

# HVAC Technologies and Strategies for Supermarkets

- Lee Churchill
- Seasons-4 Inc.

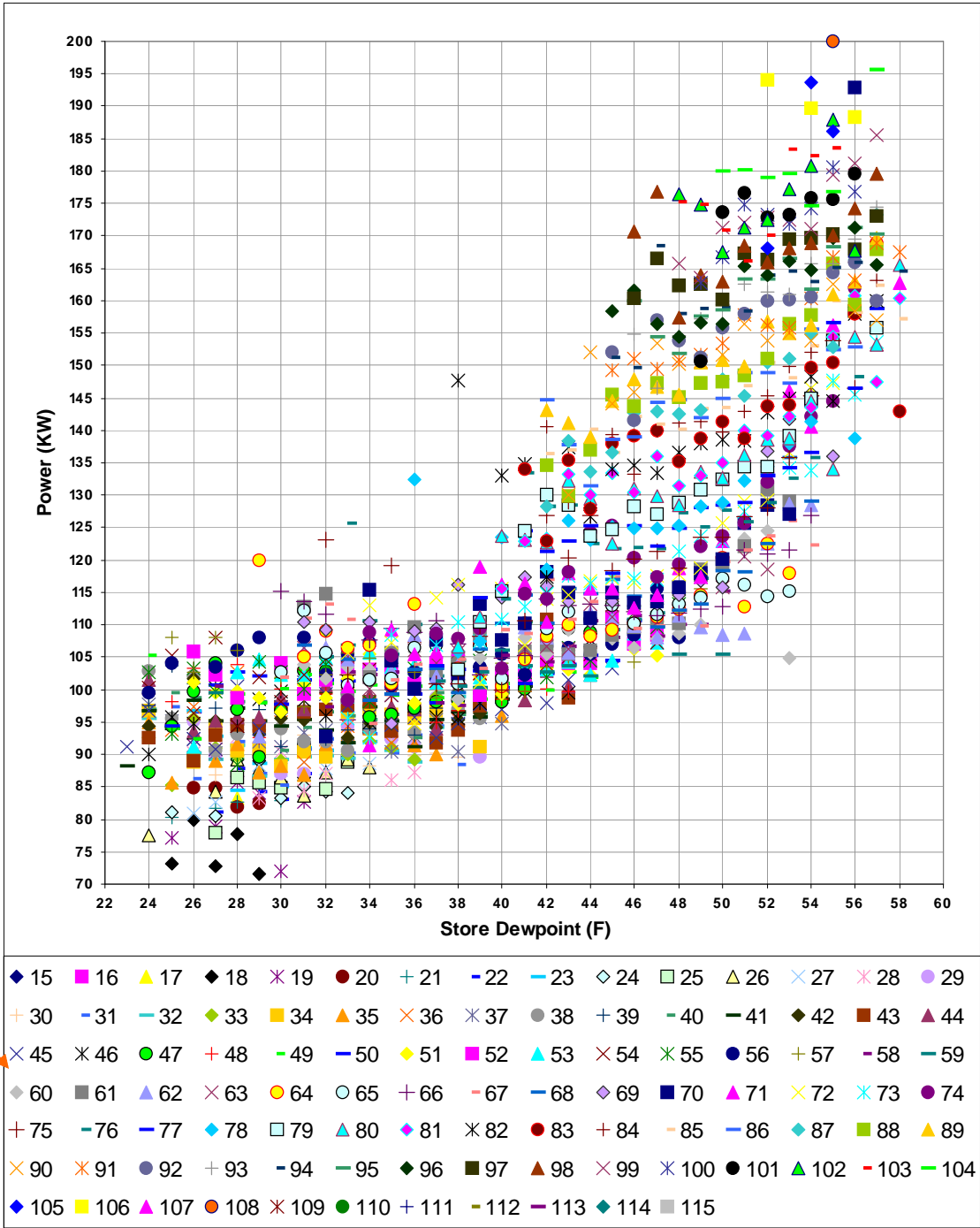
# Year Long Study

- 40,000 sq. ft supermarket in Baltimore, MD
- Three refrigeration racks (2 medium temp, 1 low temp)
- Single Path rooftop unit
- Data collection of power, energy, temperatures and humidity levels

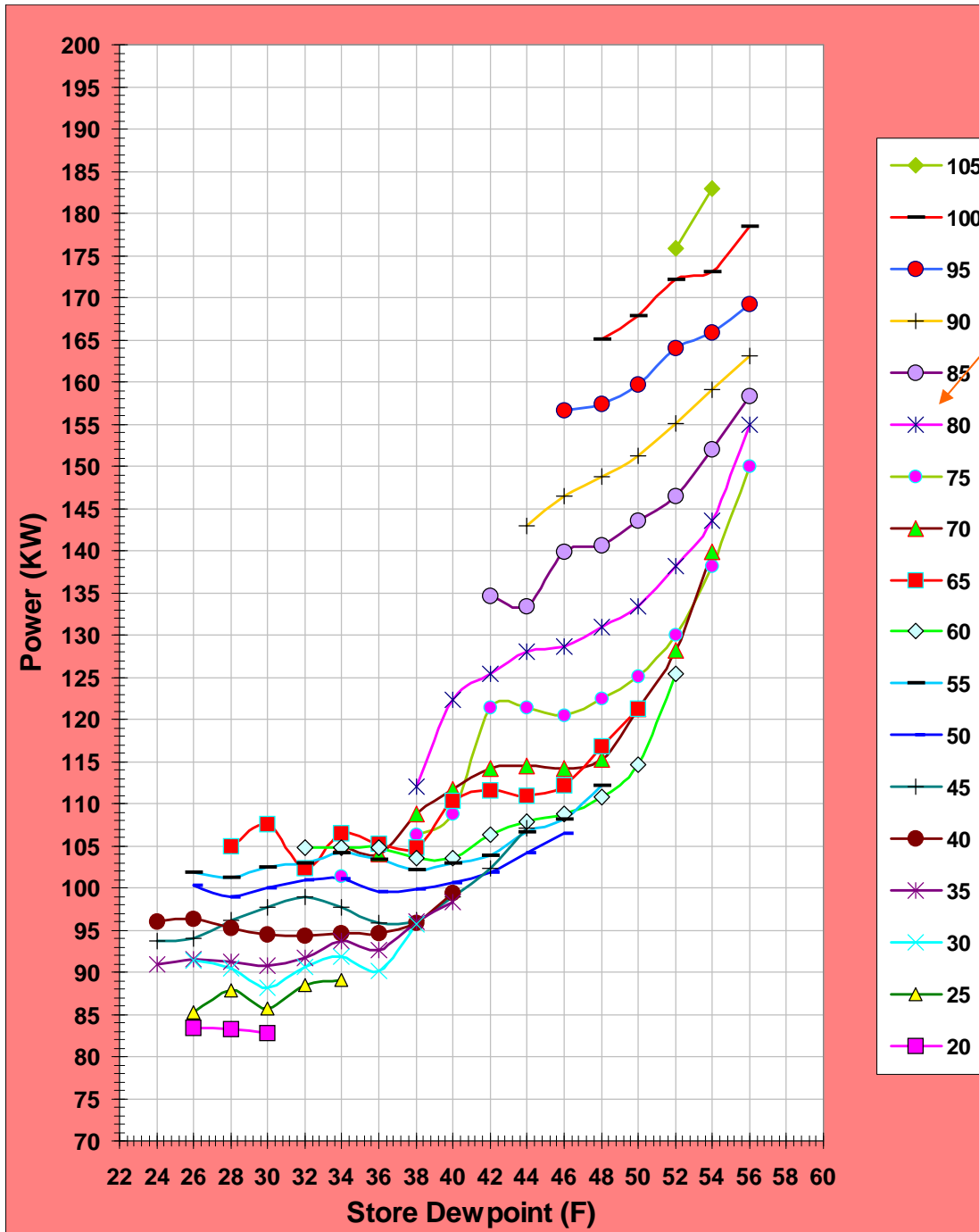
# POWER FOR REFRIG COMPRESSORS AND CONDENSERS

3 RACKS

OUTSIDE AIR TEMPERATURE



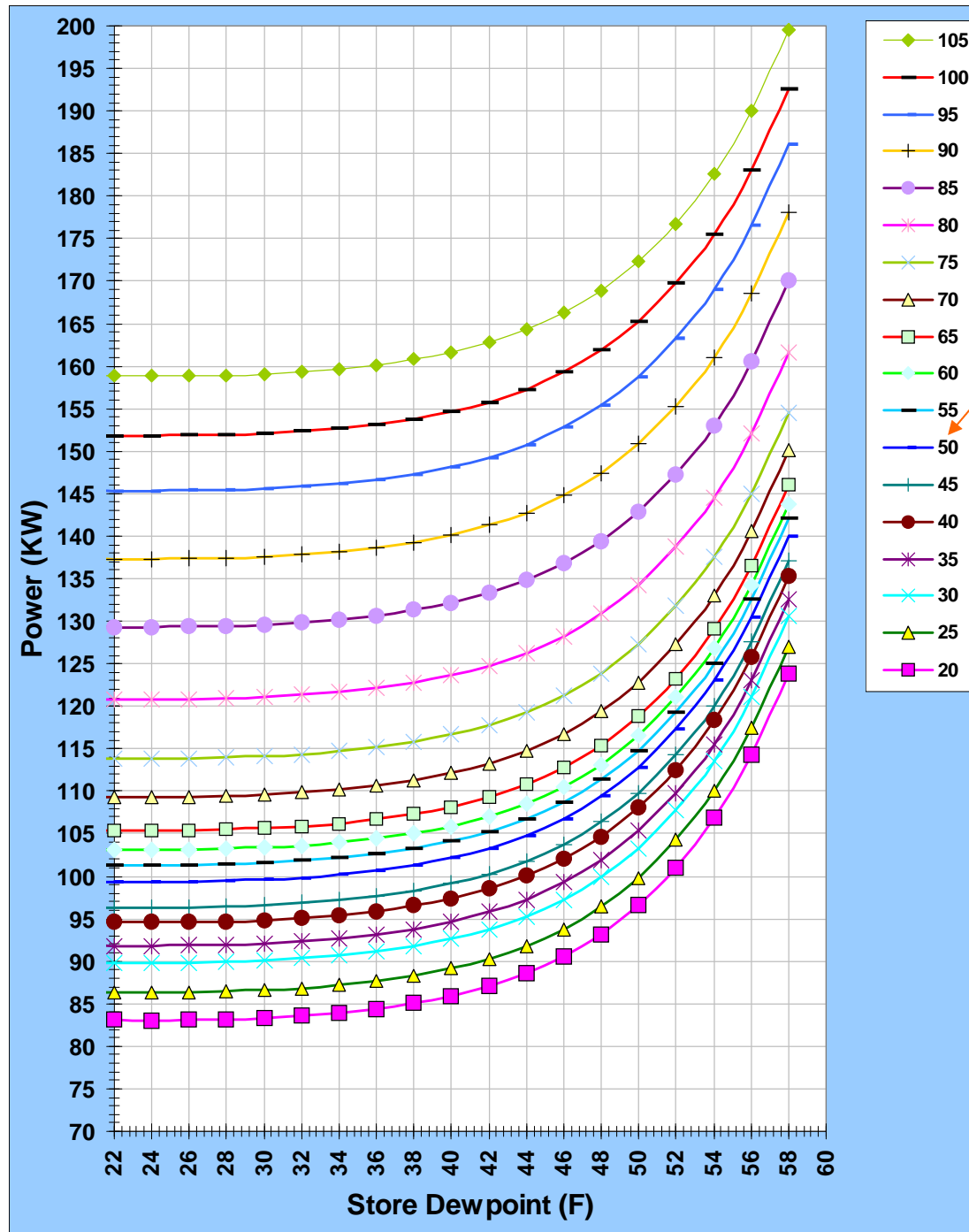
POWER FOR  
REFRIG  
COMPRESSORS  
AND  
CONDENSERS  
  
3 RACKS



OUTSIDE  
AIR  
TEMP

- 105
- 100
- 95
- 90
- 85
- 80
- 75
- 70
- 65
- 60
- 55
- 50
- 45
- 40
- 35
- 30
- 25
- 20

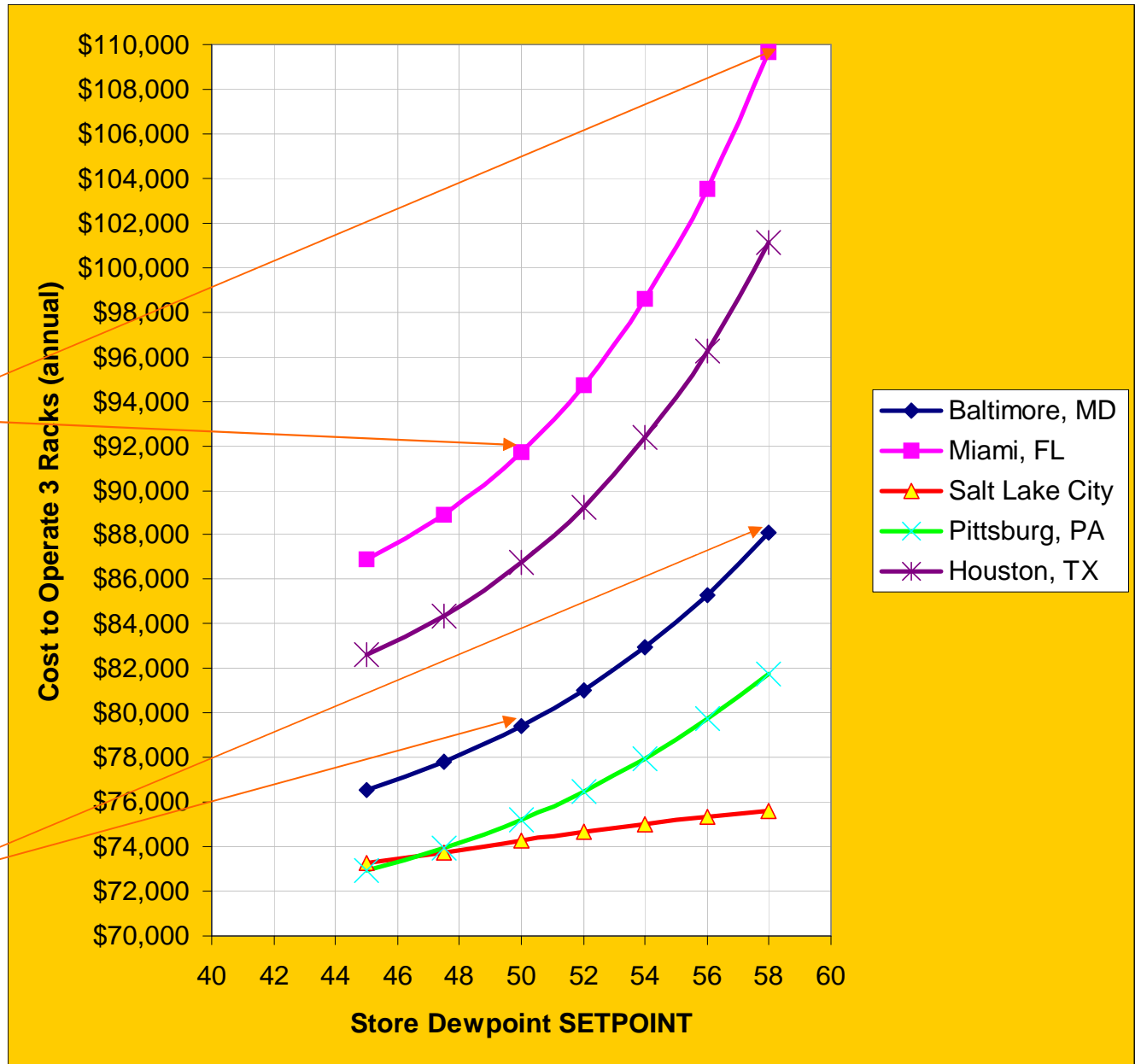
POWER FOR  
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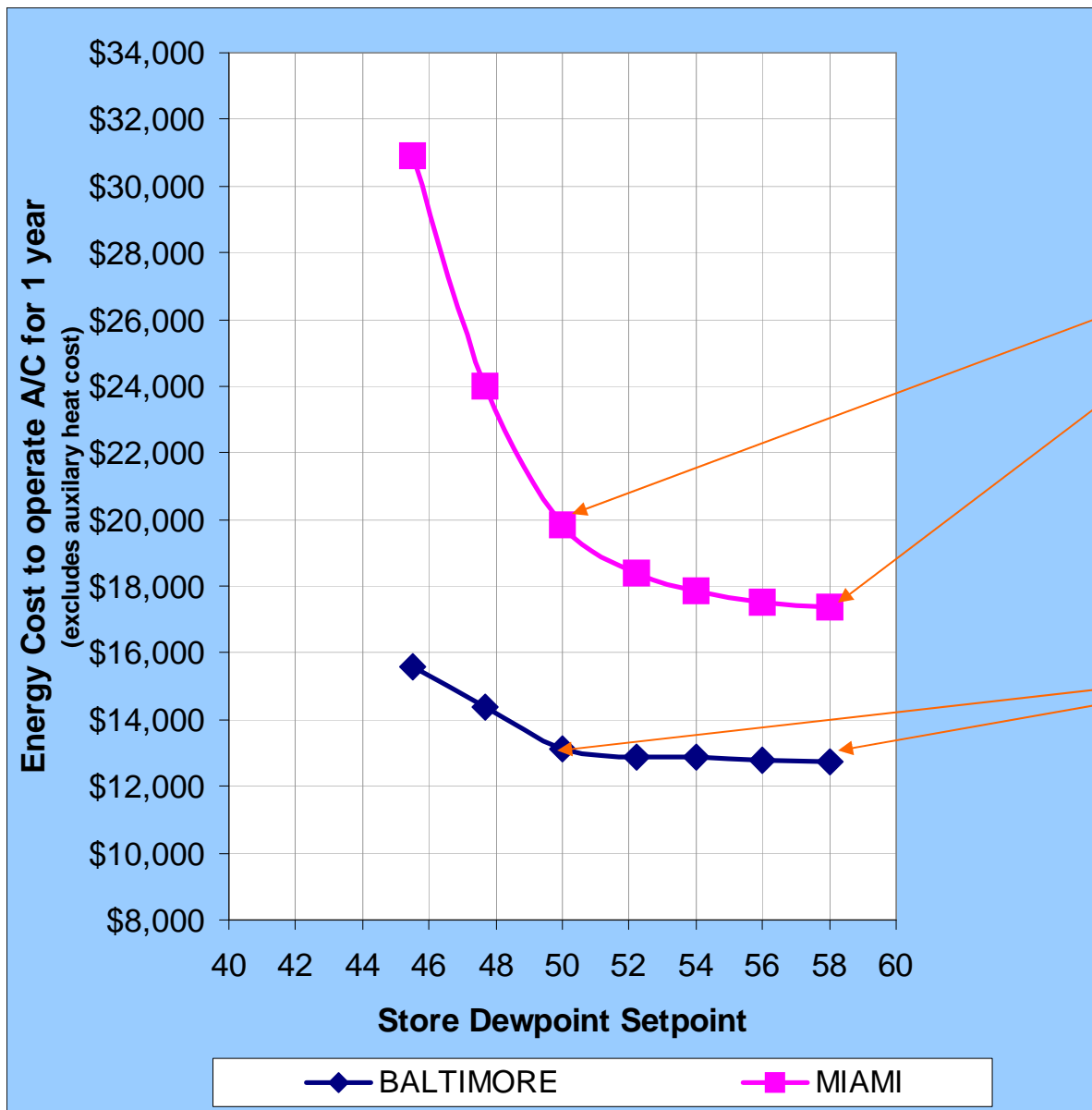


OUTSIDE  
AIR  
TEMP

In Miami  
\$18,000 rack  
energy savings  
if "setpoint" is  
50 versus 58  
dewpoint

In Baltimore  
\$8,000 rack  
energy savings  
if "setpoint" is  
50 versus 58  
dewpoint





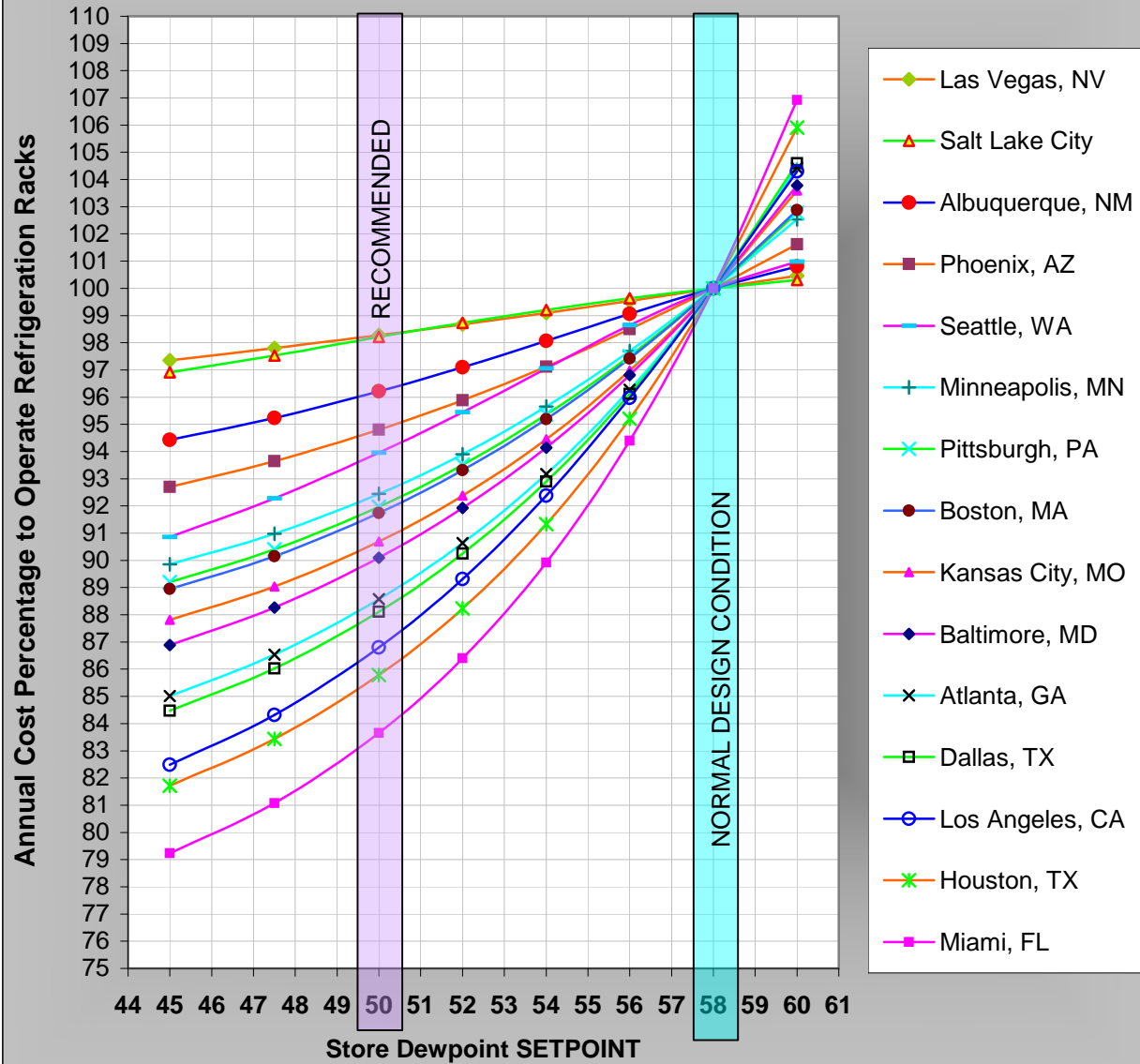
In Miami  
 \$3,000 A/C  
 energy COST  
 if "setpoint" is  
 50 versus 58  
 dewpoint

In Baltimore  
 \$400 A/C  
 energy COST  
 if "setpoint" is  
 50 versus 58  
 dewpoint

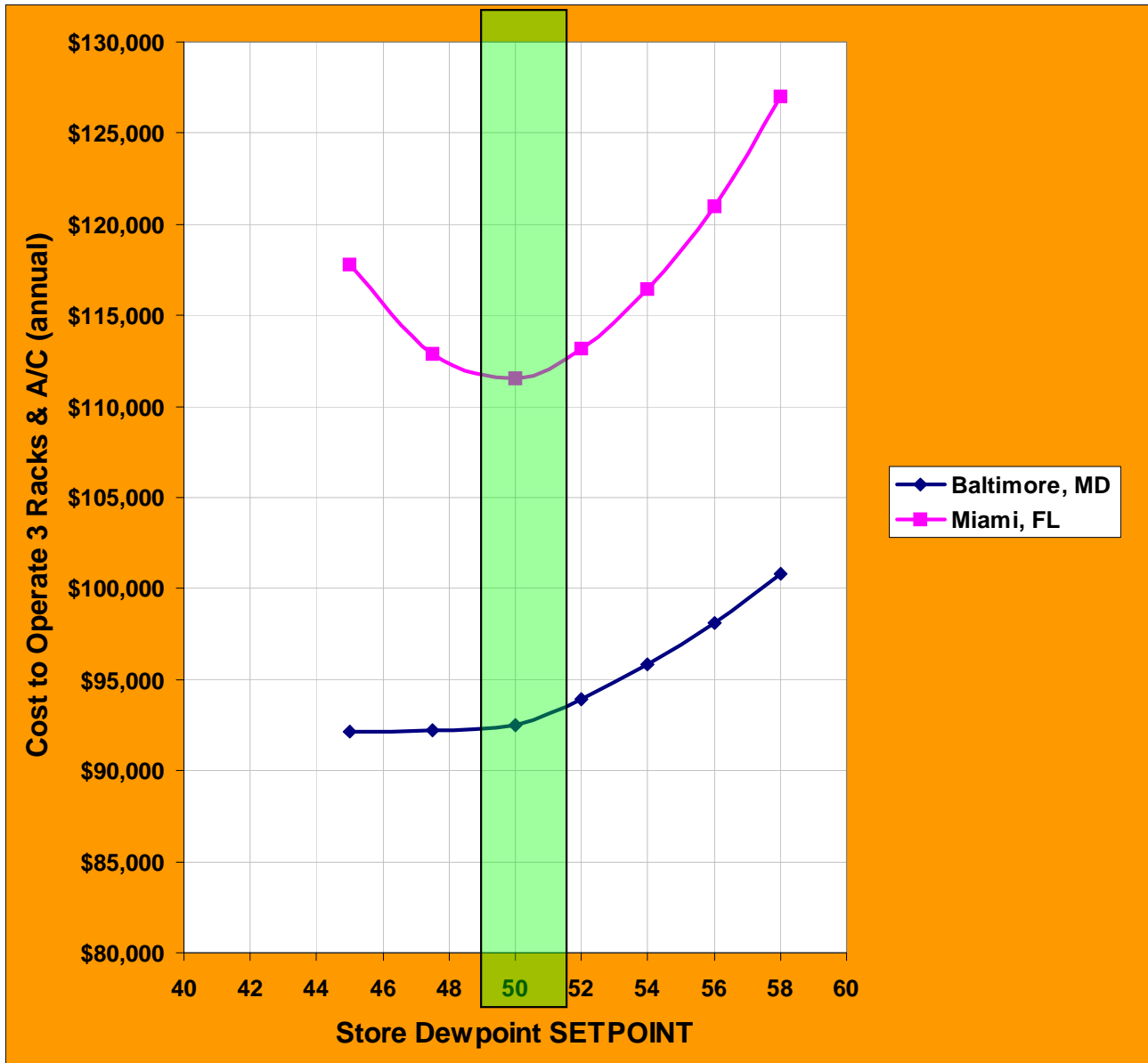
In Miami: 90% of a year the store needs humidity control

In Baltimore: 45% of a year the store needs humidity control

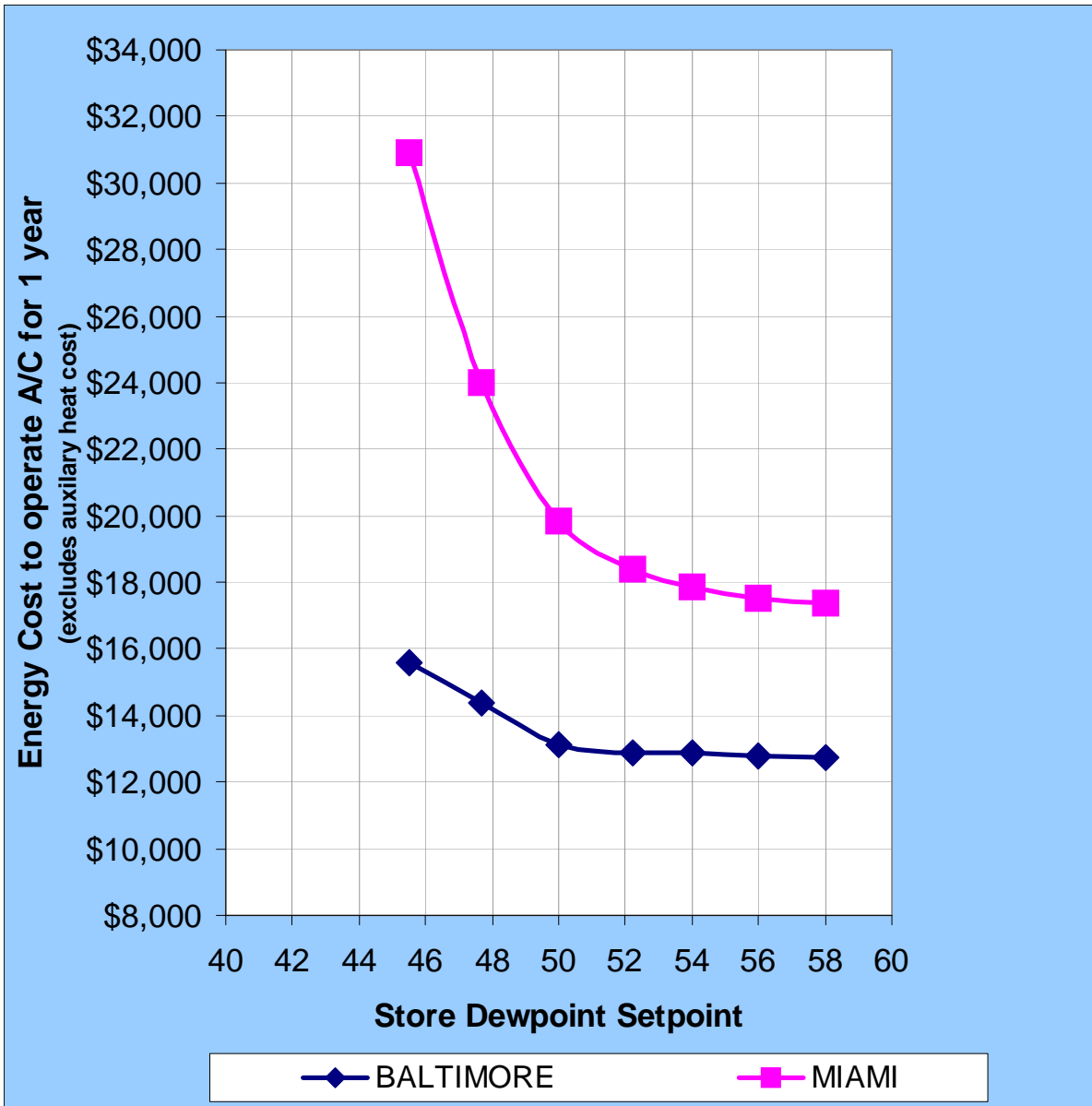
### Annual Operating Cost for Refrigeration Racks







Conclusion to study: 50 F dewpoint is an optimum setpoint



HOW CAN WE  
LOWER THE  
ANNUAL  
OPERATING  
COSTS OF THE  
A/C SYSTEM



**ELIMINATE**

**AIR**

**INFILTRATION!!!!!!**

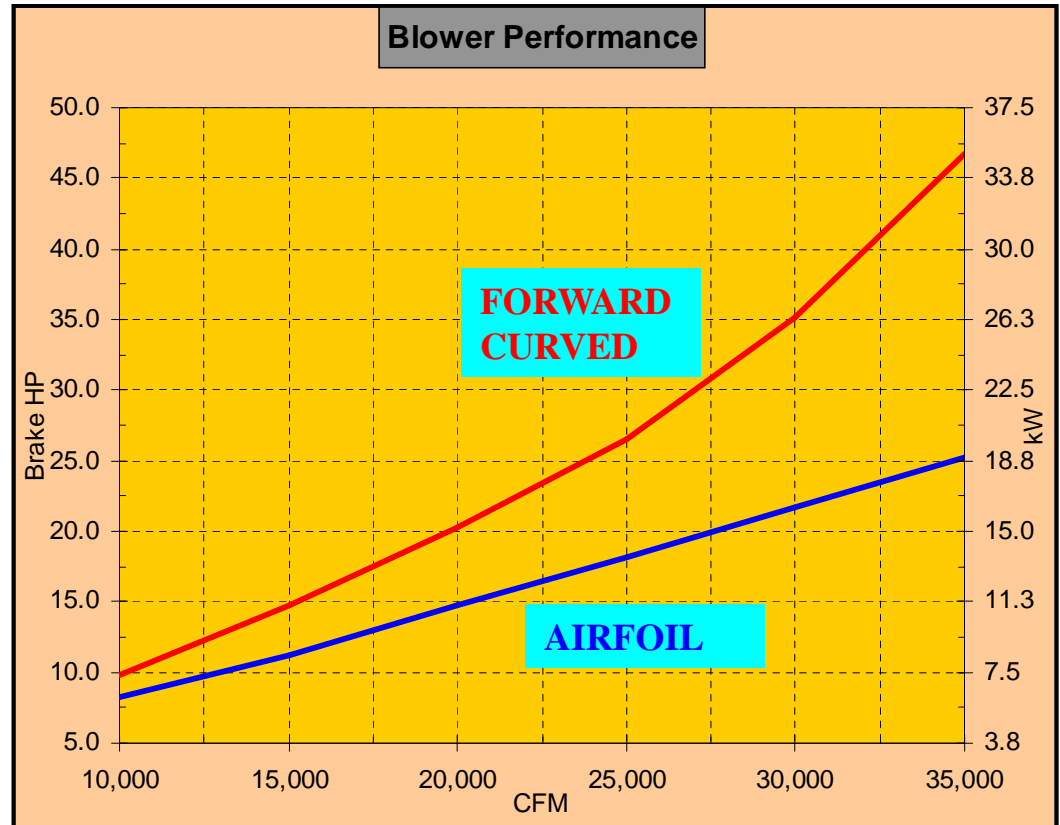
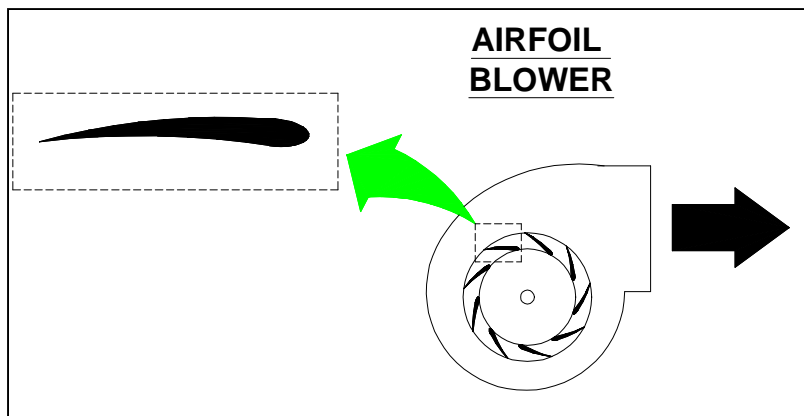
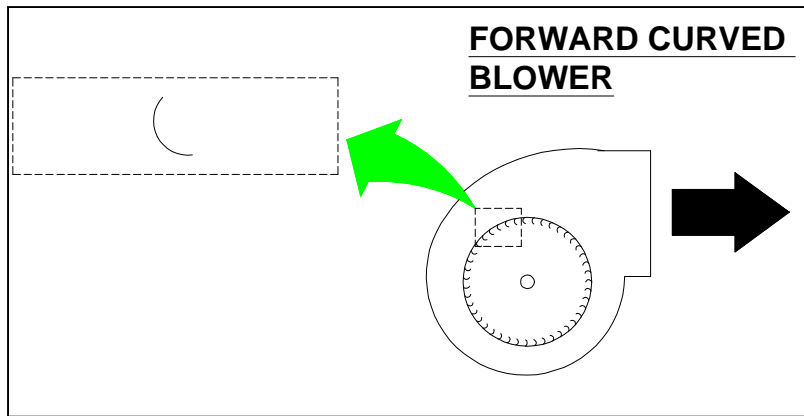
**POSITIVELY PRESSURIZE**

**YOUR STORE!!!!!!**

**(seal cracks, and**

**use enough TREATED make-up air)**

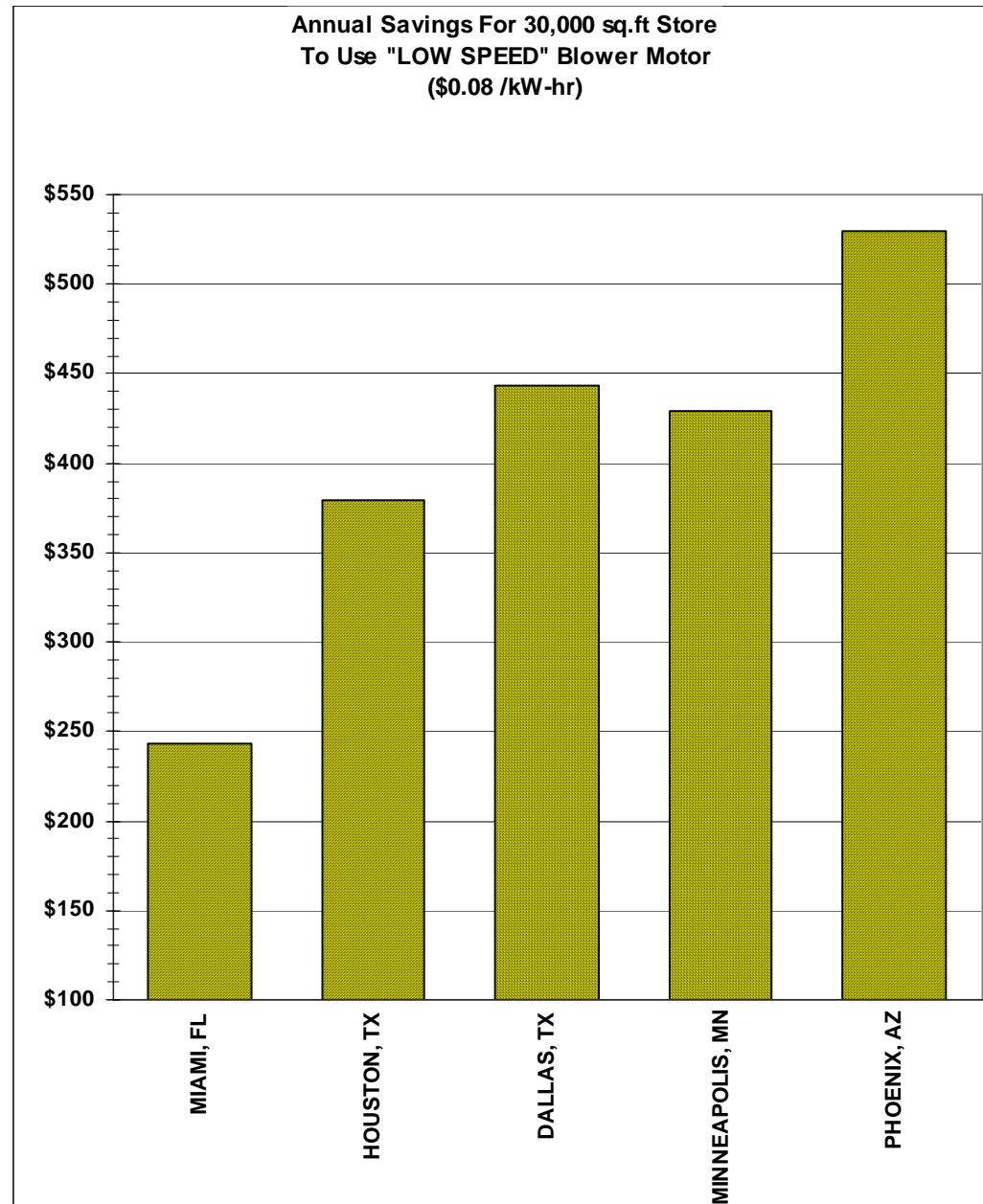
# Airfoil Blowers



**Approx \$3,500 annual savings in Baltimore store.**

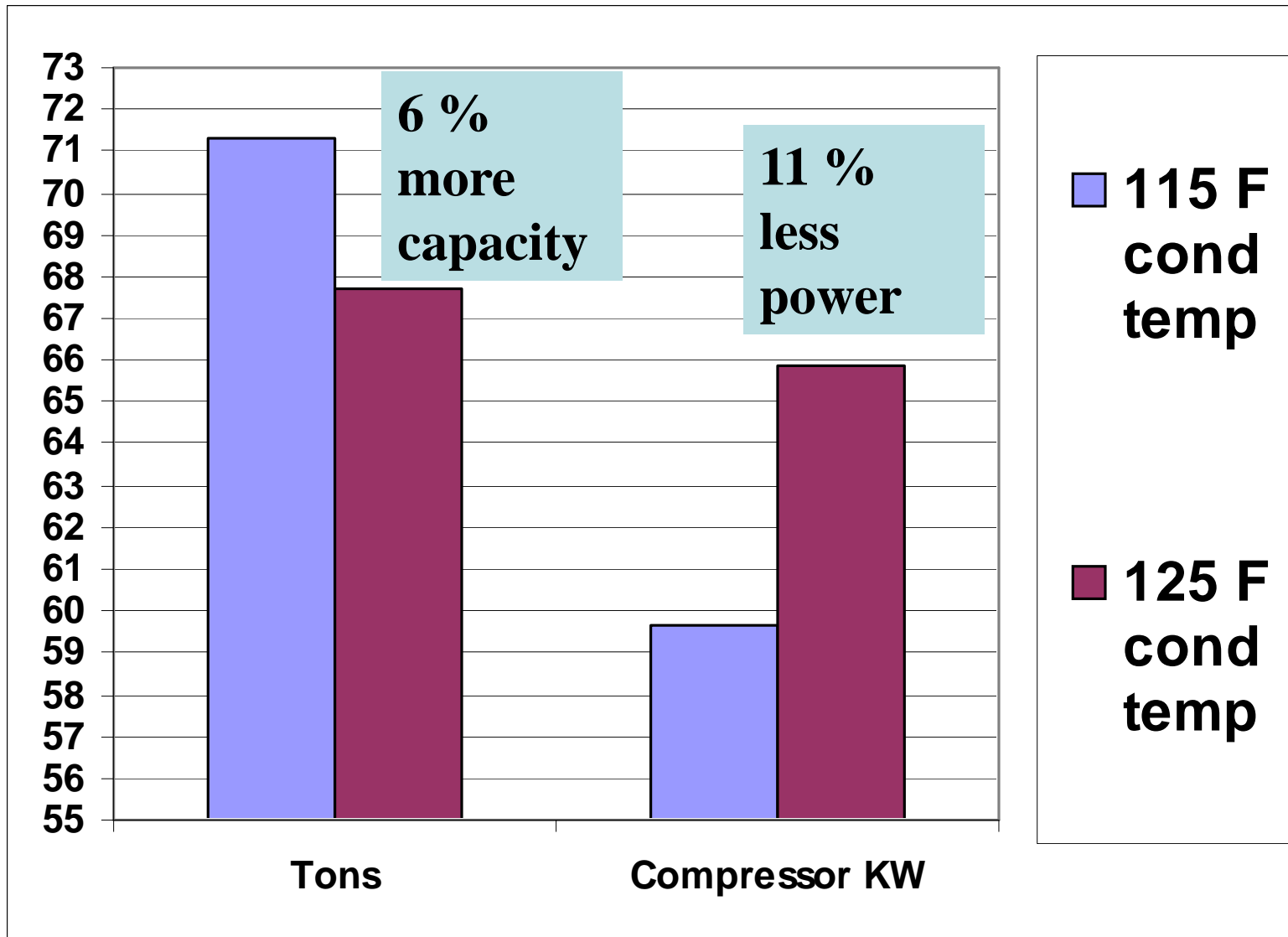
Choose a “Premium Efficient” motor and gain an additional 3% efficiency...remember your blower runs 24 hours a day!!!!

# Low Speed Blower Motor

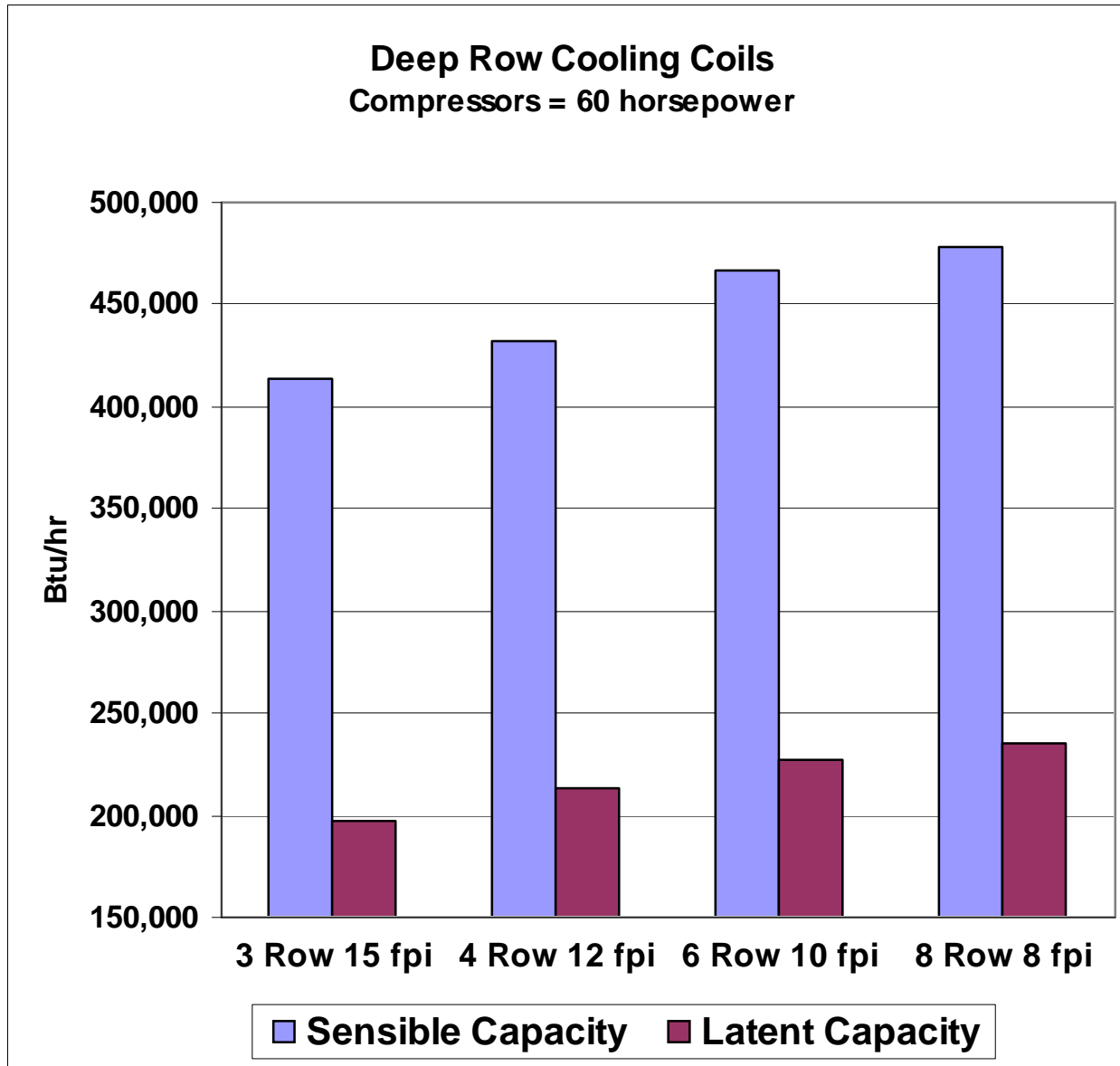


# Low Condensing Temperatures

**Approx  
\$700  
annual  
savings  
in  
Baltimore  
store.**

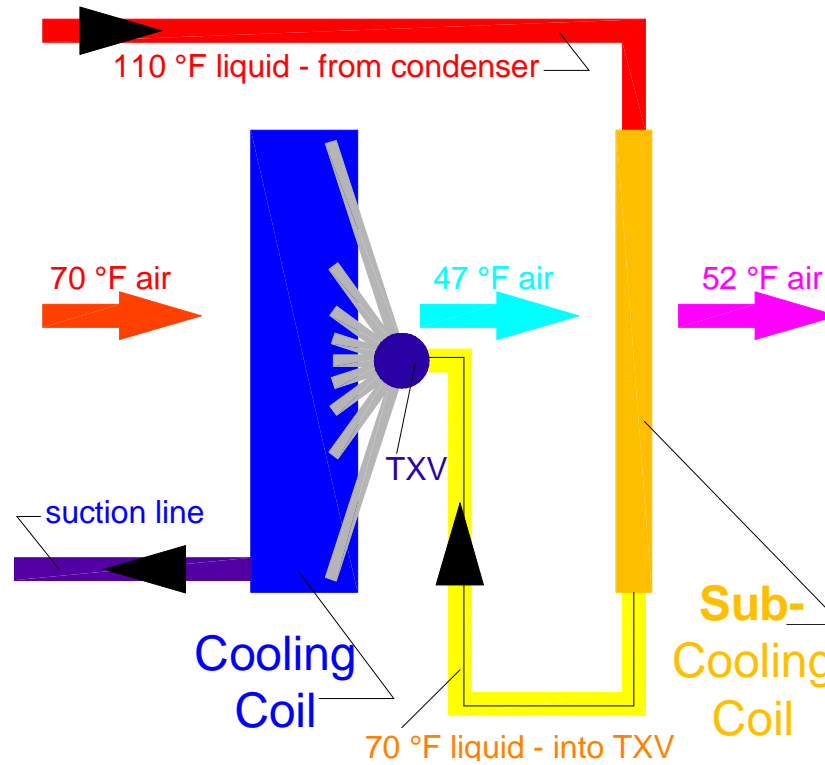
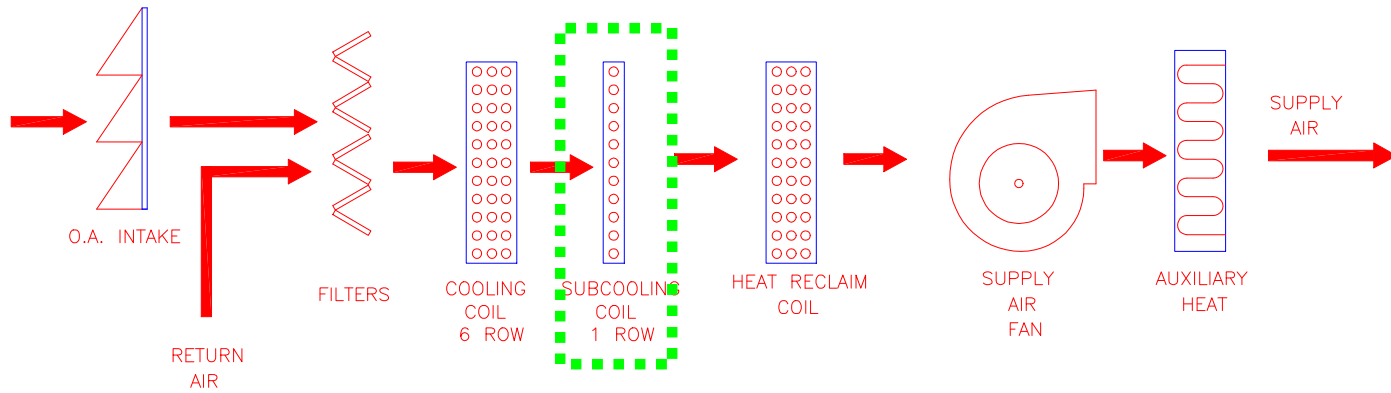


# Deep Row Cooling Coils

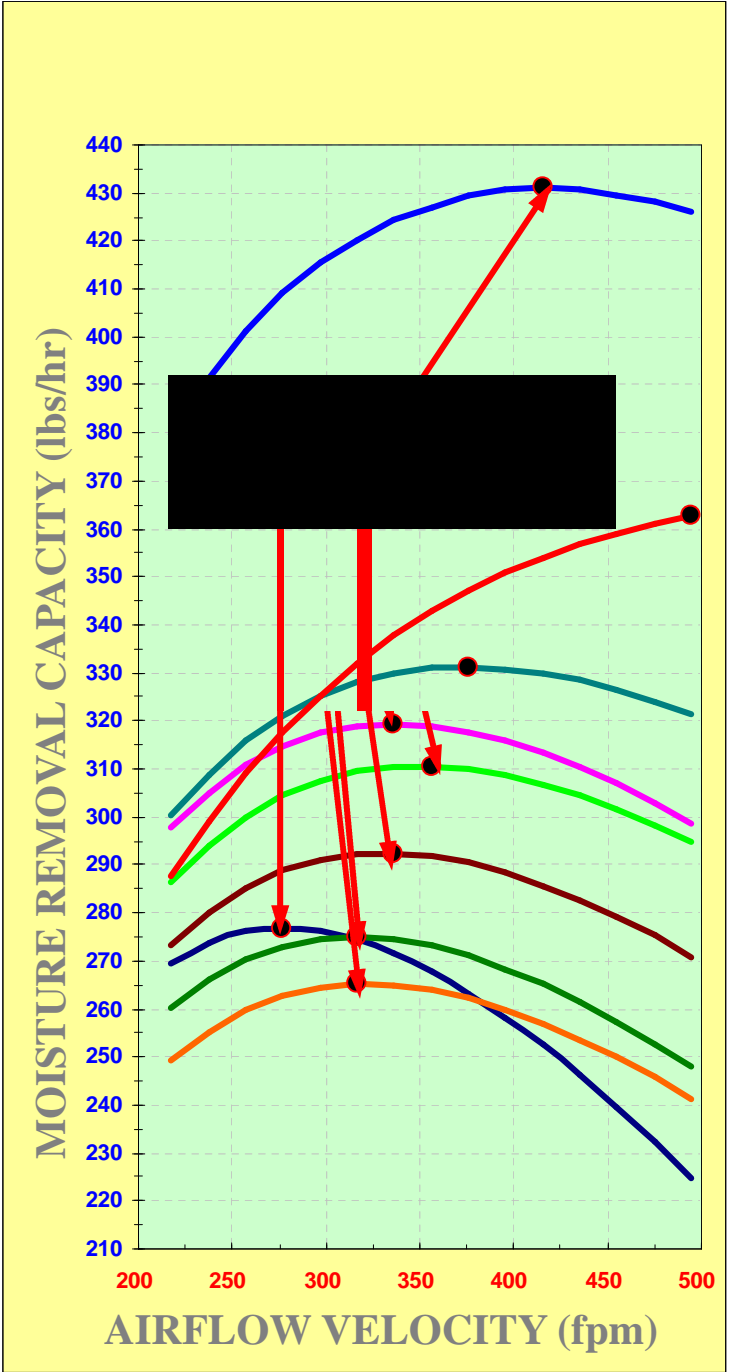
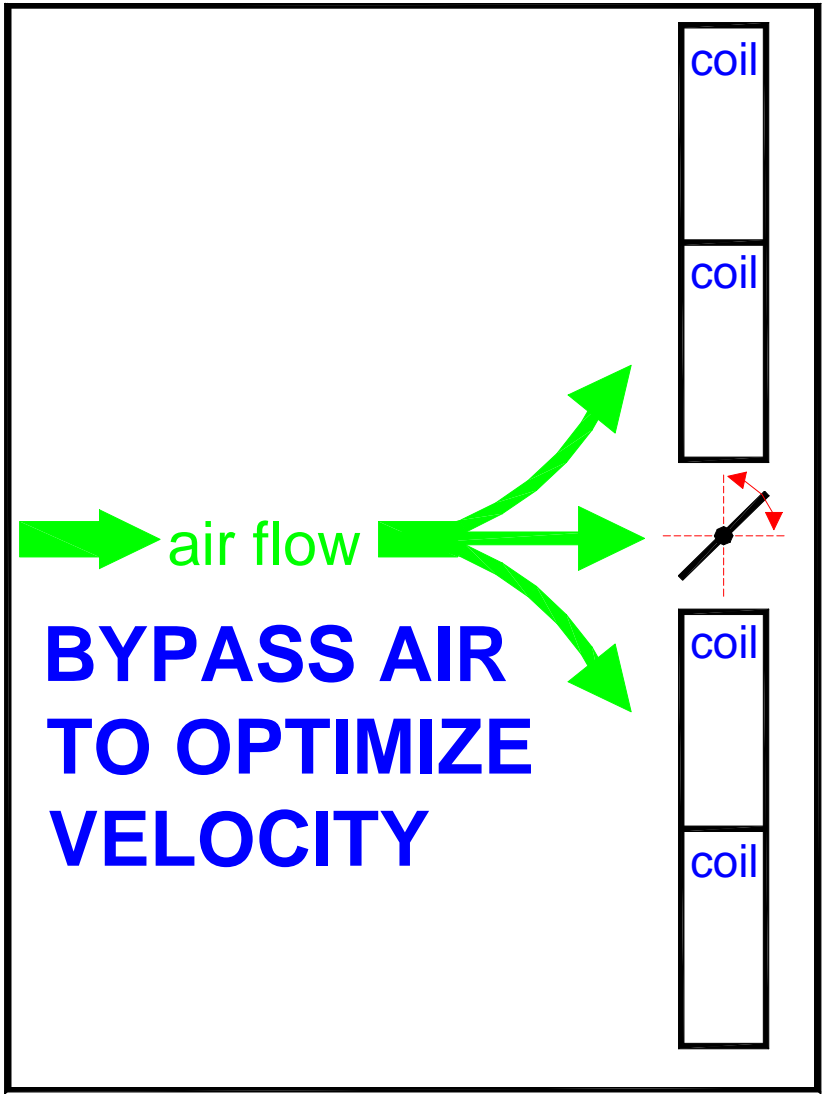


- Air stays in contact longer with the coil when using deeper row coils
- Both sensible and latent capacities increase as coil depth increases

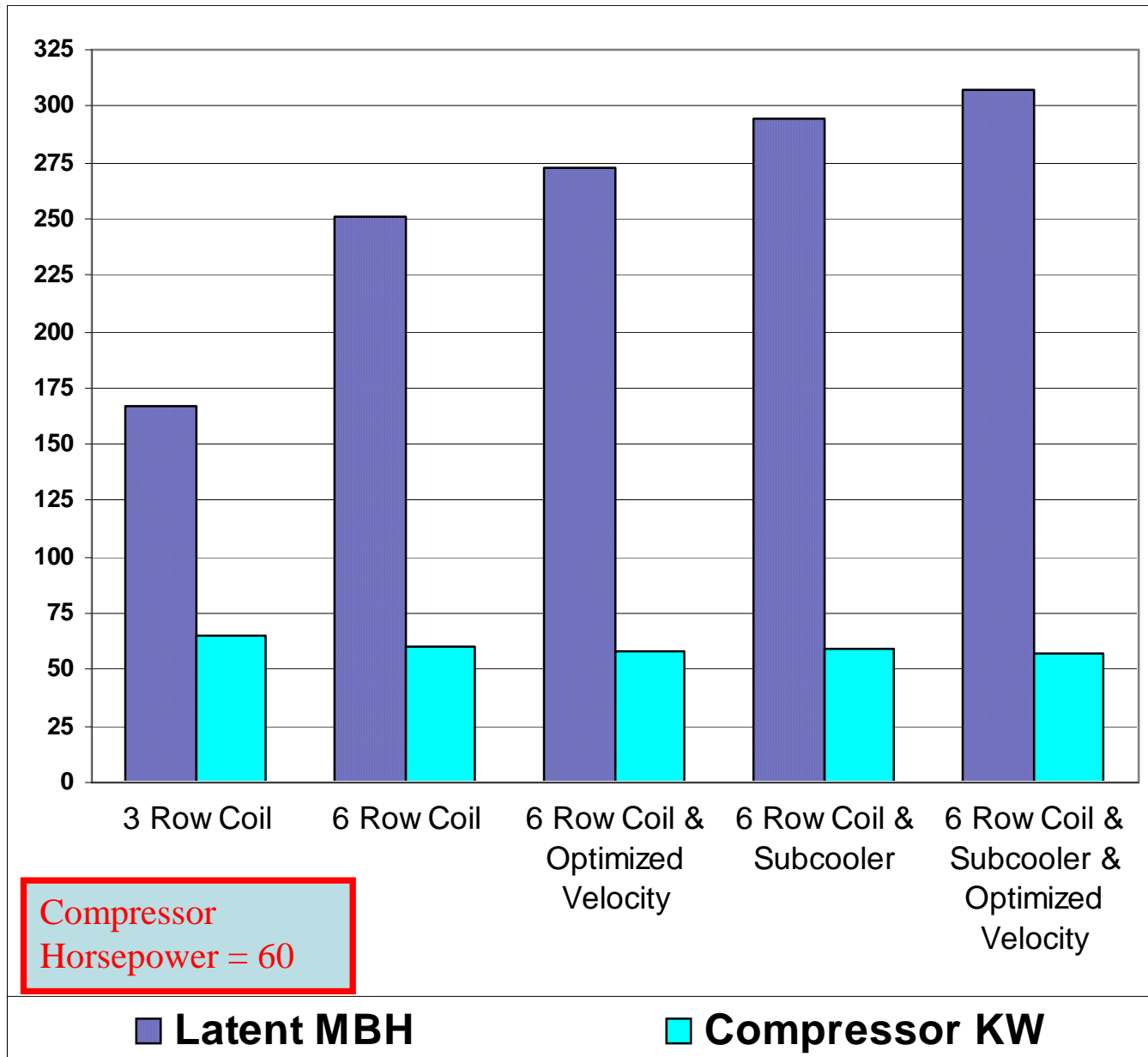
# SINGLE PATH WITH SUBCOOLING



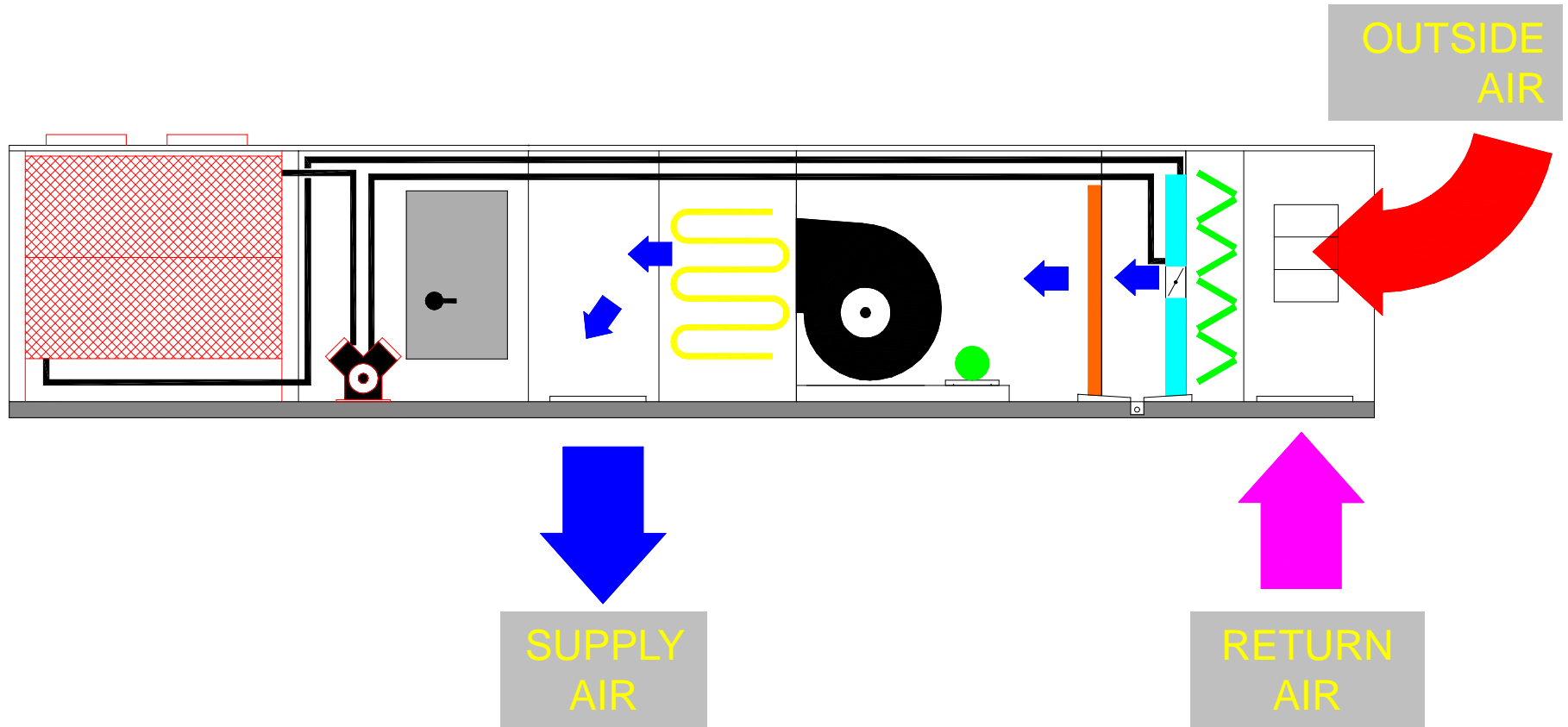




# Optimized Cooling Coil Performance

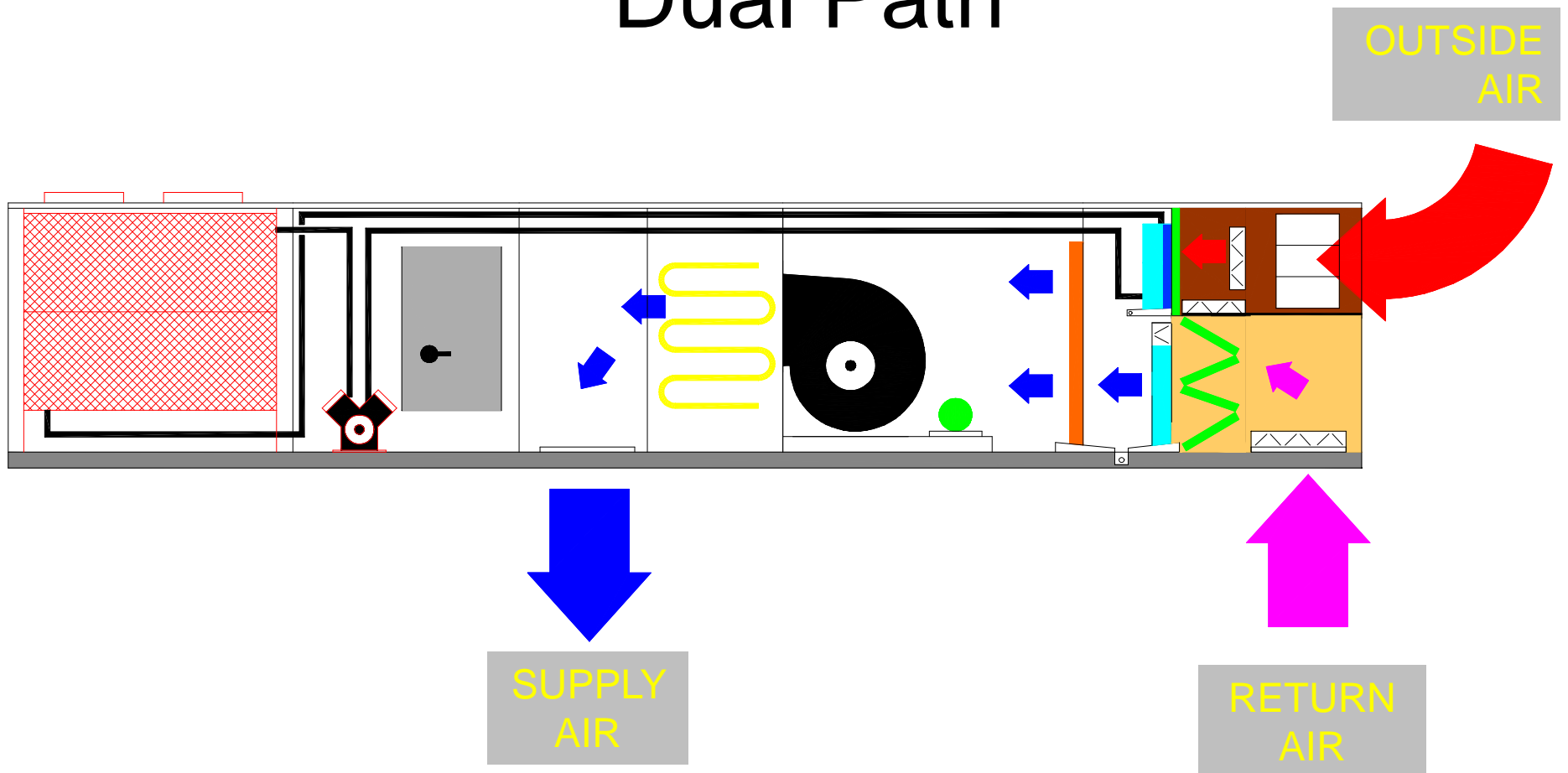


# Single Path Rooftop Unit



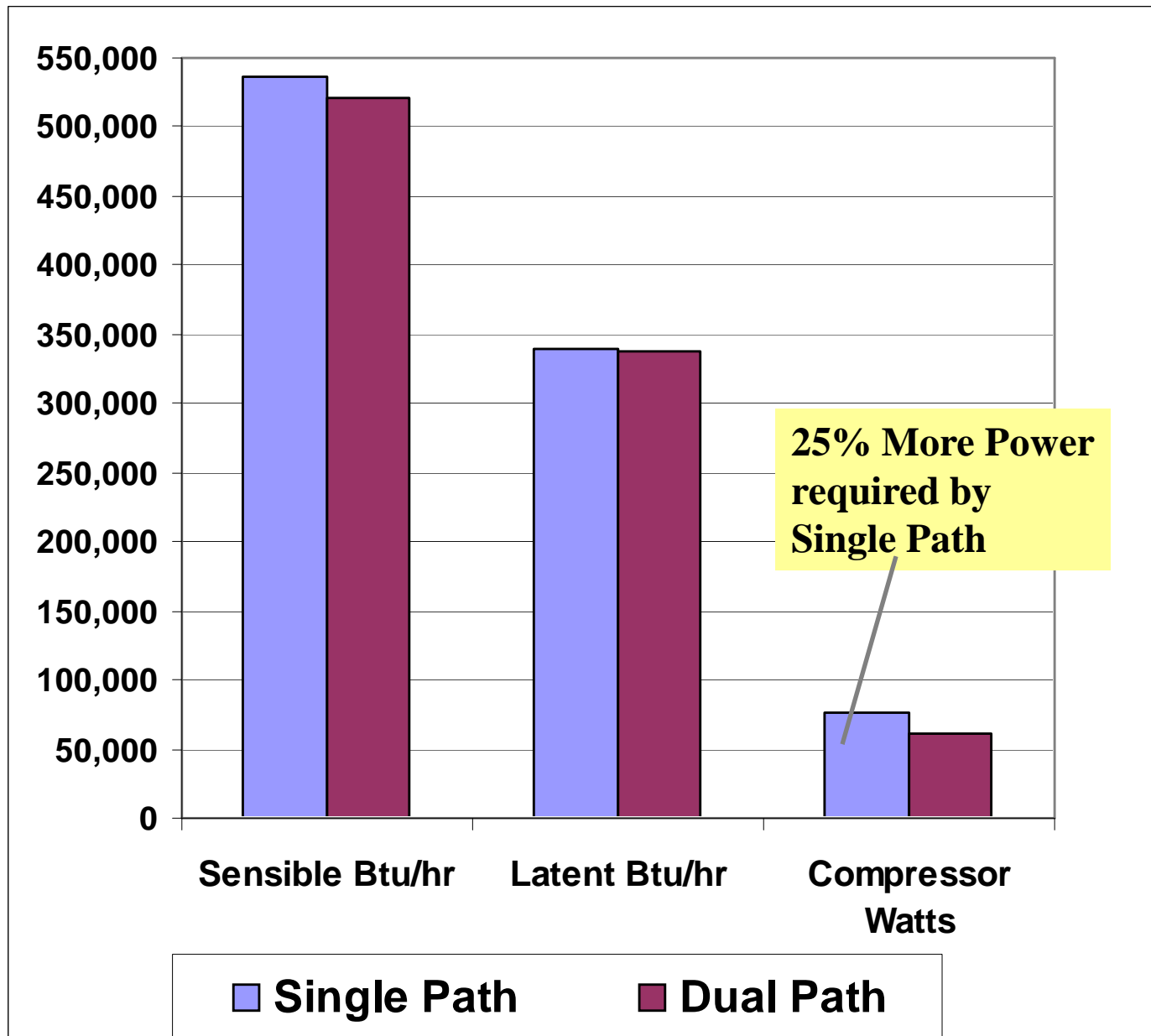
- Well suited for high return only and low quantity of ventilation.

# Dual Path



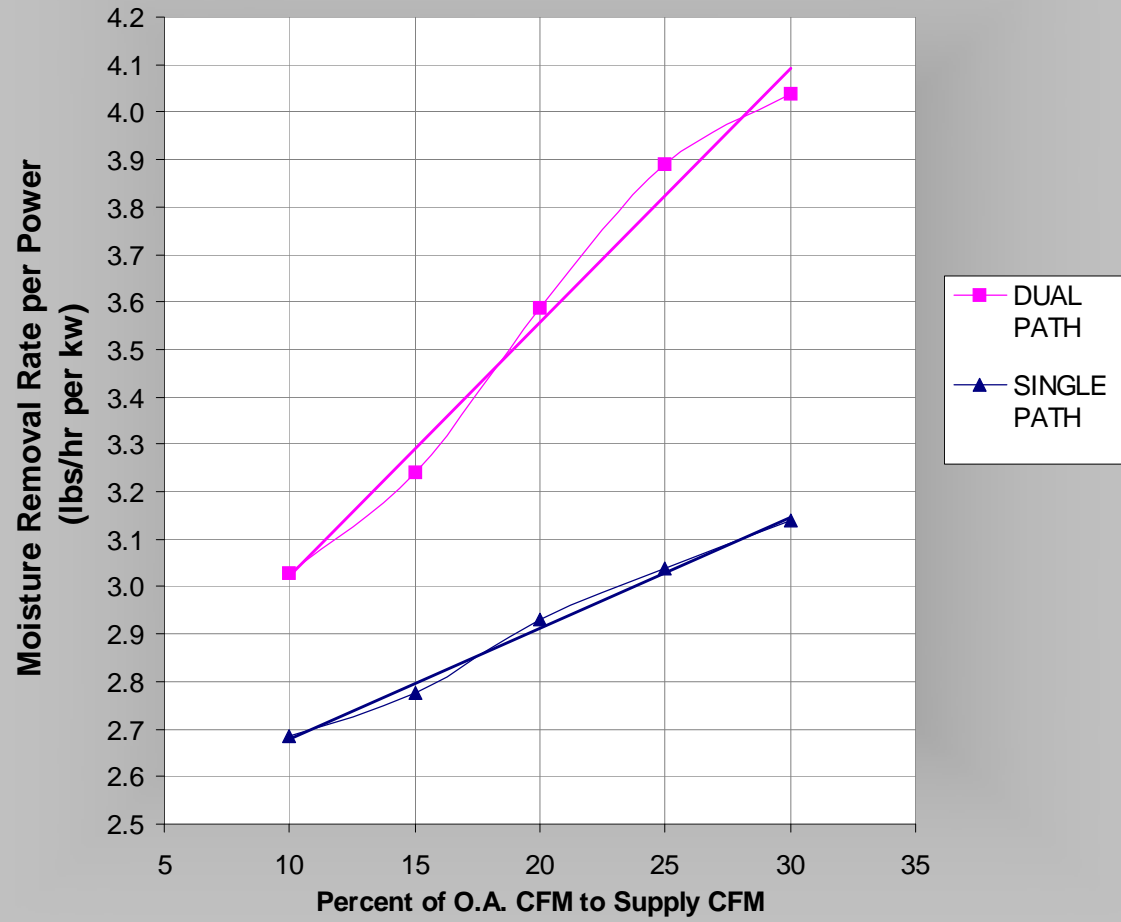
- Well suited for undercase return air only system and high quantity of ventilation air in a “humid climate”.

# Case Study: Single vs Dual Path



- 100% Undercase return
- High humidity city (near Gulf coast)
- 25% of air is ventilation/ outside air
- Space designed for 45% relative humidity

### MOISTURE REMOVAL EFFECTIVENESS DUAL PATH VERSUS SINGLE PATH



# A word about COMMISSIONING

- Generally NOT well practiced in the supermarket HVAC industry
- Confirm all airflows and control setpoints

**CO2 INFO...**

**PDF**



# Effective Ductwork: Improves Dehumidification

