

# WESTERN COOLING EFFICIENCY CENTER

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# WCEC Research Overview

## Current Research Areas

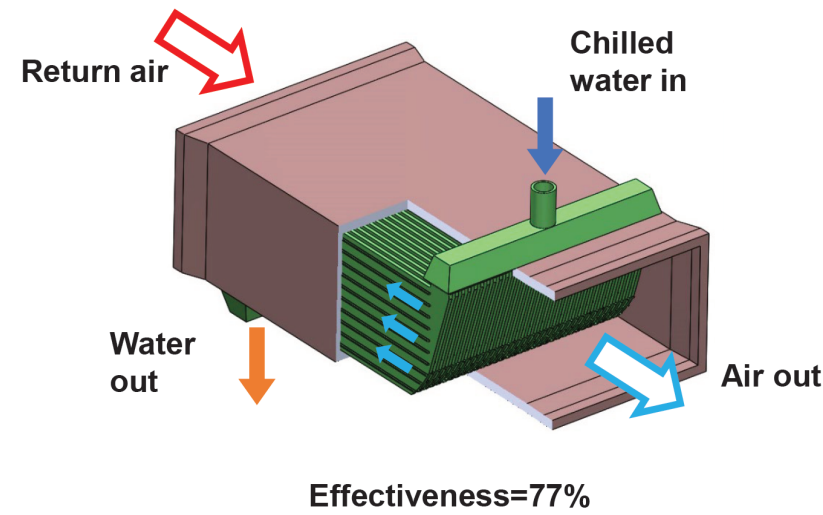
- HVAC Equipment and Systems
- Ventilation, Airflow, and Indoor Air Quality
- Whole Building Performance
- Industrial Processes and Agriculture

## Research Methods

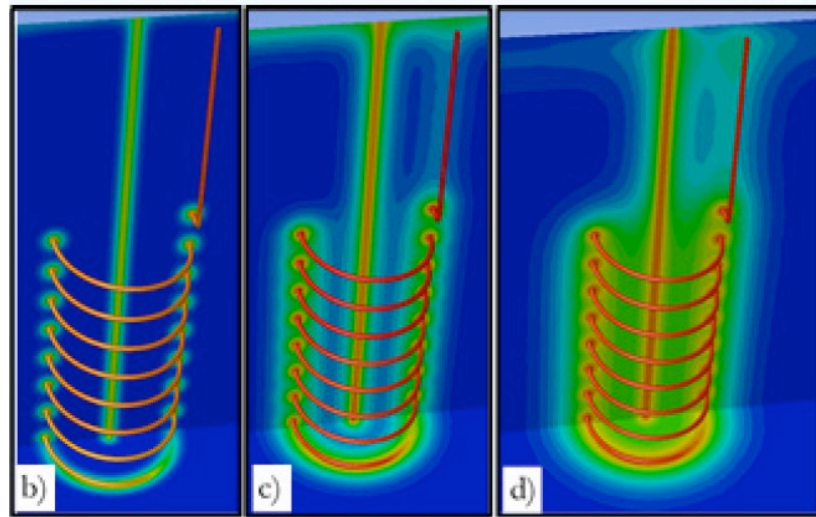
- Technology Development
- Modeling
- Laboratory Testing
- Field Testing
- Industry Alliances
- Standards Development
- Market Analysis
- Human Behavior Research
- Policy Analysis



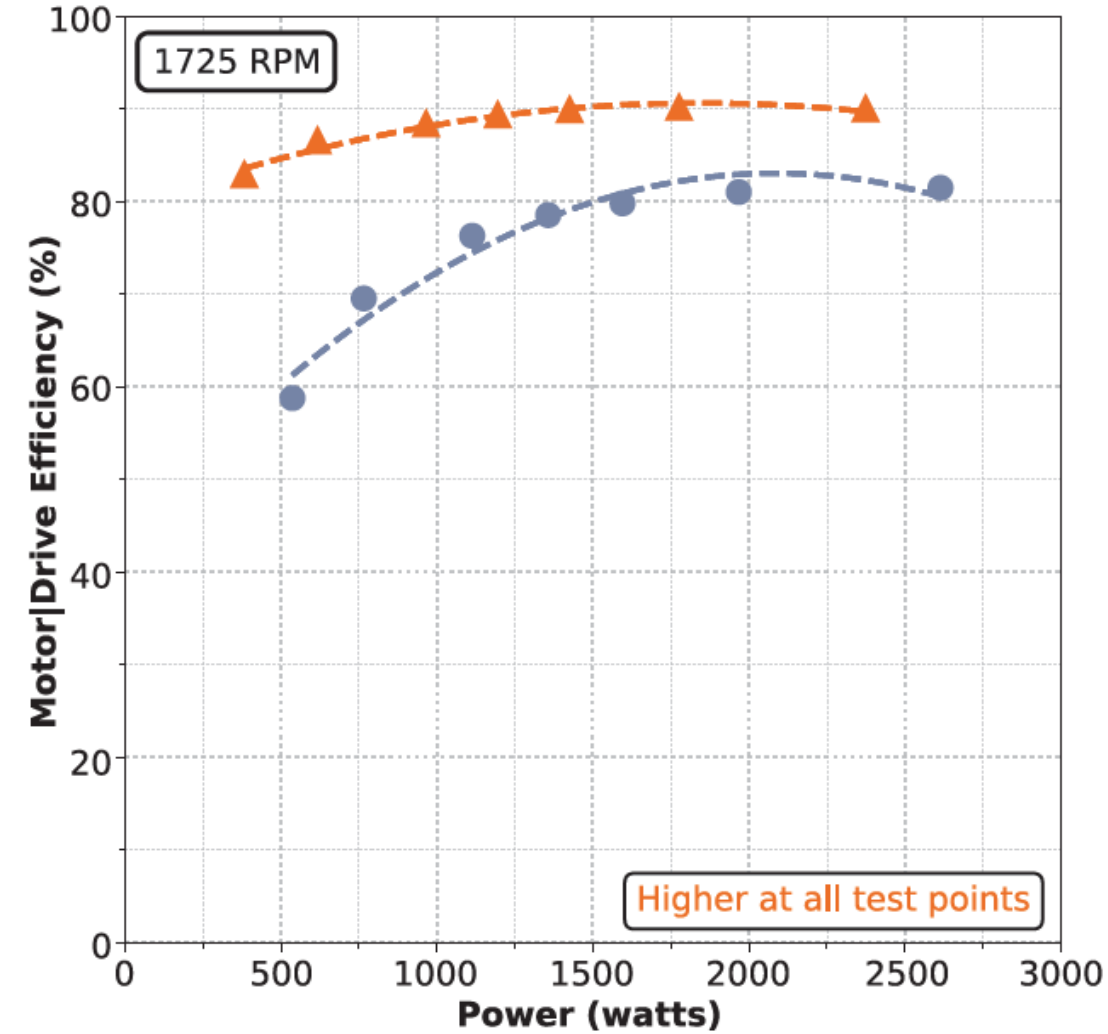
# HVAC EQUIPMENT AND SYSTEMS



**Advanced Microchannel Heat Exchangers**



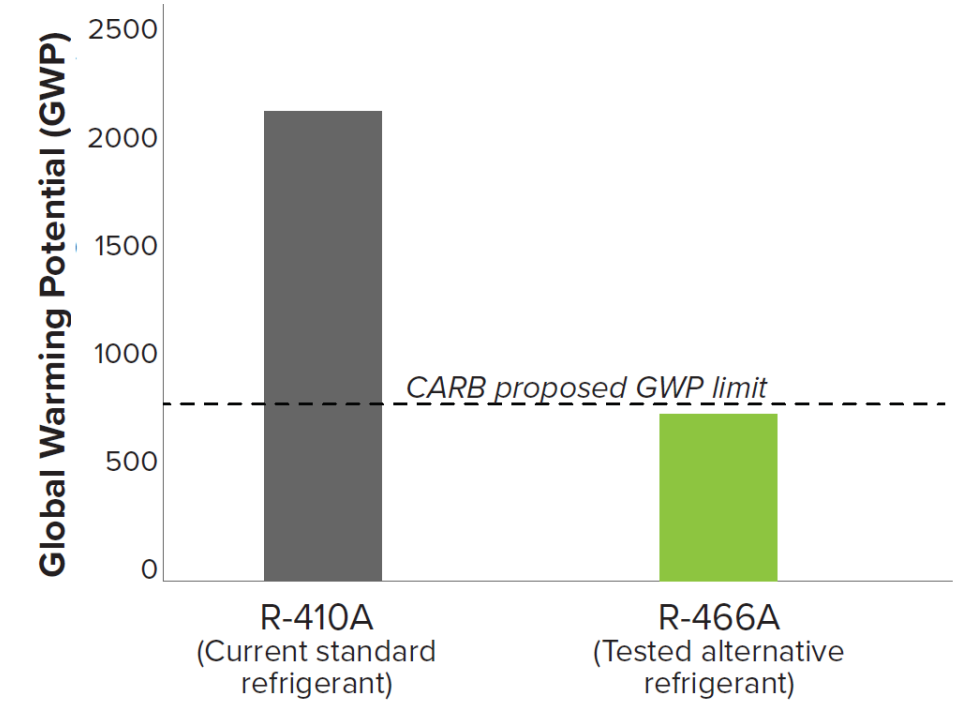
**Helical Ground Heat Exchangers**



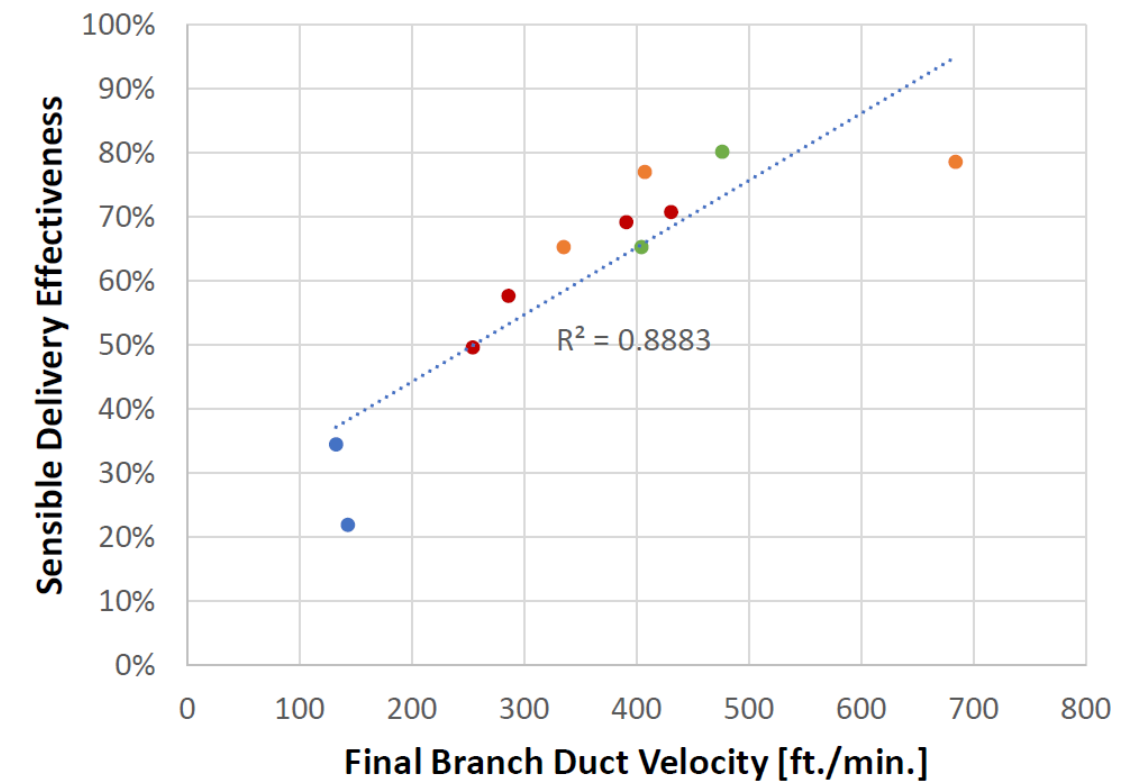
**High-Rotor-Pole Switched Reluctance Motors**

**Coming Soon:**

- *Residential Indirect Evaporative Cooler*
- *Sub-Wet-Bulb Evaporative Chiller*



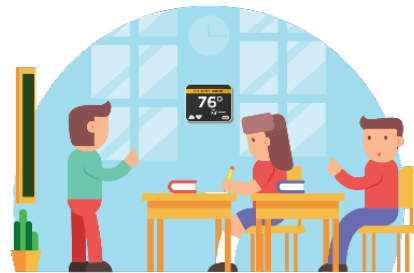
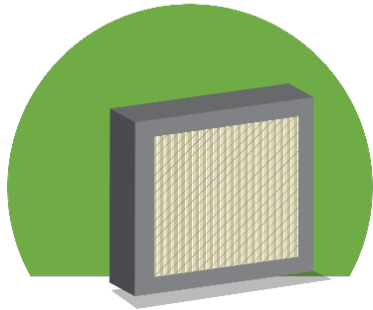
**Low GWP Refrigerants**



**Variable Speed Heat Pumps**



# VENTILATION, IAQ, AND AIRFLOW



## Ventilation in Schools

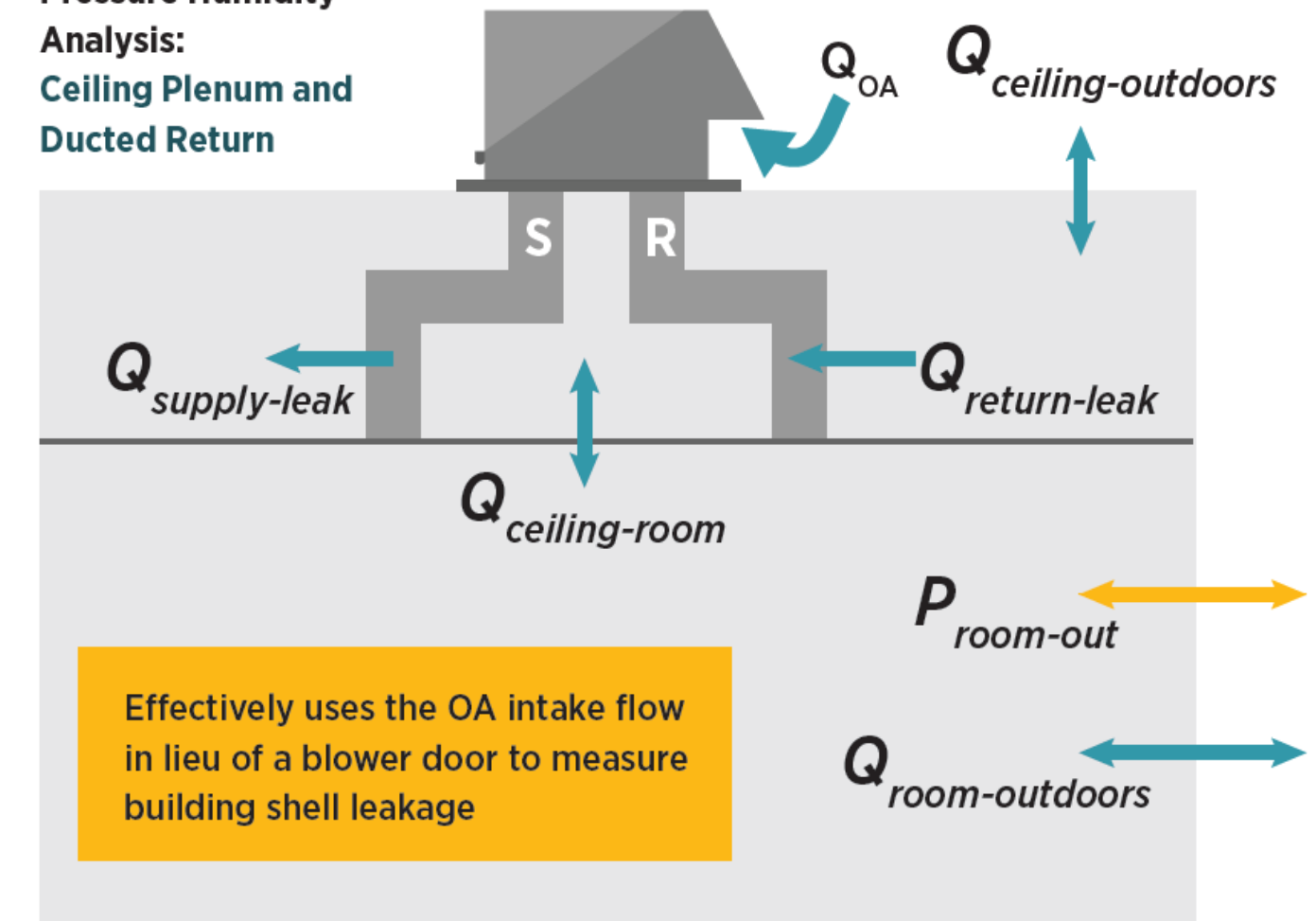


## Aerosol Envelope Sealing

### Coming Soon:

- *Citizen Science in Schools*
- *Demonstration of arbnco Indoor Air Quality Monitoring*
- *Aerosol Sealing Existing Homes*
- *Retrofitting Existing Uninsulated Walls with PCM-Enhanced-Insulation Solution*
- *Indoor Air Quality and Air-Tightness in Multifamily Buildings*

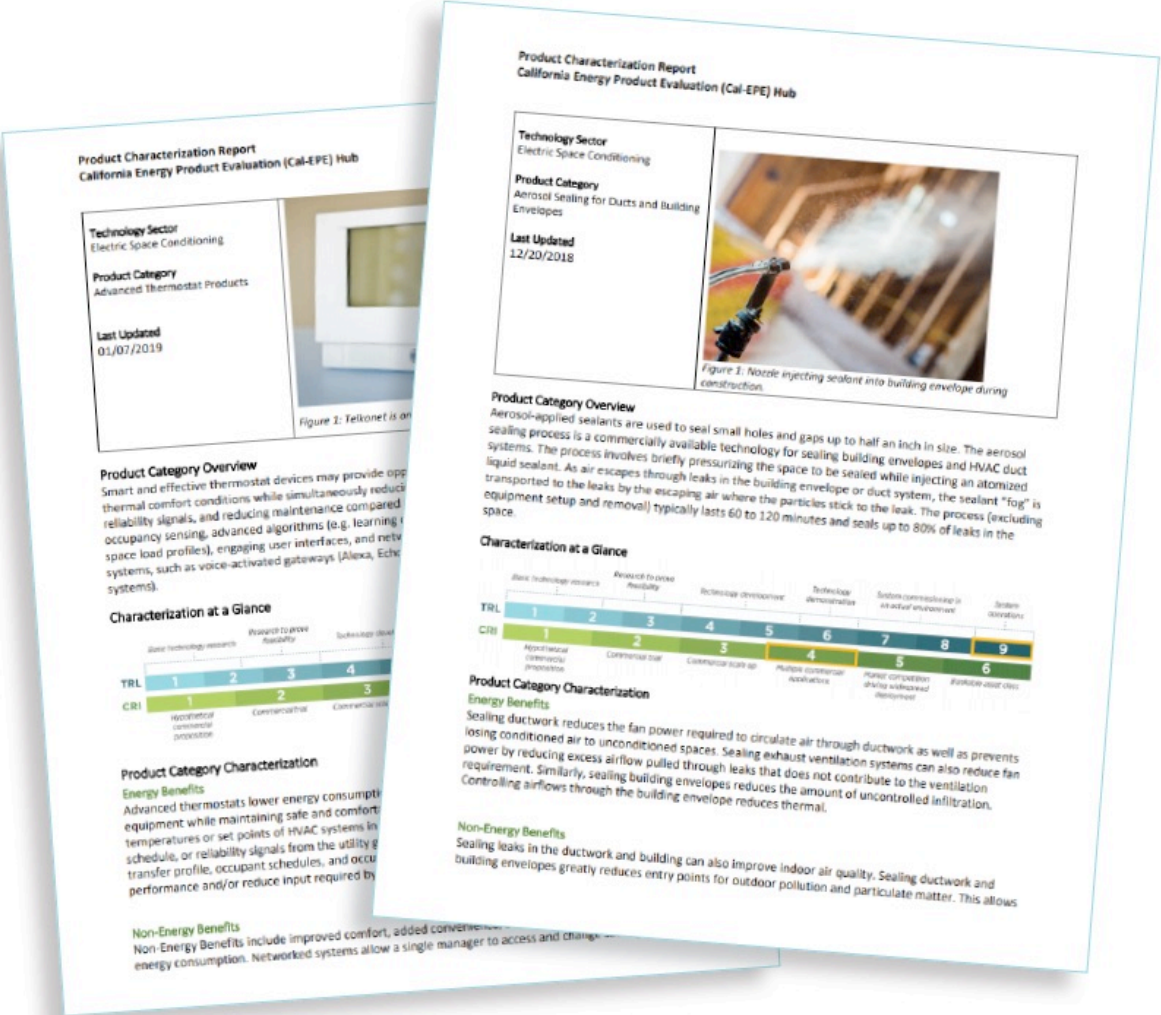
Pressure Humidity  
Analysis:  
Ceiling Plenum and  
Ducted Return



## Leakage Diagnostics



# WHOLE BUILDINGS

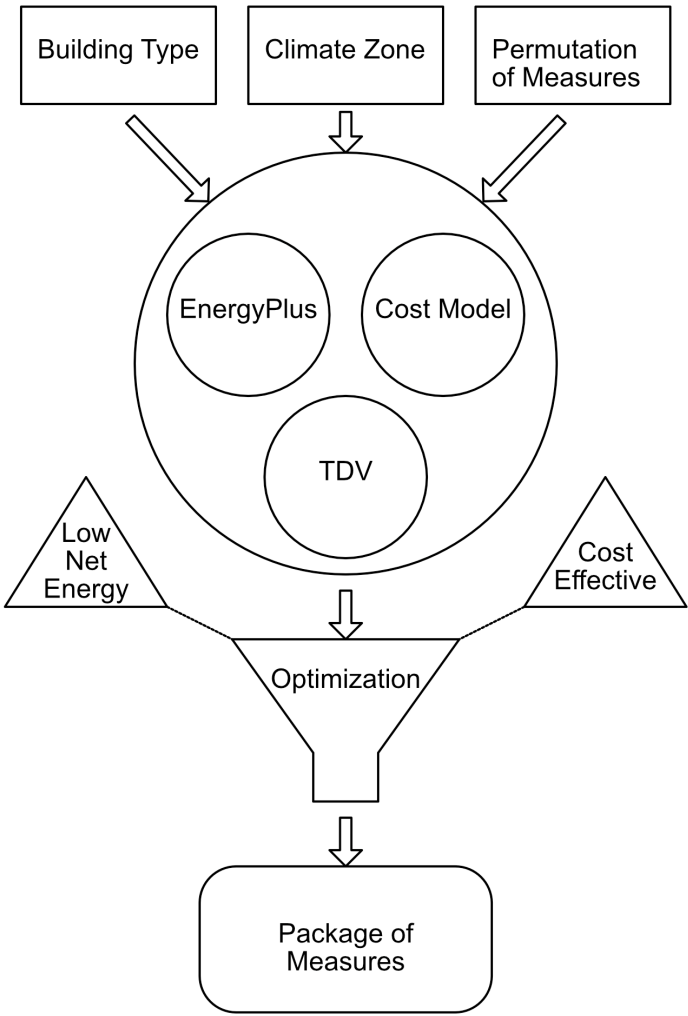


Cal-EPE Hub

## Coming Soon:

- Cal Test-Bed (Lab Testing for Emerging Tech)
- REALIZE (Zero-Net-Energy Multifamily Retrofits)

## Cost-Optimized ZNE in New Commercial Construction

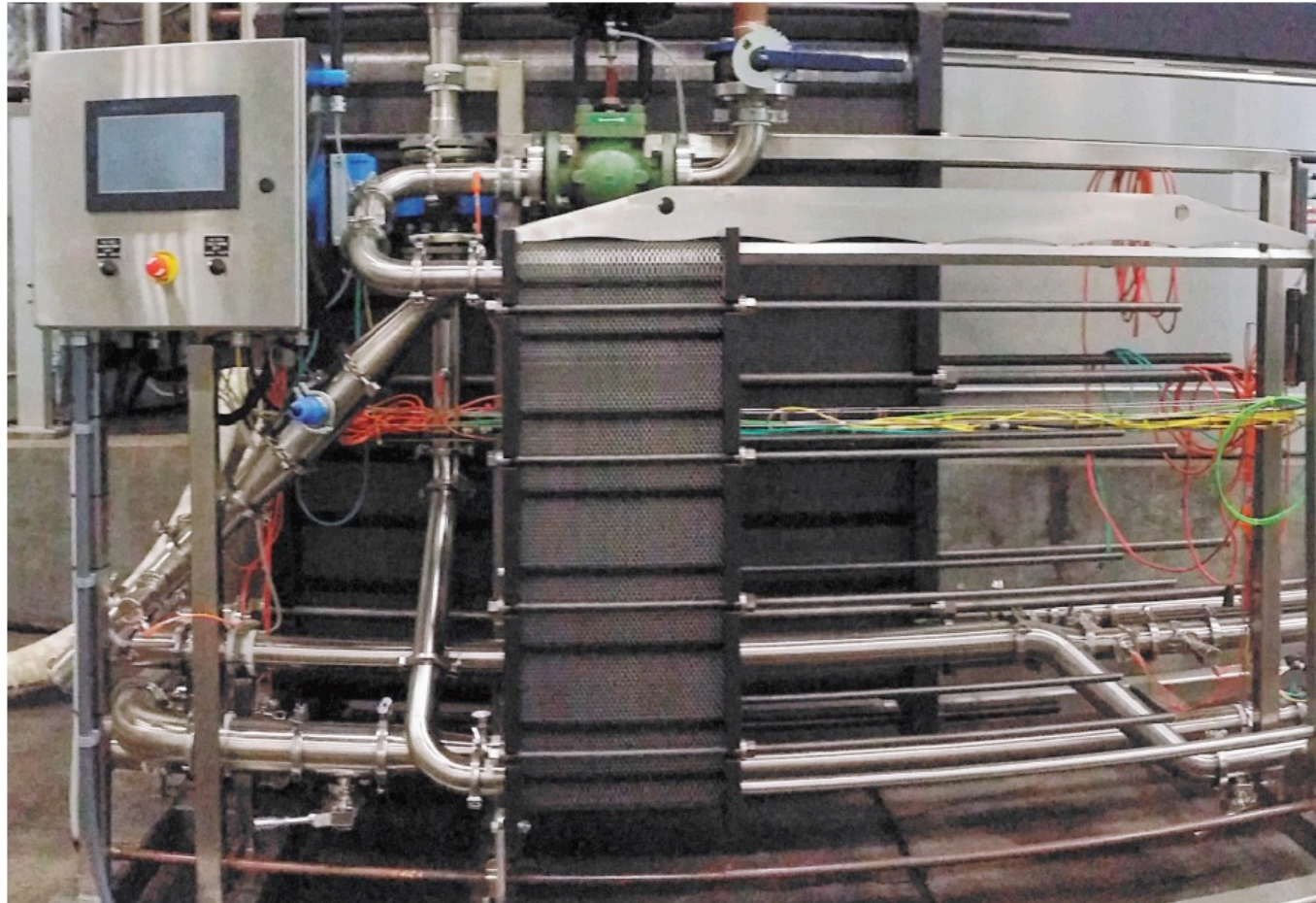


## Building Audit Tools





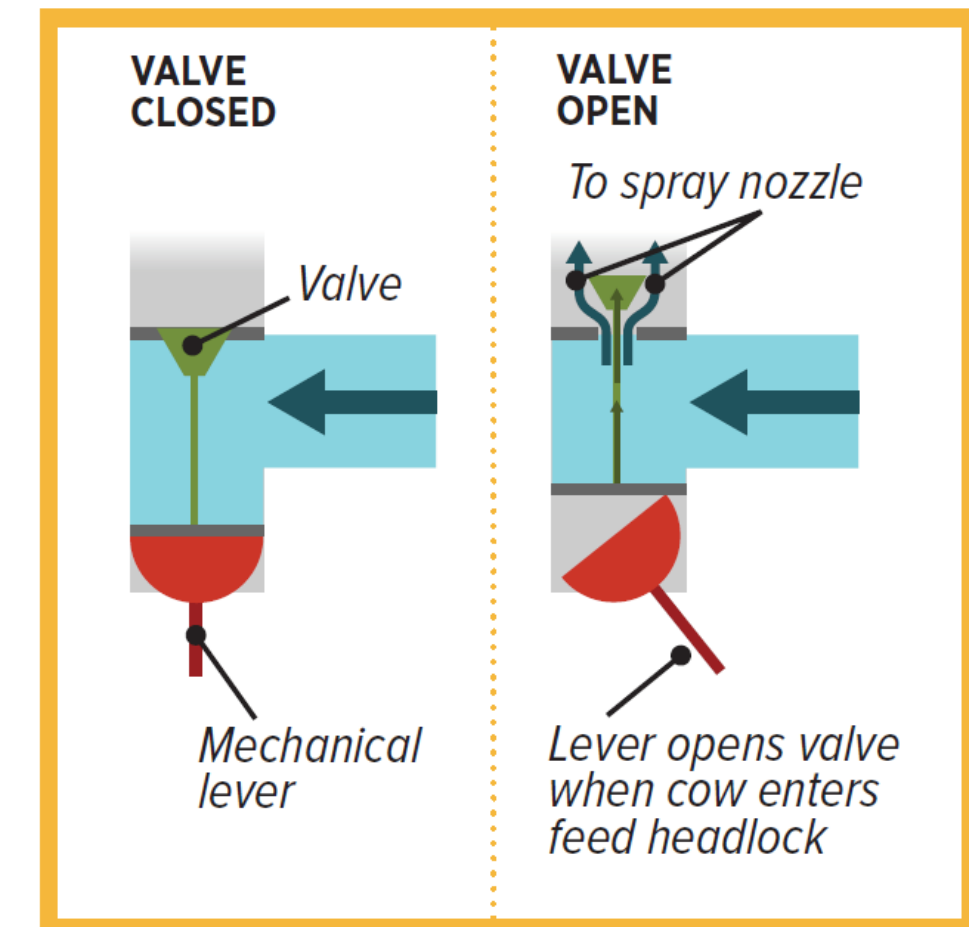
# INDUSTRIAL AND AGRICULTURE



**White Wine Processing**



**Cow Cooling**





CASE STUDIES | PRESS ARTICLES  
| NEWS | HVAC PRESENTATIONS |  
NEWSLETTER | REPORTS |  
PUBLICATIONS | INTERVIEWS |  
RESEARCH | EDUCATION |  
DEMONSTRATION BRIEFS |  
OVERVIEW | OUTREACH |  
MISSION | CONTACT | TECHNICAL  
SERVICE AGREEMENTS |

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TECHNOLOGY TOPICS | SECTOR  
RESEARCH | BEHAVIORAL  
RESEARCH | SYSTEMS  
INTEGRATION | CONTROLS |  
DEMAND SIDE MANAGEMENT |  
EVAPORATIVE TECHNOLOGIES |  
RADIANT COOLING | TITLE 24 |  
VIDEO PRODUCTION |  
MARKET TRANSFORMATION |