Ohio Hospital Association

UNITY IN ACTION

110TH ANNUAL MEETING & EDUCATIONAL SUMMIT

OHIO HOSPITAL ASSOCIATION

110th OHA Annual Meeting & Education Summit

Tuesday, May 20, 2025

Hyatt Regency Columbus
Delaware Room

75TH Anniversary

KETCHUM WALTON co.

EMPLOYEE OWNED for 25 YEARS

Innovative Solutions for Real World Problems

Speaker: Russ Elkins

Choosing the Right Energy Recovery Technology within Air Handling

As energy codes continue to mandate attention, finding effective compliance solutions can be challenging. This session explores the airside of Energy Recovery, providing insights to help determine the best technology for specific applications

The purpose of this presentation is to provide OHA members—including healthcare facility management professionals, consulting engineers, new construction leaders, and affiliate members—with the latest advancements in energy recovery applications for both new and existing air handling units. The objective is to educate attendees on best practices and emerging technologies that support sustainability initiatives and reduce overall energy consumption in healthcare facilities, covering both traditional approaches and innovative future solutions.

OHIO HOSPITAL ASSOCIATION

110th OHA Annual Meeting & Education Summit

Tuesday, May 20, 2025

Hyatt Regency Columbus
Delaware Room

75TH Anniversary
KETCHUM WALTON co.
EMPLOYEE OWNED for 25 YEARS

Innovative Solutions for Real World Problems

Speaker: Russ Elkins

Choosing the Right Energy Recovery Technology within Air Handling

Learning Objective

- *1) Understanding the energy recovery technologies available.*
- *2) How to choose the best energy recovery type for specific applications.*
- *3) Comparative analysis of the different advantages/disadvantages for each type of energy recovery technology.*

OHIO HOSPITAL ASSOCIATION

110th OHA Annual Meeting & Education Summit

Tuesday, May 20, 2025

Hyatt Regency Columbus
Delaware Room

75TH Anniversary
KETCHUM WALTON co.
EMPLOYEE OWNED for 25 YEARS

Innovative Solutions for Real World Problems

Event Speaker: Russ Elkins

Understanding Energy Recovery:

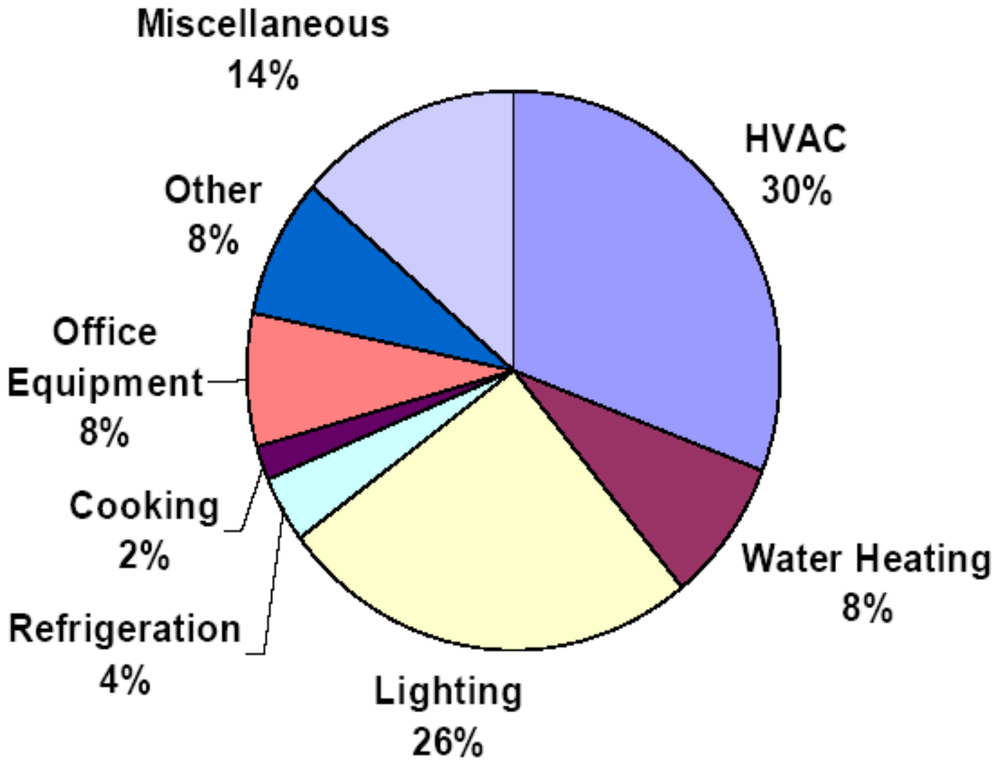
- What is Energy Recovery?
  - *Airside, Heat Recovery (winter), Heat Rejection (summer), Sensible, Latent*
- Why Energy Recovery?
  - *Compliance with ASHRAE 62.1 and ASHRAE 90.1*
- What are the issues with Energy Recovery?
  - *Added First Cost, Maintenance, Availability of Mechanical Space, Choosing Correct Applications*
- What are the benefits of Energy Recovery?
  - *Reduces HVAC Infrastructure Load, Saves Energy, Lowers Utility Usage, Improves IAQ*
- What are the different types of Energy Recovery?
  - *Coils, Wheels, Plates, Cores*

Understanding Energy Recovery:

- Energy is rejected and wasted from all buildings in many forms.
- Airside: Specific to HVAC applications.
- Energy Recovery is capturing the energy (BTU’s) from one source and transferring to another.
  - Sensible Energy
  - Latent Energy
- To balance pressures within the building, an approximate equal amount of air must be exhausted as is supplied.
- The energy contained in the return air stream can be recovered before exhausted.

Understanding Energy Recovery:

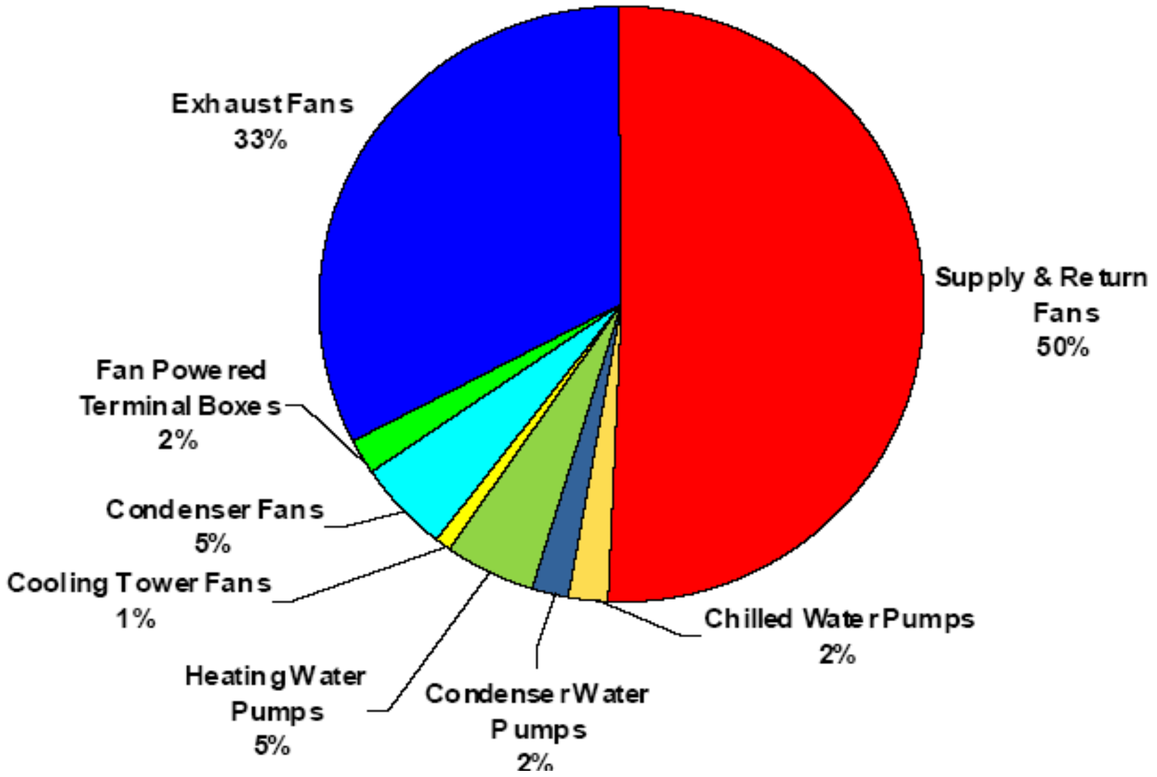
- What is the breakdown of how energy is utilized in facilities?



The U.S. has 4.2% of the world’s population and consumes over 20% of the worlds oil supply.

Understanding Energy Recovery:

- What is the breakdown of how energy is utilized in HVAC infrastructure?



Commercial buildings in the U.S. generate 33% of municipal solid waste, 36% of total CO2 emissions, 46% of sulfur dioxide emissions, 19% of nitrogen oxide emissions and 10% of fine particulates.

Understanding Energy Recovery:

- What is the impact of energy savings on the environment?

One (1) kWh Saved Results in:

- ***0.8 lbs of COAL***
- ***1.48 lbs of CARBON DIOXIDE***
- ***0.25 oz of SULFER DIOXIDE***
- ***0.11 oz of NITROGEN OXIDE***

U.S. Department of Energy statistics as of 2021

Understanding Energy Recovery:

- What is the total cost of ownership over a 30-year lifecycle?

First Cost of Design & Construction ~ 20%

Operations & Maintenance ~ 80%

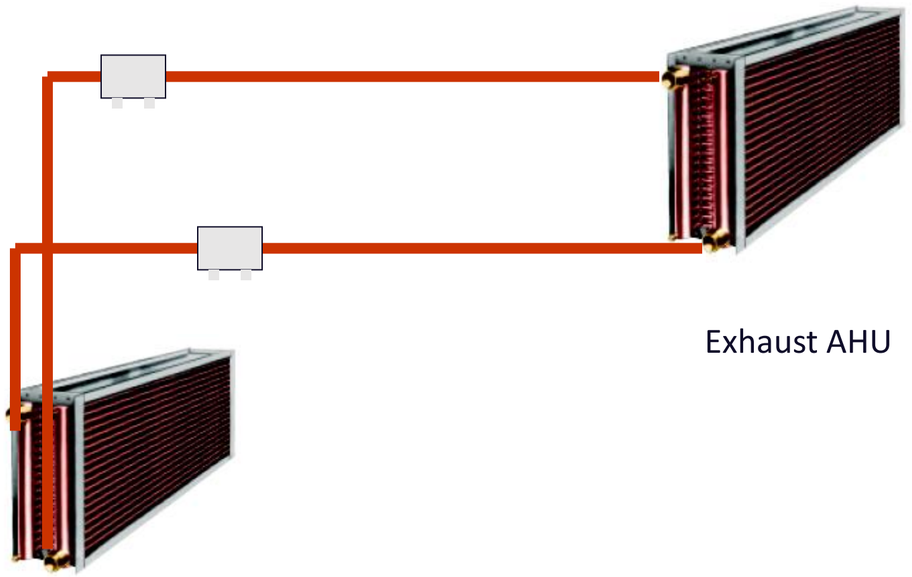
Partners Healthcare Case Study 2014

Types of Energy Recovery Technologies (airside):

- Runaround Glycol Coils
  - *Active pumped system*
- Refrigerant Heat Pipes
  - *Active pumped system, Passive closed-loop, Wraparound for desaturation*
- Plate Exchangers
  - *Passive fins*
- Core Exchangers
  - *Passive fins and membrane*
- Rotary Wheels
  - *Passive flute desiccant media*

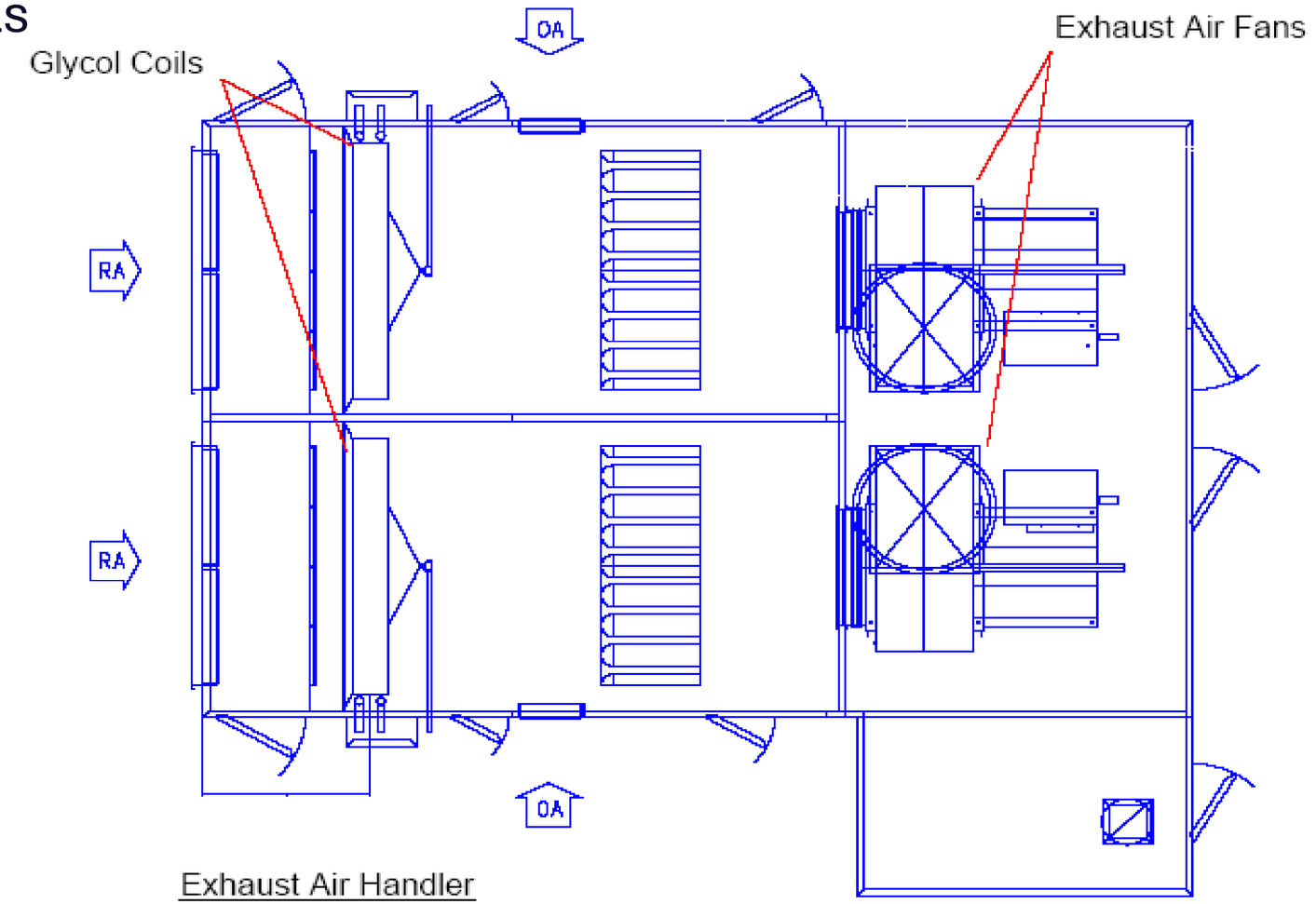
Types of Energy Recovery Technologies (airside):

- Runaround Glycol Coils
  - *Active pumped system*



Types of Energy Recovery Technologies (airside):

- Runaround Glycol Coils
  - *Active pumped system*



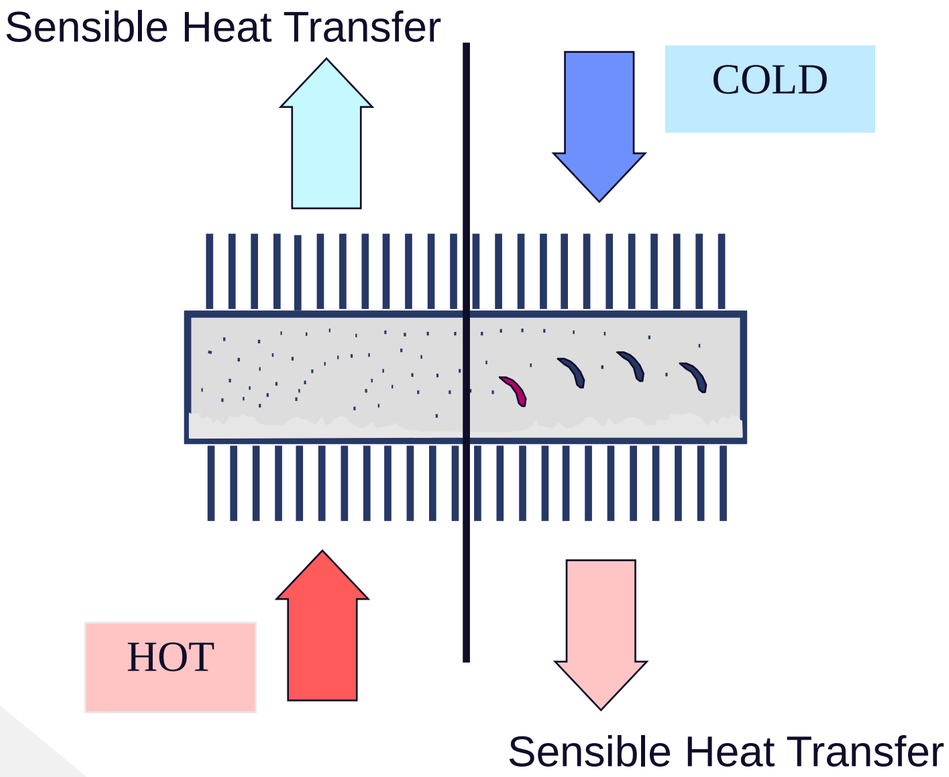
Types of Energy Recovery Technologies (airside):

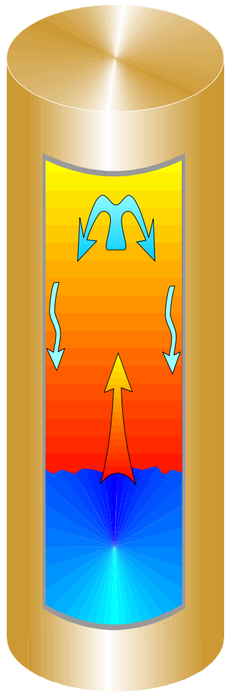
- Runaround Glycol Coils
  - *Active pumped system*

- Efficiency Range (40 - 50%)
- Sensible Only
- Adjacent Supply & Exhaust Ducts not required
- Most flexible
- Maintenance - pumps, glycol system, piping
- Coatings available for corrosion protection

Types of Energy Recovery Technologies (airside):

- Refrigerant Heat Pipe Systems
  - *Active pumped system, Passive closed-loop, Wraparound for desaturation*



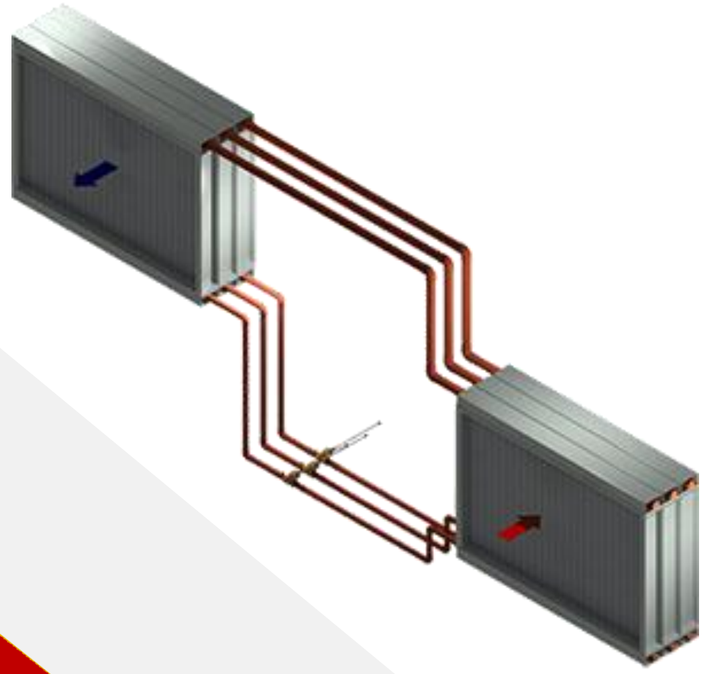


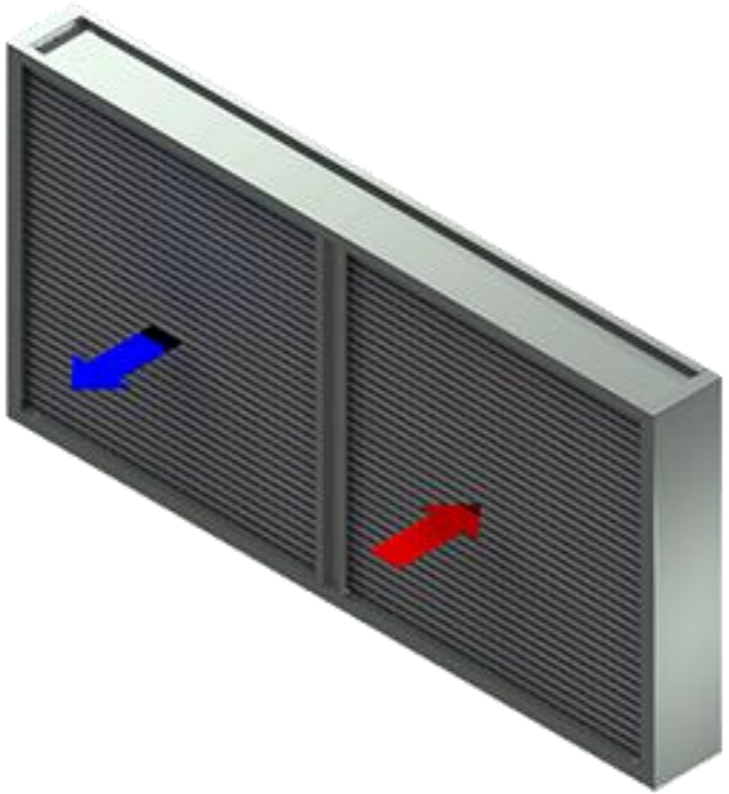
A heat pipe is a hollow cylinder filled with a two-phase fluid.

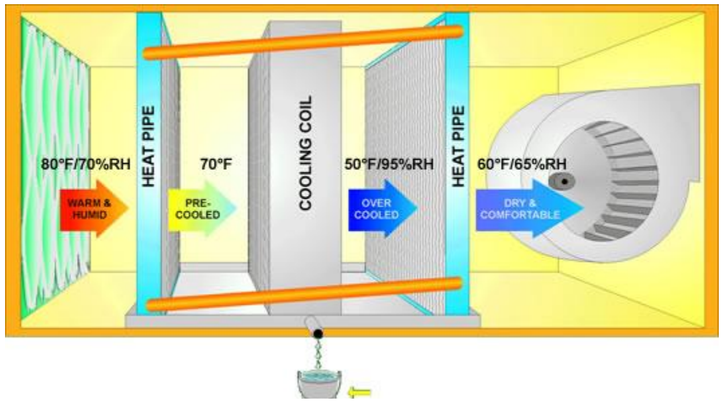
1) Heat is absorbed at bottom
2) Liquid evaporates to vapor
3) Vapor rises to top
4) Heat is released at top
5) Vapor condenses to liquid
6) Liquid drains to bottom

Types of Energy Recovery Technologies (airside):

- Refrigerant Heat Pipe Systems
  - *Active pumped system, Passive closed-loop, Wraparound for desaturation*

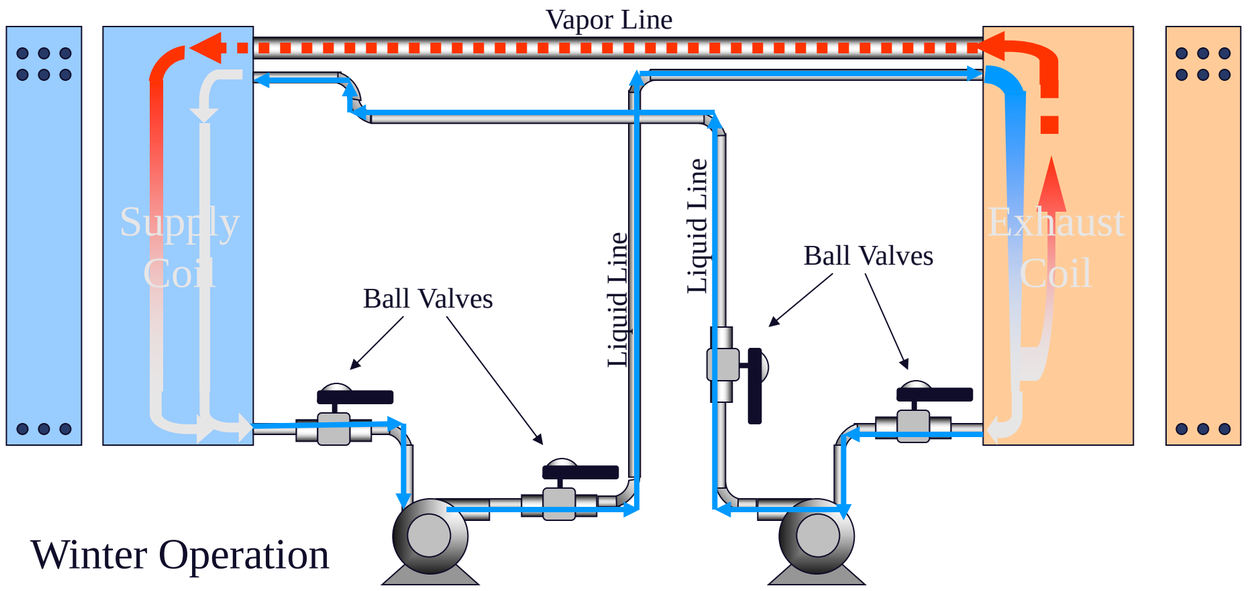






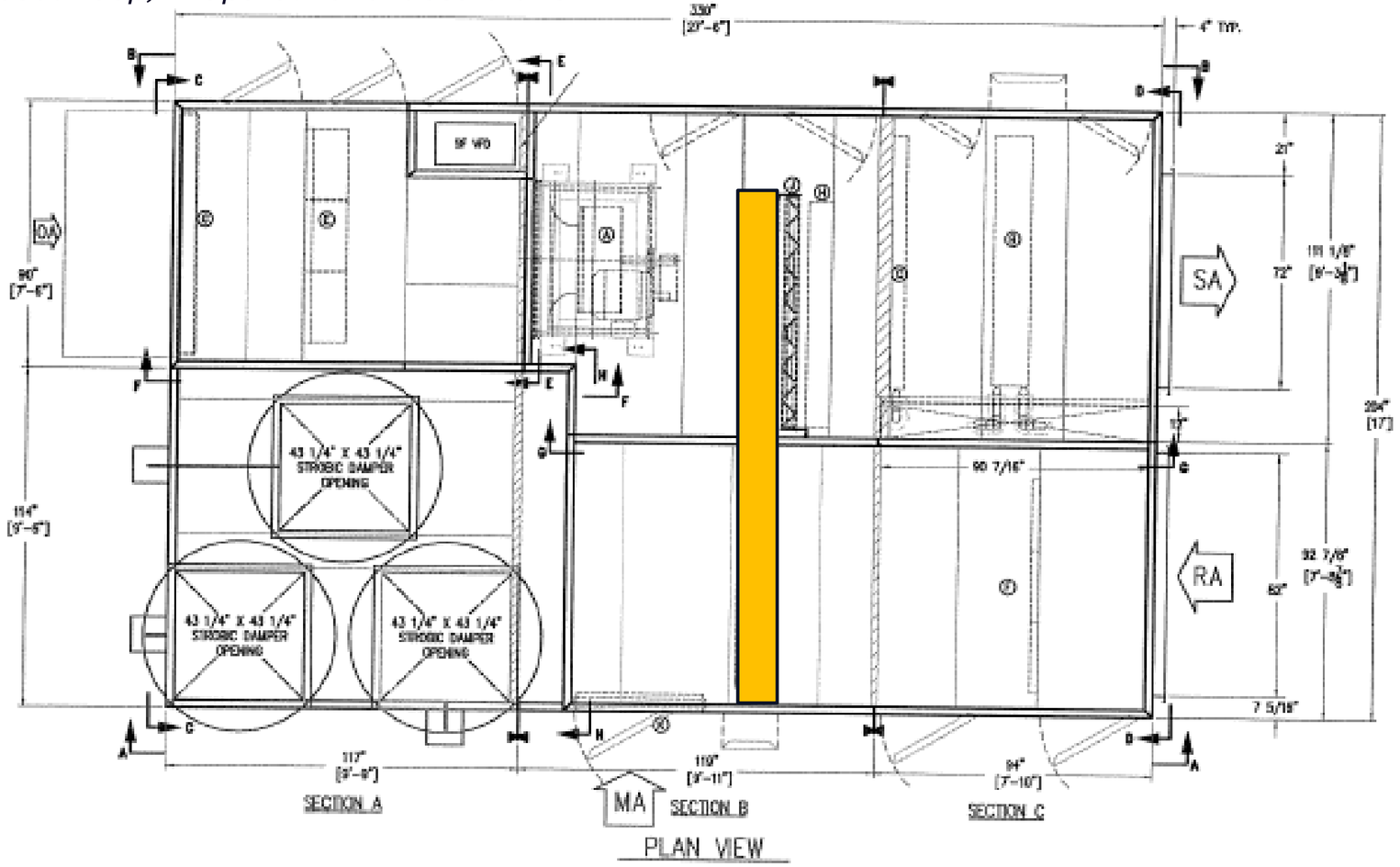
Types of Energy Recovery Technologies (airside):

- Refrigerant Heat Pipe Systems
  - *Active pumped system, Passive closed-loop, Wraparound for desaturation*



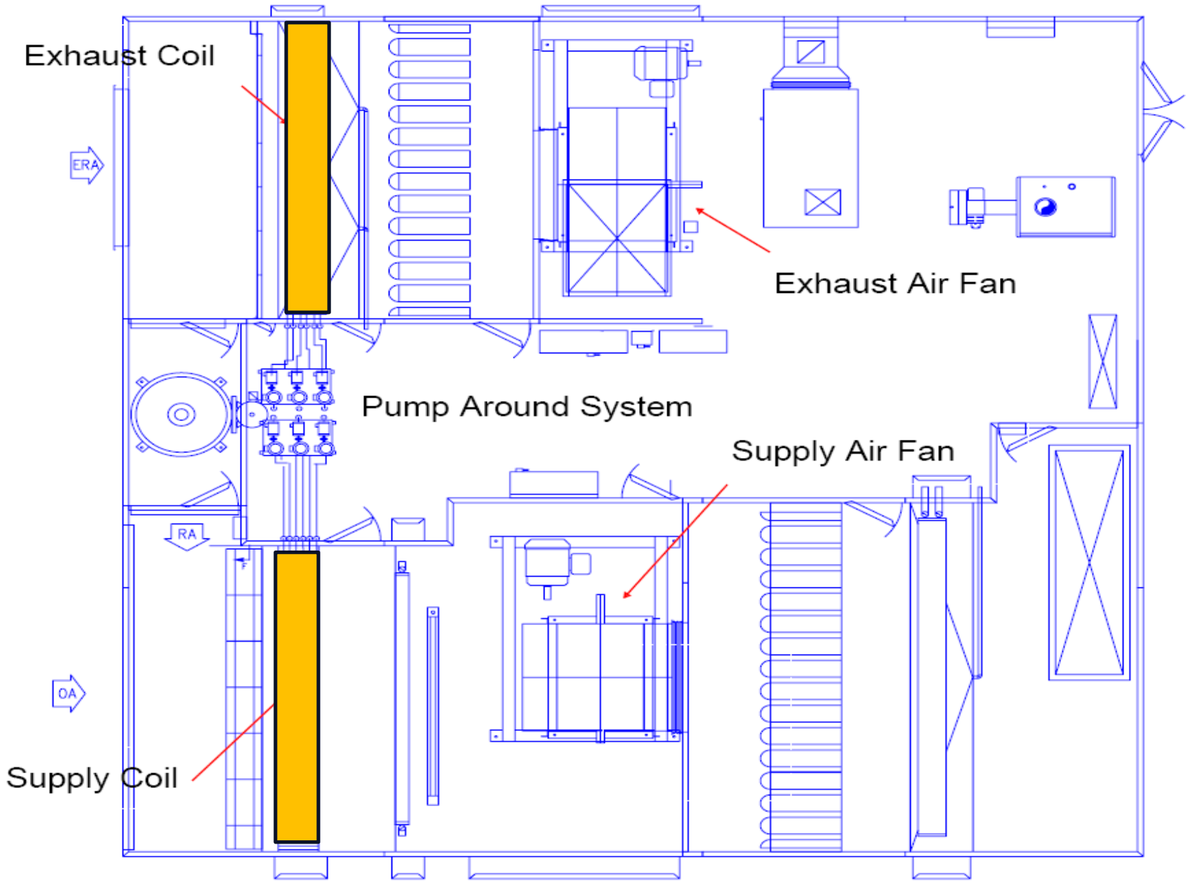
Types of Energy Recovery Technologies (airside):

- Refrigerant Heat Pipe Systems
  - *Active pumped system, Passive closed-loop, Wraparound for desaturation*



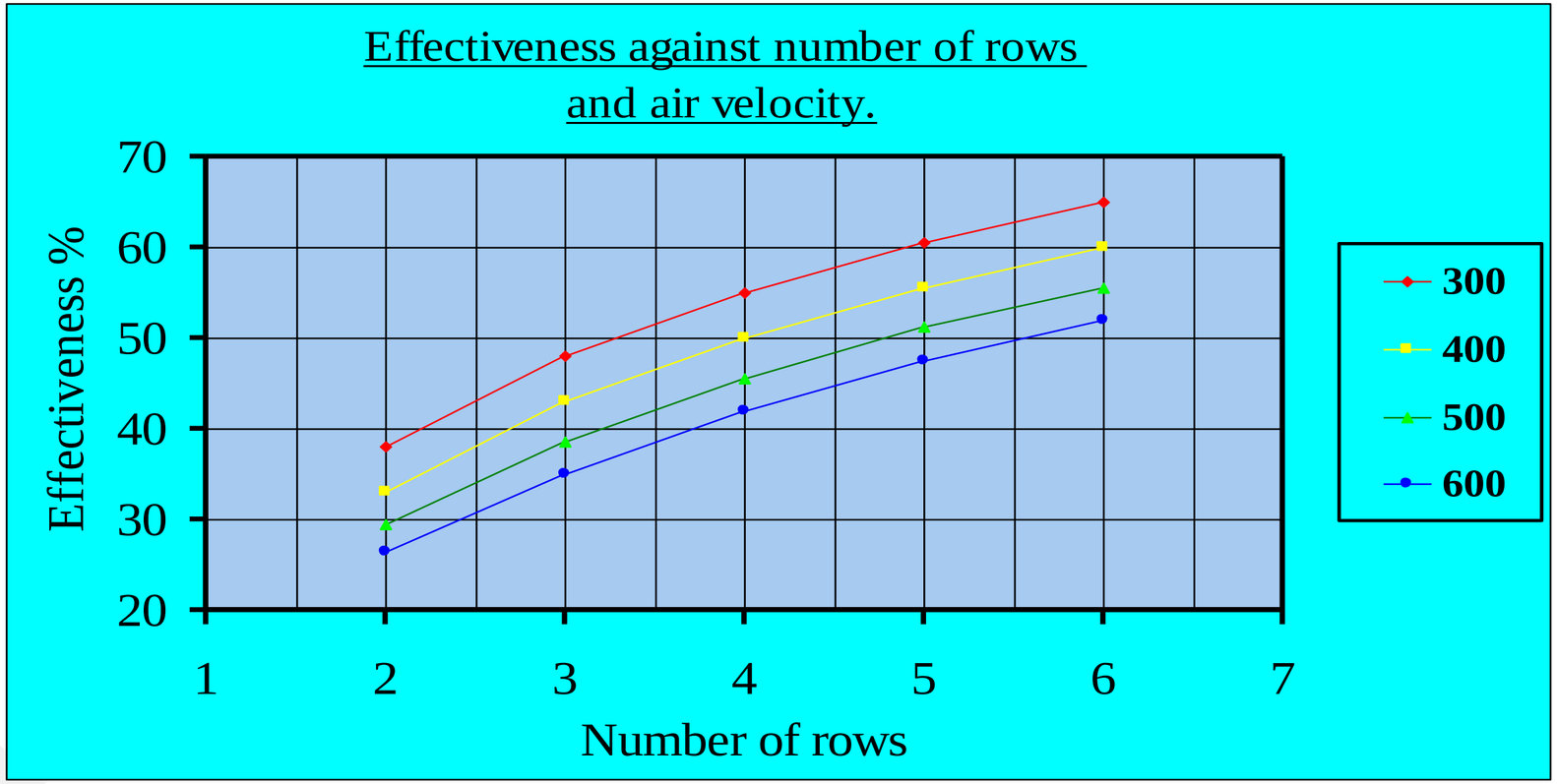
Types of Energy Recovery Technologies (airside):

- Refrigerant Heat Pipe Systems
  - *Active pumped system, Passive closed-loop, Wraparound for desaturation*



Types of Energy Recovery Technologies (airside):

- Refrigerant Heat Pipe Systems
  - *Active pumped system, Passive closed-loop, Wraparound for desaturation*



Types of Energy Recovery Technologies (airside):

- Refrigerant Heat Pipe Systems
  - *Active pumped system, Passive closed-loop, Wraparound for desaturation*

Active Pumped System

- Efficiency Range (50 - 60%)
- Sensible Only
- Adjacent Supply & Exhaust Ducts are not required
- Layout is slightly flexible (~50-ft pumped limit)
- Maintenance: pumps and general cleaning
- Coatings available for corrosion protection

Passive Closed-Loop System

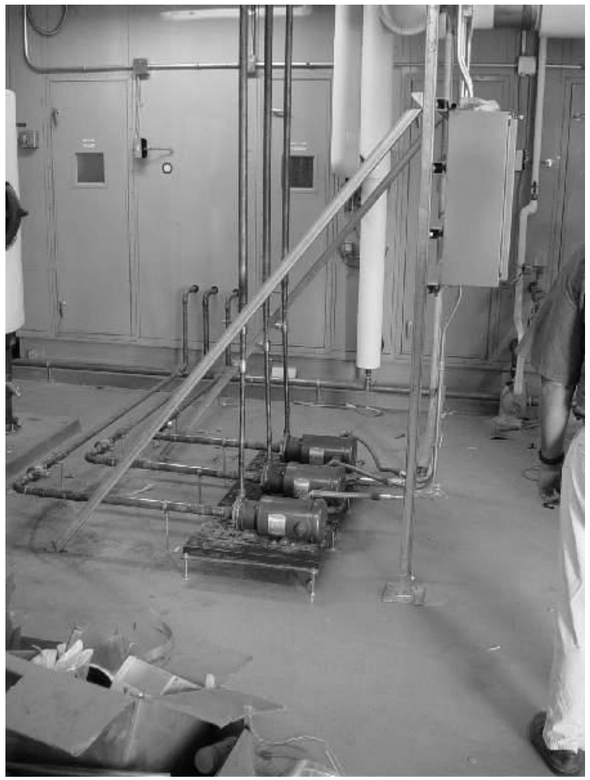
- Efficiency Range (50 - 60%)
- Sensible Only
- Adjacent Supply & Exhaust Ducts are required
- Layout is limited
- Maintenance: general cleaning
- Coatings available for corrosion protection

Types of Energy Recovery Technologies (airside):

- Refrigerant Heat Pipe Systems
  - *Active pumped system, Passive closed-loop, Wraparound for desaturation*

Advantages of Split Heat Pipe Systems vs Glycol Loops

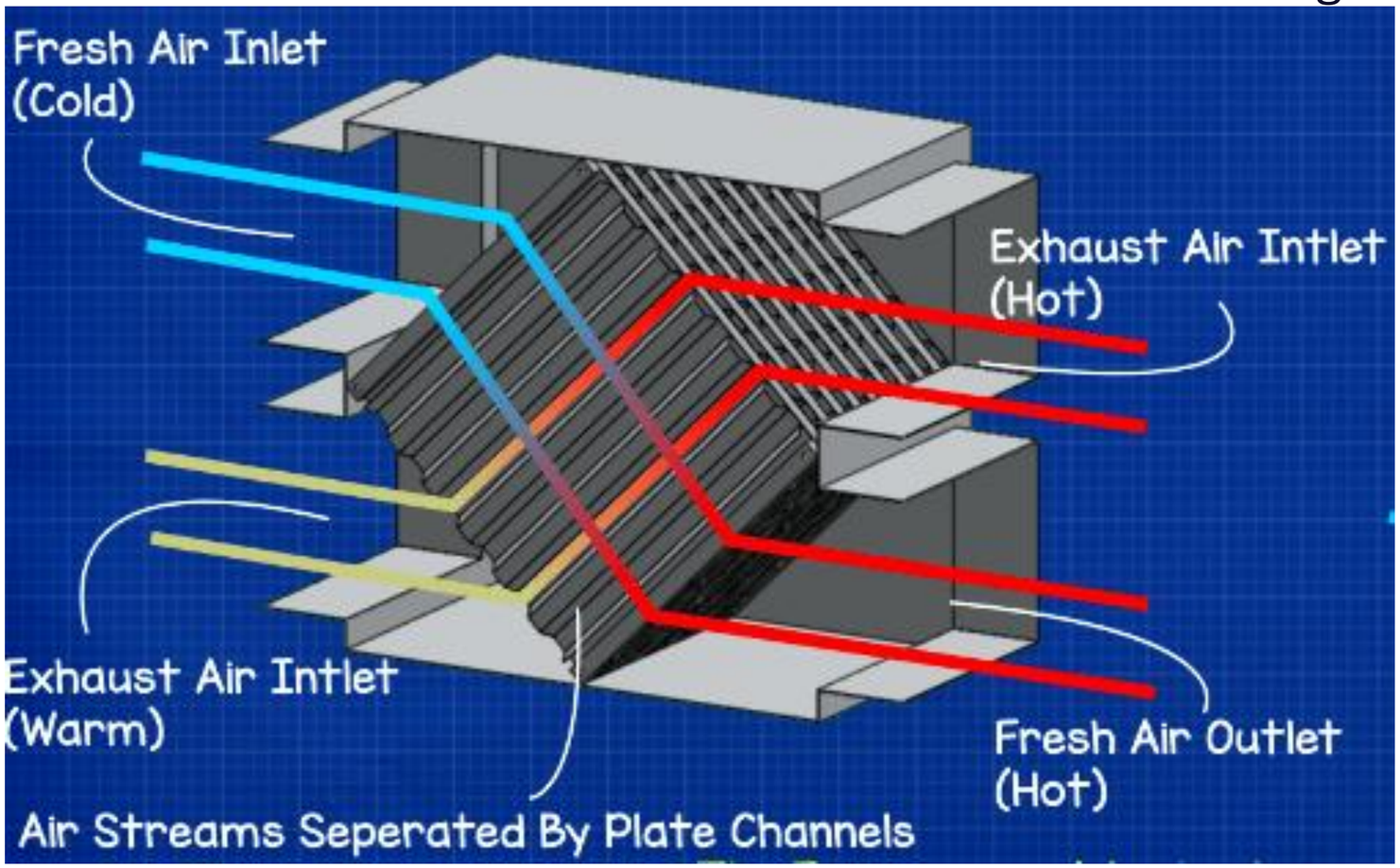
- Requires 1/10 as much volume pumped
- Smaller pumps require less horsepower
- Smaller interconnecting pipes
- Multiple circuit systems can be arranged for counterflow, increasing efficiency



Types of Energy Recovery Technologies (airside):

- Plate & Core Exchangers
  - *Passive fins and membrane*

Passive Air-to-Air Heat Exchanger



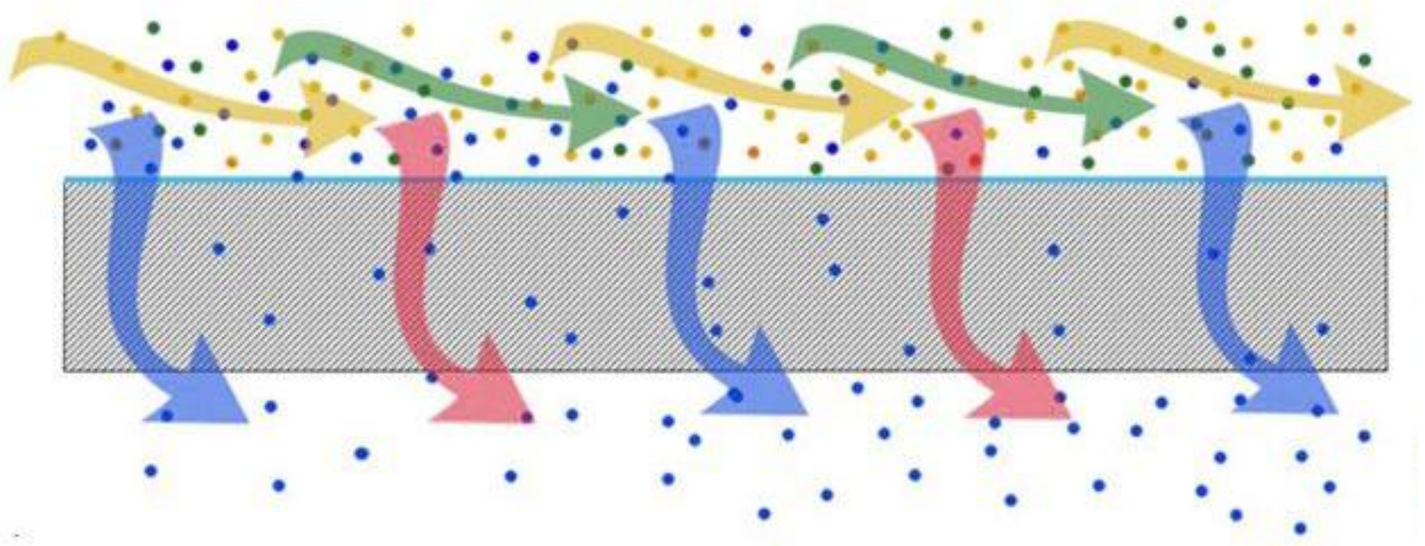
Types of Energy Recovery Technologies (airside):

- Plate & Core Exchangers
  - *Passive fins and membrane*

Passive Air-to-Air Heat Exchanger

Types of Energy Recovery Technologies (airside):

- Plate & Core Exchangers
  - *Passive fins and membrane*



Membrane “Core” Air-to-Air Heat Exchanger

Types of Energy Recovery Technologies (airside):

- Plate & Core Exchangers
  - *Passive fins and membrane*

Plate Exchanger

- Efficiency Range (50 - 70%)
- Sensible Only
- Counterflow airstreams are required
- Layout is critical and very limited
- Maintenance: surface and tunnels cleaning
- Coatings available for corrosion protection

Plate & Core Exchanger

- Efficiency Range (70 - 80%)
- Sensible and Latent
- Counterflow airstream are required
- Layout is critical and very limited
- Maintenance: surface and tunnels, core replacement
- Coatings available for corrosion protection

Types of Energy Recovery Technologies (airside):

- Energy Recovery Wheels
  - *Passive flute desiccant media*

Types of Energy Recovery Technologies (airside):

- Energy Recovery Wheels
  - *Passive flute desiccant media*

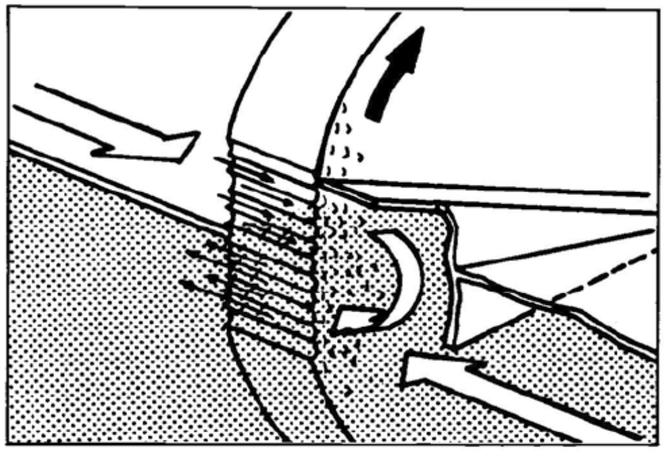
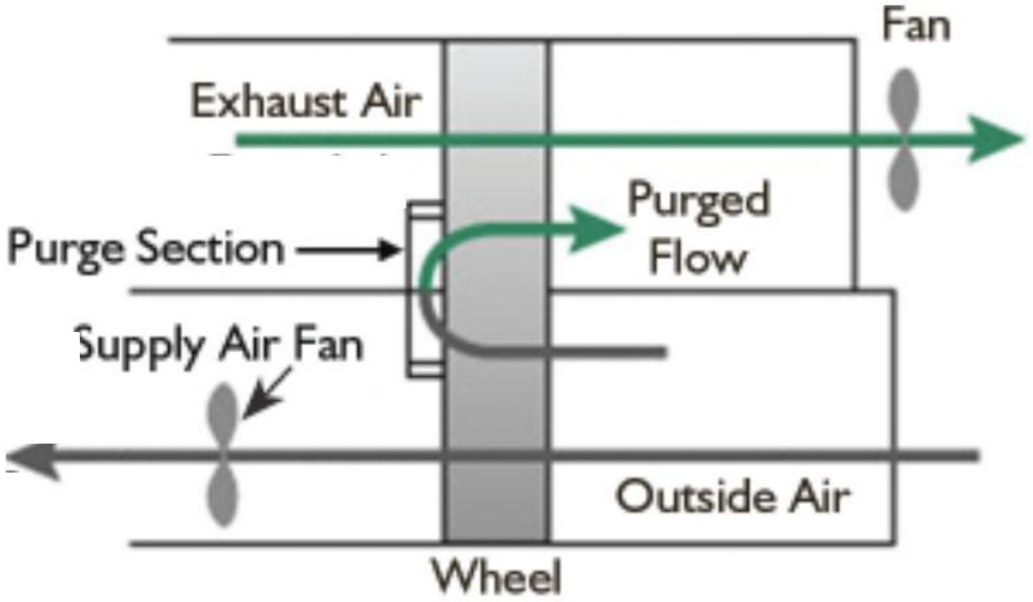
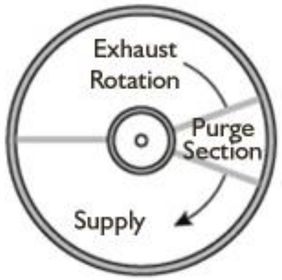


Figure 3 illustrates how the carryover is eliminated by the utilization of the purge.

Principle of Purge Flow

(cross-contamination mitigation)





Types of Energy Recovery Technologies (airside):

- Energy Recovery Wheels
  - *Passive flute desiccant media*

Media Substrate:

- Aluminum
- Ceramic
- Paper
- Stainless Steel
- Silica Gel
- 3Å/4Å

Coating Types:

- Aluminum (sensible)
- Silica Gel (enthalpy)
- 3Å/4Å (microbial)

Types of Energy Recovery Technologies (airside):

- Energy Recovery Rotary Wheels
  - *Passive flute desiccant media*

Energy Recovery Wheels

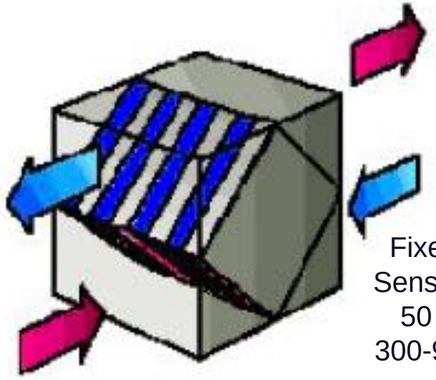
- Efficiency Range (60 - 80%)
- Sensible (60 - 70%) or Enthalpy (70 – 80%)
- Parallel airstreams are required
- Layout is limited
- Maintenance: surface, bearings, belts (or direct drive)
- Potential for cross-contamination
- Coatings available for corrosion protection or desiccant dehumidification

Energy Recovery Technologies | Summary

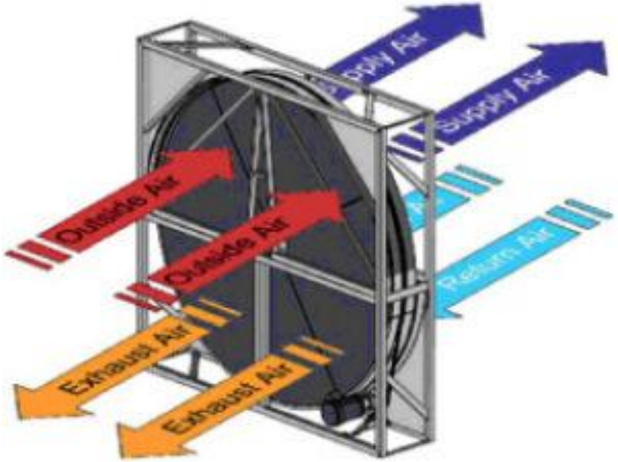
Characteristic	*Runaround Coils*	*Heat Pipes*	*Plate Exchangers*	*Wheels*
Ave. Efficiency	40 – 50%	50 – 60%	50 – 80%	70 – 80%
Latent Recovery	No	No	Yes	Yes
Size Limitations	No	Yes	Yes	~150,000 CFM
Maintenance	Pumps, Seals, Clean	Clean	Clean	Grease Bearings, Belts*
Cross Contamination	No	No	No	Potential
Parallel Airstreams	No	Yes	Yes	Yes
Retrofit Applications	Yes	Yes	No	Yes
Life Expectancy	~10-15 years	~10-20 years	~10-20 years	up to 25+ years
First-Cost Payback	3-5 years	2-4 years	3-5 years	1-2 years
Operational Cost	High	Low	Low	Low
**No belt maintenance with direct drive applications*				

Energy Recovery Technologies | Summary

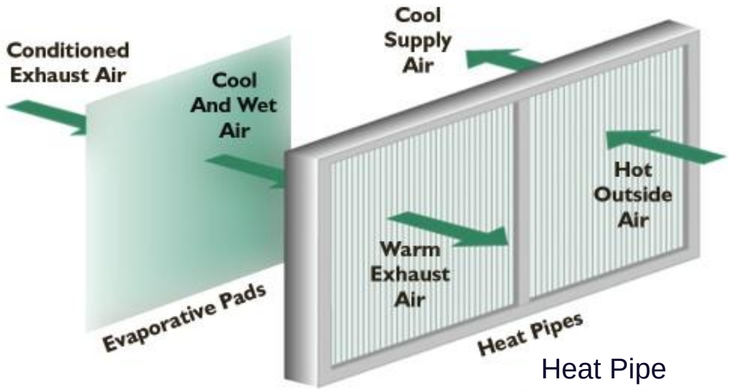
Runaround Coil
Sensible Only
40 > 50%
500-600 FPM



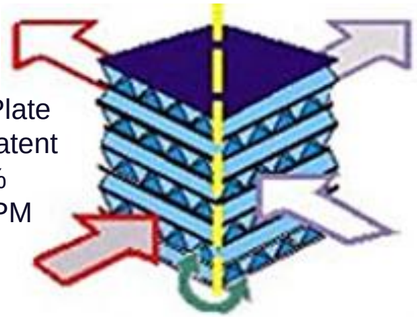
Fixed Plate
Sensible Only
50 > 70%
300-900 FPM



Energy Wheel
Sensible & Latent
70 > 80%
500 > 900 FPM



Heat Pipe
Sensible Only
50 > 60%
< 500 FPM



Membrane Plate
Sensible & Latent
70 > 80%
200-500 FPM

Ohio Hospital Association

UNITY IN ACTION

110TH ANNUAL MEETING & EDUCATIONAL SUMMIT

OHIO HOSPITAL ASSOCIATION

110th OHA Annual Meeting & Education Summit

Tuesday, May 20, 2025

Hyatt Regency Columbus
Delaware Room

75TH Anniversary

KETCHUM WALTON co.

EMPLOYEE OWNED for 25 YEARS

Innovative Solutions for Real World Problems

Speaker: Russ Elkins