

# The Whitehead Building Energy Recovery System: Enthalpy Wheels in Laboratory Environments



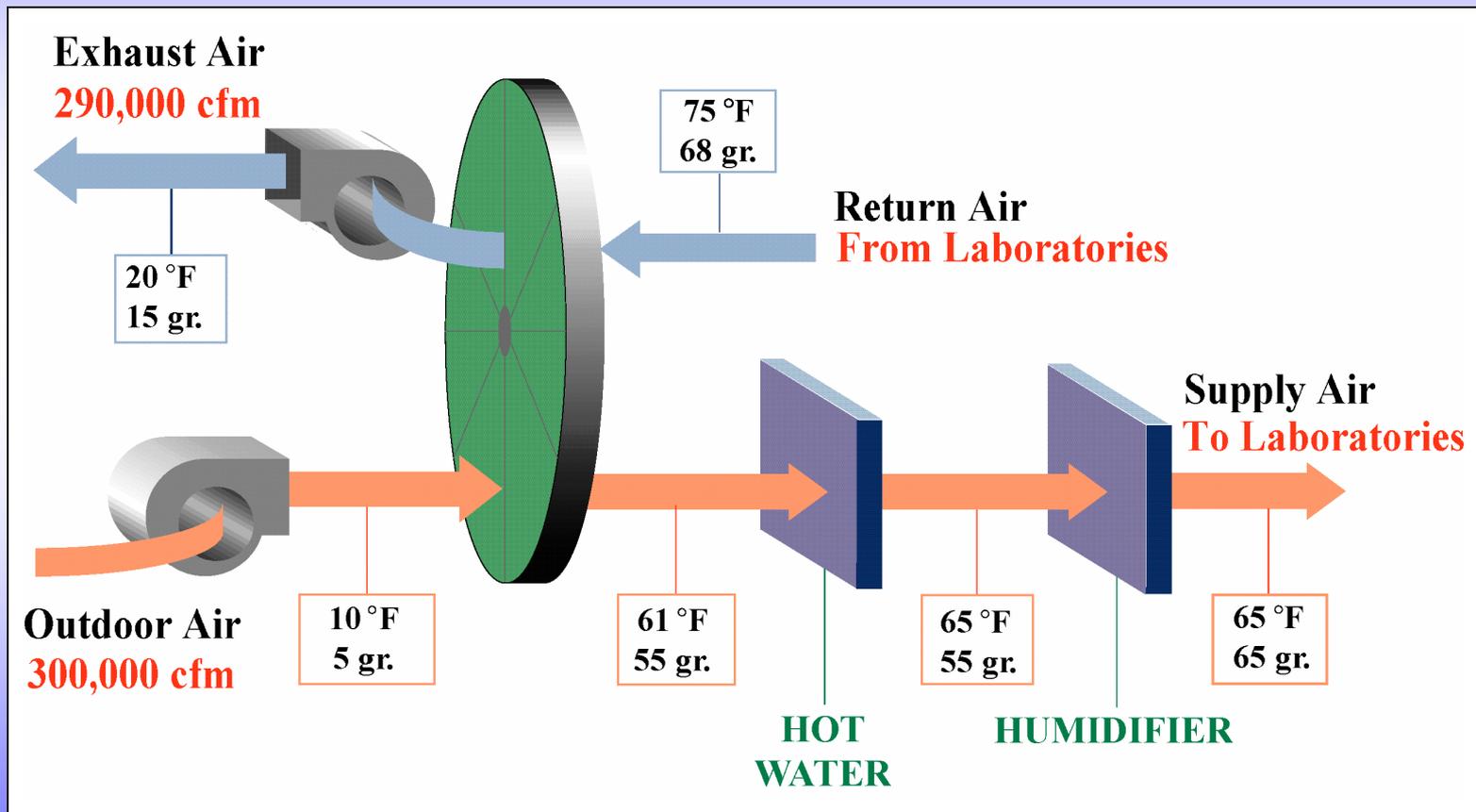
# Challenges: Laboratory HVAC Design

- High quantities of outdoor air (often 100%)
- Large cooling/heating plant capacity requirements
- Corresponding high energy and first cost
- Need for tight temperature & humidity control
- Desire for redundant chiller and boiler capacity
- High humidification loads (non-boiler steam)
- High condensate quantities (wet final filters)
- Optimize occupant safety within budget allocated

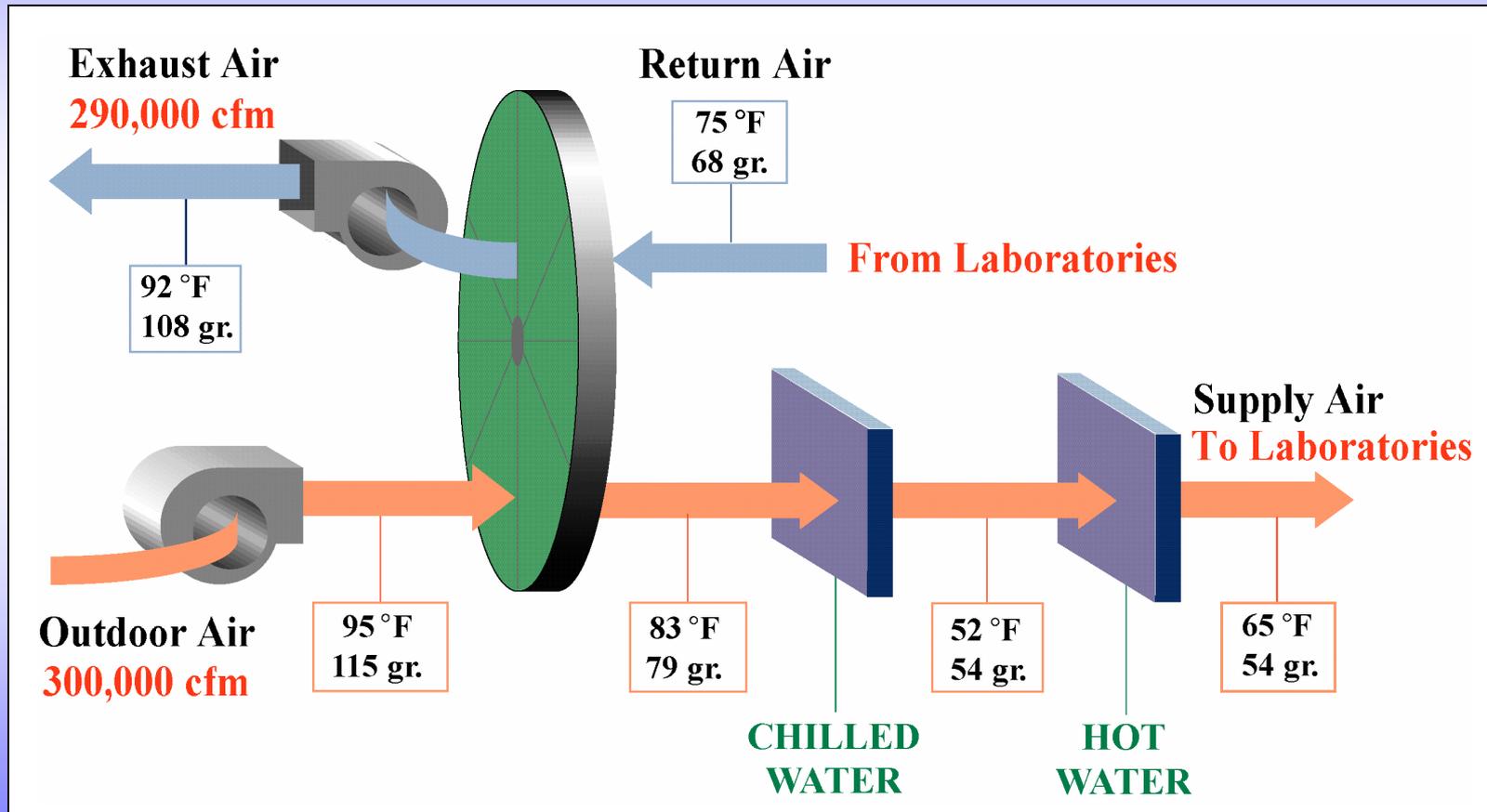
# Whitehead Recovery Wheels (4 total)



# Heating Mode Performance



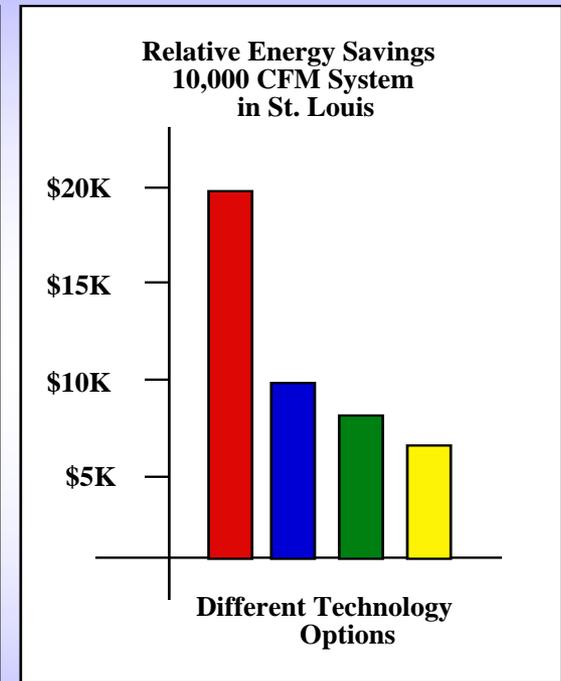
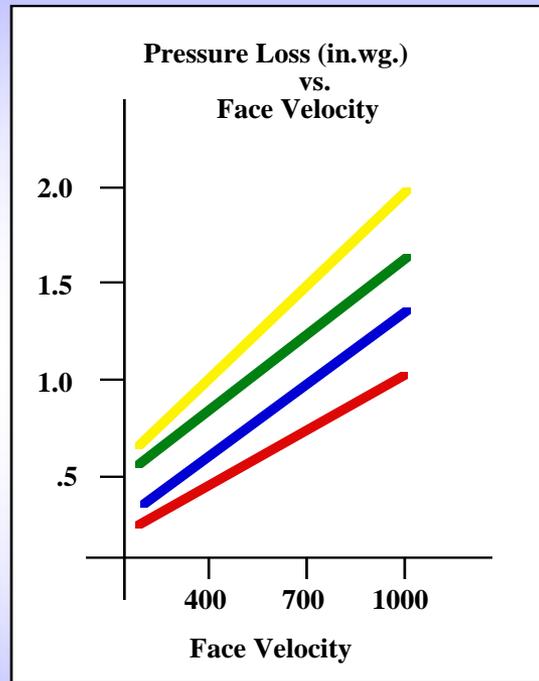
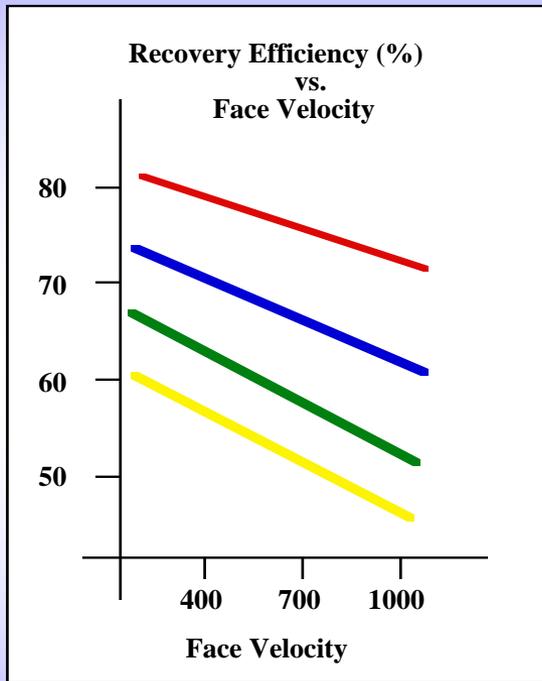
# Cooling Mode Performance



# Benefits Of Enthalpy Wheels

- Economical application of high volume, 100% outdoor air system for laboratory facilities
- Reduced operating cost and life cycle cost
- Reduced chiller/boiler capacity requirements
- Improved humidity control, reduced condensate on cooling coils by 65%, lessens risk of wet final filters
- Reduced size of steam to steam humidifiers

# Comparing Recovery Options



**Total Energy Wheel**



**Plate Exchanger**

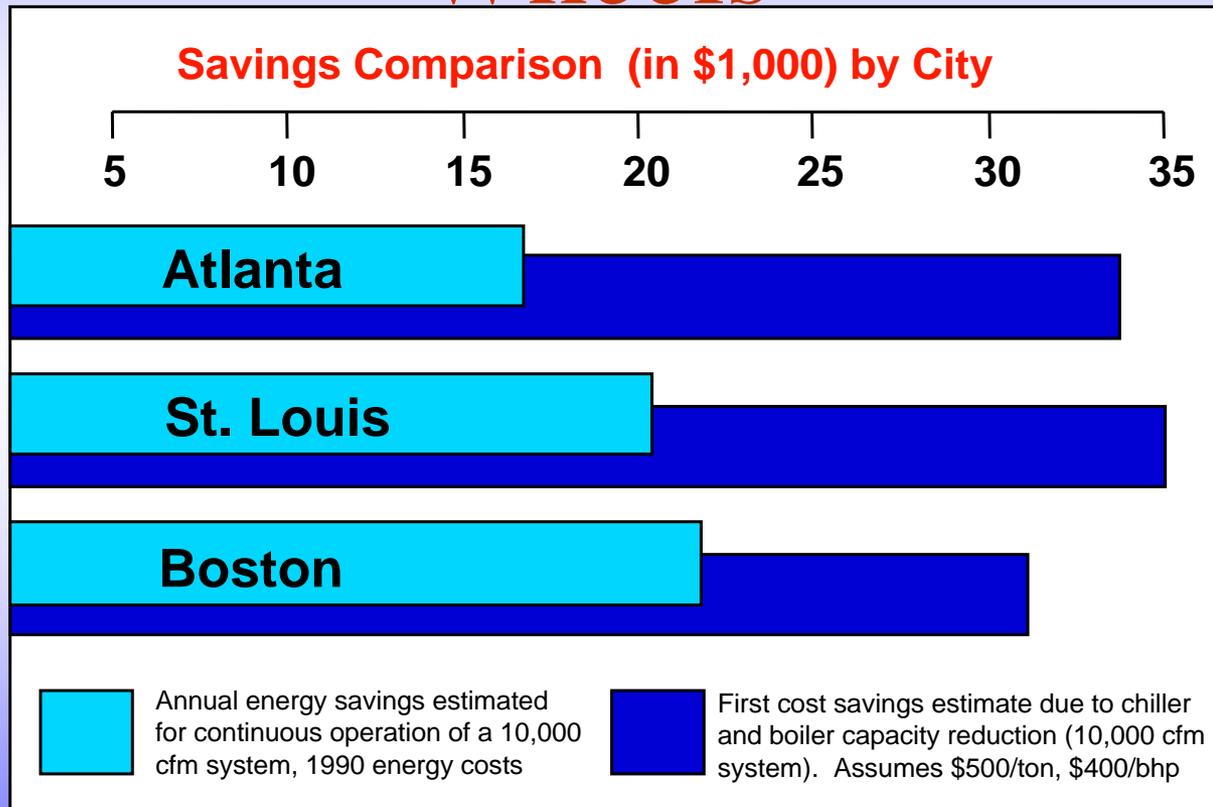


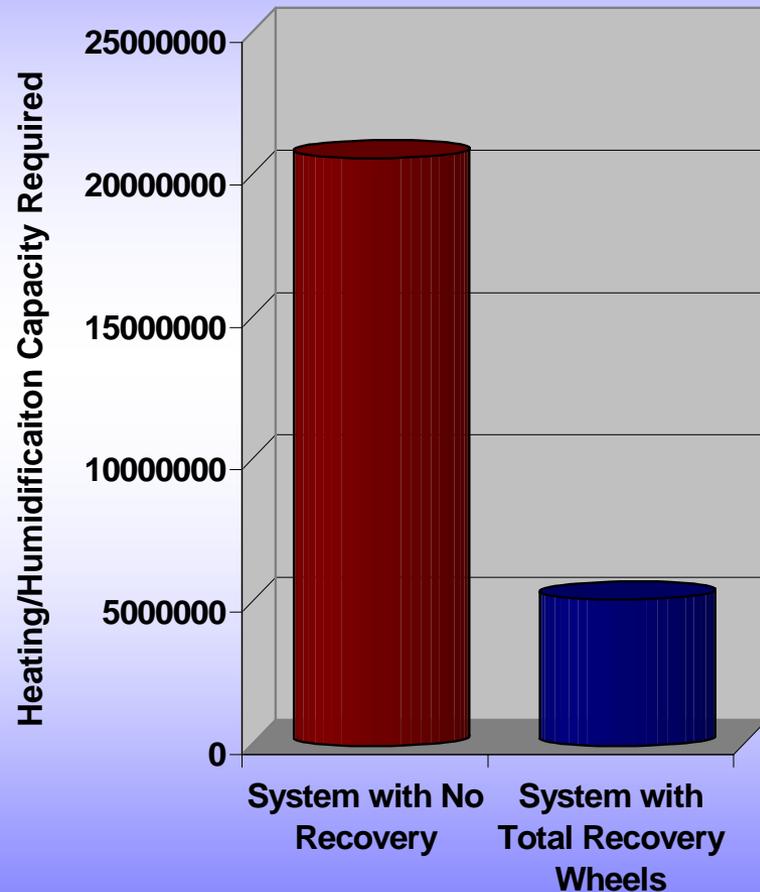
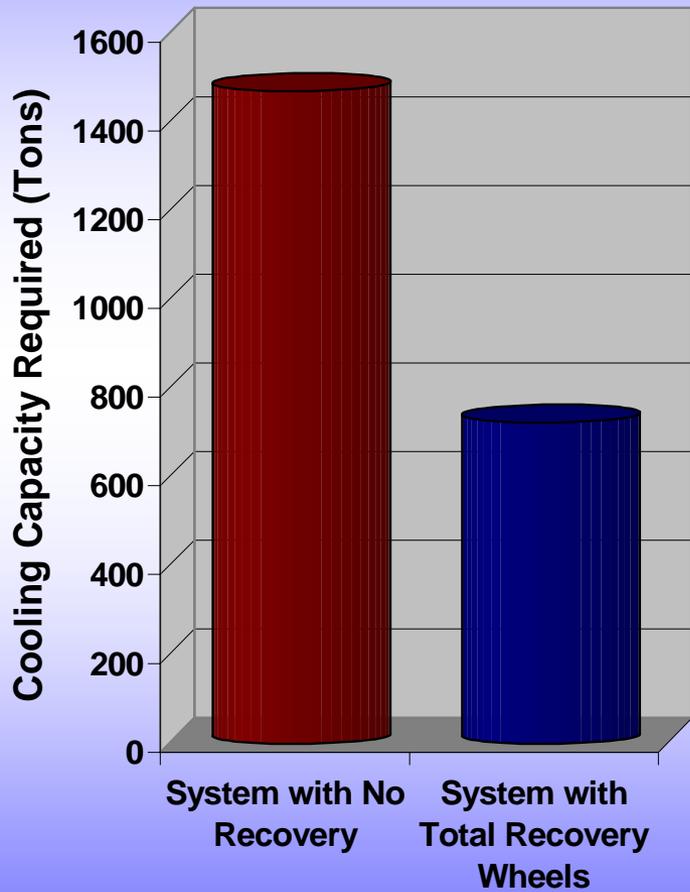
**Heat Pipe**



**Run Around Coils**

# Significant Energy and First Cost Savings Exist with Enthalpy Wheels





# Whitehead Life Cycle Analysis

- Enthalpy wheels save an estimated \$245,000 annually, three times that of a coil to coil recover option
  - The wheels cut 750 tons of chiller capacity and 450 Boiler horsepower
  - Provided a positive present value cash flow of \$1,700,000 based on 20 year life cycle
  - Provides estimated energy savings in the amount of \$5,900,000 based on a 20 year life cycle analysis\*
- \* Assumes: inflation at 2.5% and cost of capital of 8%, 50% taxes

