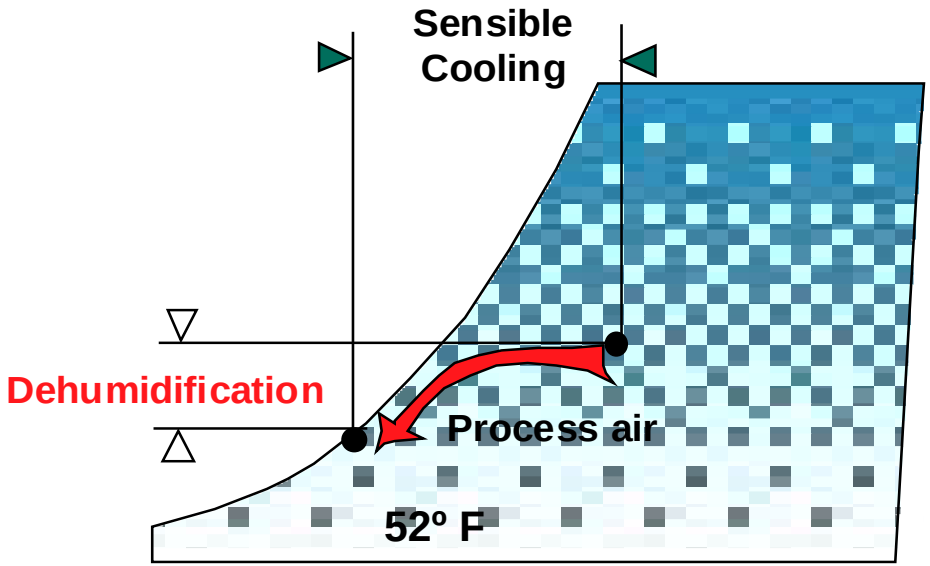
Why Humidity Control?



E.M. Sterling, Criteria for Human Exposure to Humidity in Occupied Buildings, 1985 ASHRAE



- Maximum moisture content is proportional to air temperature
- Cooling the air removes moisture by condensation



Coil must perform cooling in order to perform dehumidification

Is 55 F leaving air temperature low enough to handle internal latent load

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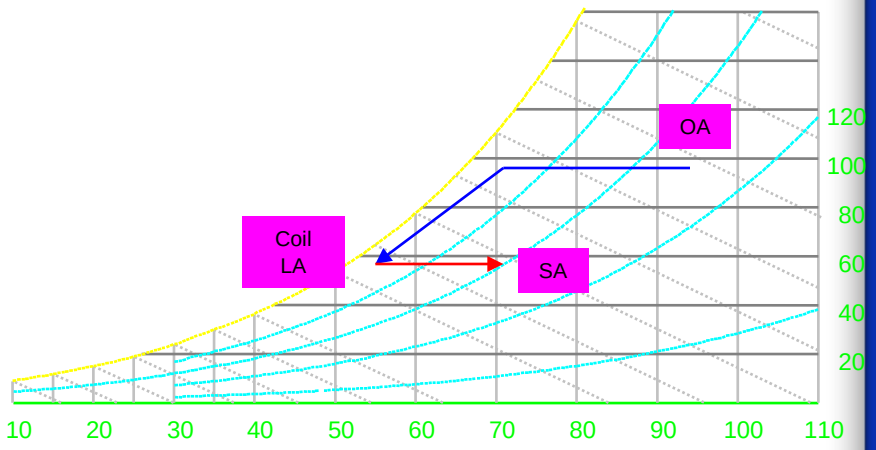
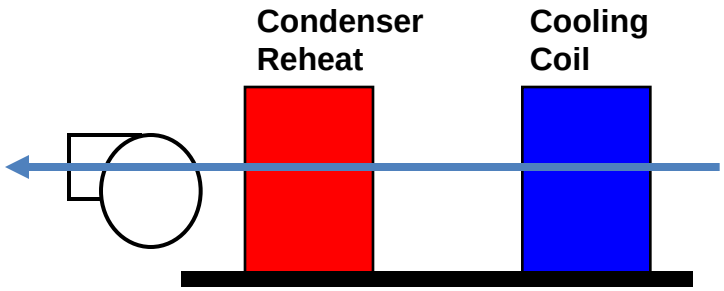
Exact SHR

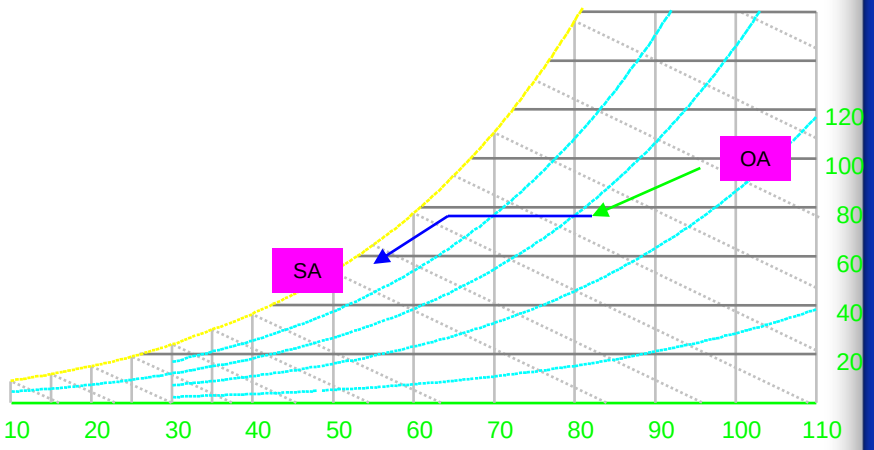
Compressor cycling issues require capacity modulation to maintain low coil leaving condition at part load conditions (Digital)

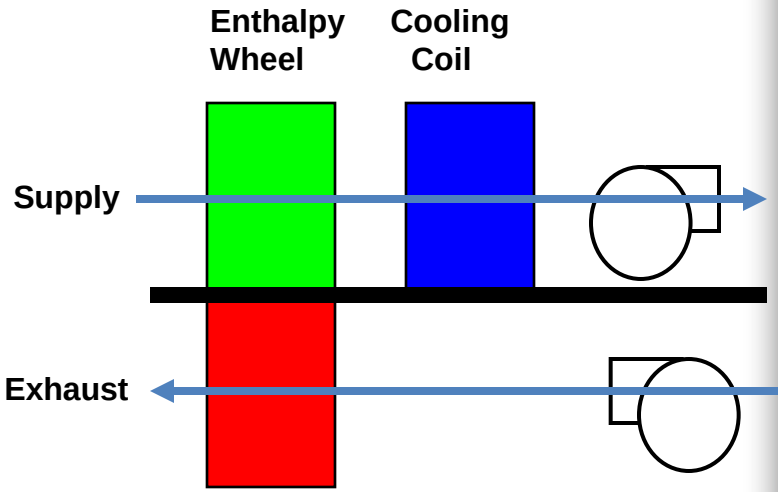
Requires modulating reheat to maintain leaving temperature





Energy Recovery





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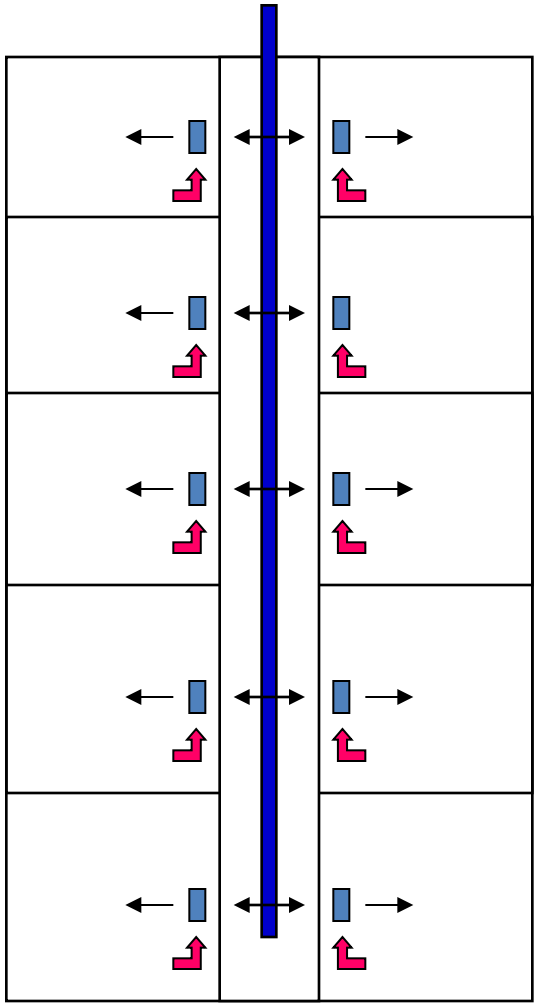
Layout

- Dedicated 100% OA unit
- Deliver air directly to room or to the return air plenum of water source heat pump or VRF fan coil unit
- Room unit can be sized for internal load without outside air load.



Direct Expansion

- Air Source & Water Source
- ~ 40 F Dewpoint Capability

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High Capacity DX Coils

- Increased Efficiency
- Increased Dehumidification

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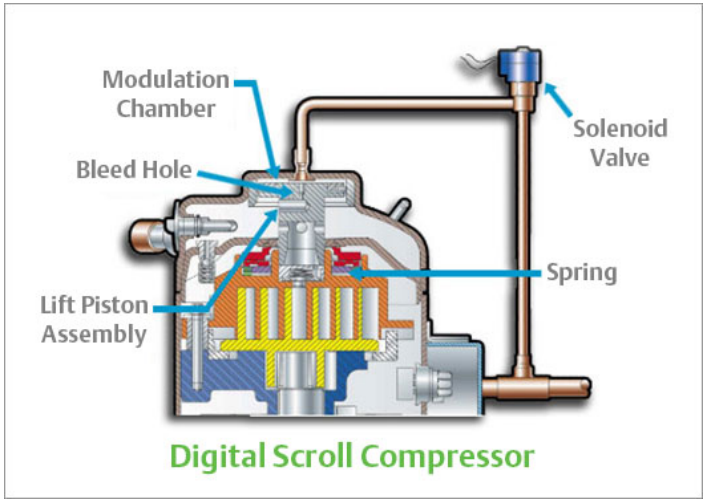
Compressors

- Modulating Compressors
  - Scroll – Digital & VFD
  - Screw - VFD
  - Centrifugal - Magnetic
- Or Hot Gas Bypass



Head Pressure Control

- Variable Speed Condenser Fan Provides Energy Savings
  - Fluctuating Ambient Conditions
- Similar to Cooling Tower with VFD's

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Gas Heat

Gas Heat

- 3:1 Modulation
  - 90 Degree TR = 30 Degree Minimum TR
- 5:1 Modulation
  - 90 Degree TR = 18 Degree Minimum TR
- 10:1 Modulation
  - 90 Degree TR = 9 Degree Minimum TR
- 20:1 Modulation
  - 90 Degree TR = 4.5 Degree Minimum TR

Hybrid Heat

- Primary Air Source Heat Pump
- Primary Water Source Heat Pump
- Secondary Gas, HW, Steam or Electric

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Hybrid Heat for 100% OA

- Infinite TR
- 3:1 Modulation
  - 90 Degree TR = 1 Degree Minimum TR
- 5:1 Modulation
  - 90 Degree TR = 1 Degree Minimum TR
- 10:1 Modulation
  - 90 Degree TR = 1 Degree Minimum TR

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AAON

- Rooftop Package Units
  - 2 to 300 tons in 7 cabinet sizes
    - Air Cooled
    - Geo/Water Cooled
    - Evaporative Condensing
- Air Handling Units – 800 to 70,000 cfm

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The RQ Series Rooftop

- 2 through 6 Tons
- A Different Choice

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The RN Series Rooftop

- 6 through 140 Tons
- Large Capacity, Small Footprint, Lightweight

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The RL Series Rooftops

- 40 through 300 Tons

Thank You