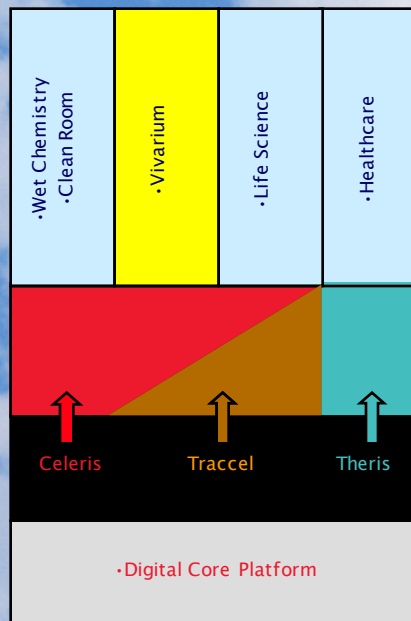


Vivarium Spaces

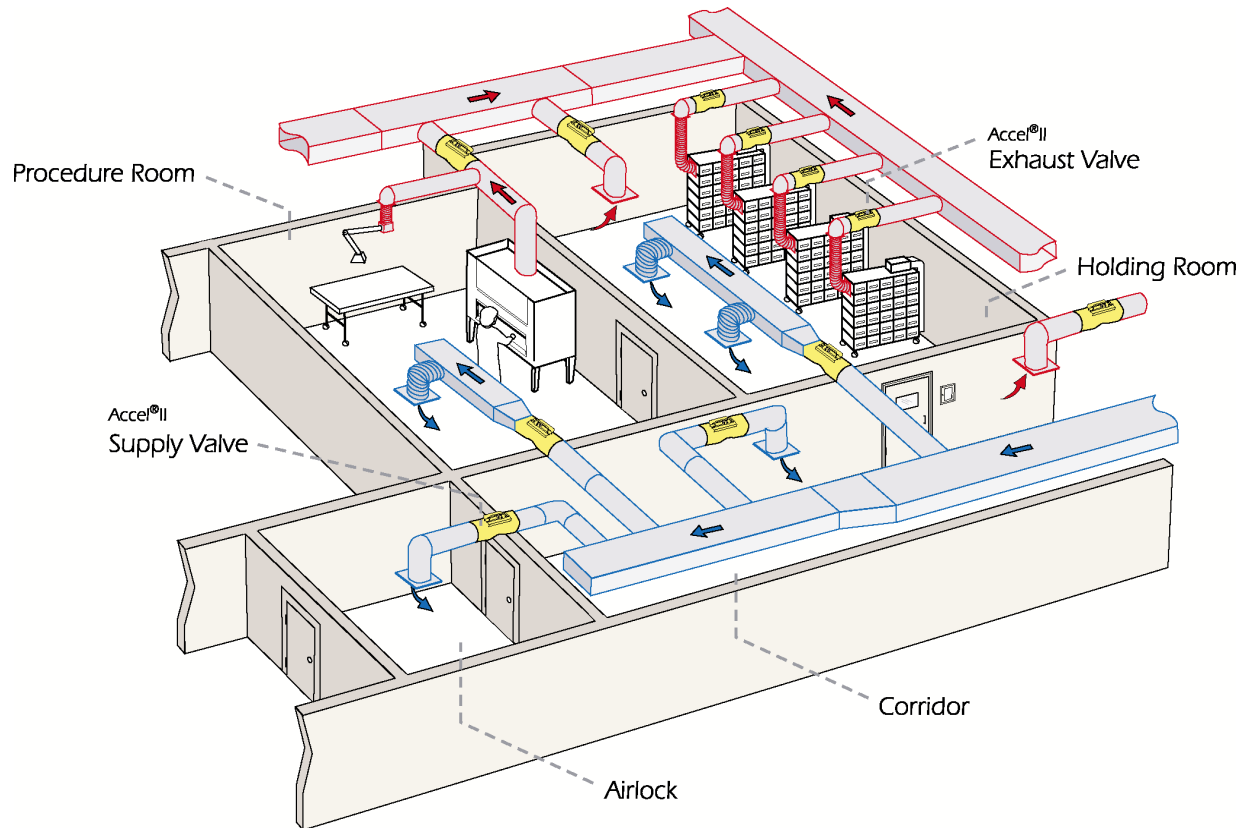
•Phoenix Controls—Proprietary and Confidential



ensuring environmental integrity



Primary objective



Stable Environment for Research

Environmental control criteria

■ ILAR

- The Guide for the Care & Use of Laboratory Animals

■ ASHRAE

- American Society of Heating, Refrigeration and Air-Conditioning Engineers, Inc. (www.ashrae.org)

■ NIH

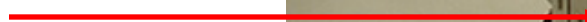
- Vivarium Design Policy & Guidelines

Macro- and micro-environments

**Macro-environment
(Room)**



**Micro-environment
(Cage)**



Ensuring Environmental Stability

- Temperature
- Relative humidity
- Room pressurization
- Ventilation

All of these parameters depend
on a stable airflow control system

Macro Environmental Requirements

Temperature Control

Room capability: 16 to 28°C

Maintain +/- 1°C of setpoint

Air change rates

Room: typically 10 – 18 ACH,
but less may be possible.

Do calculations to verify room ACH

Pressurization

Room: + or -

Cage: almost always +

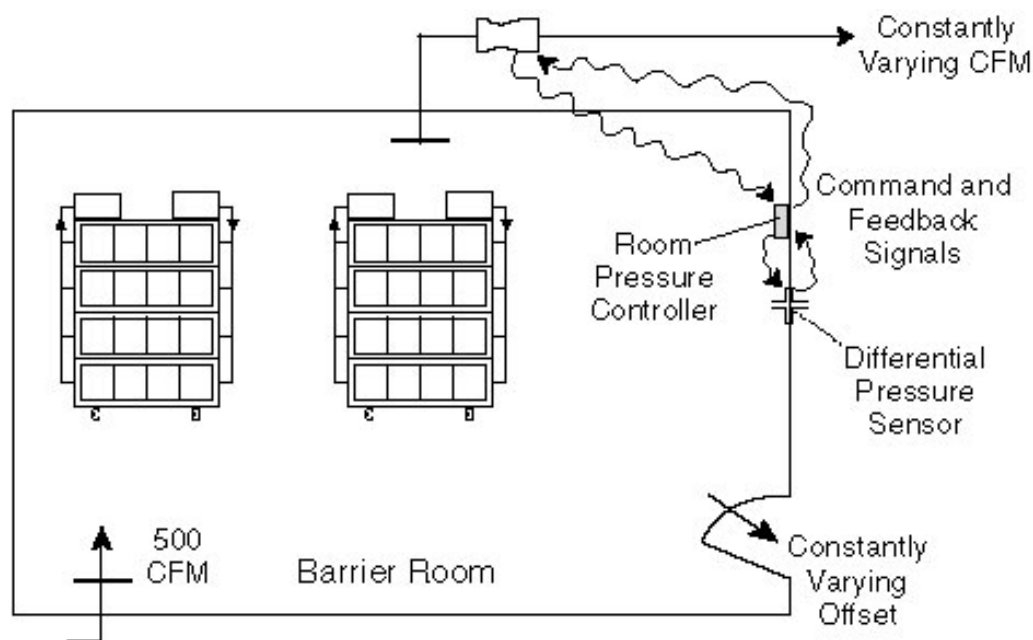
Relative Humidity

30 to 70% +/- 10%

Setpoint ~ 45 to 50%

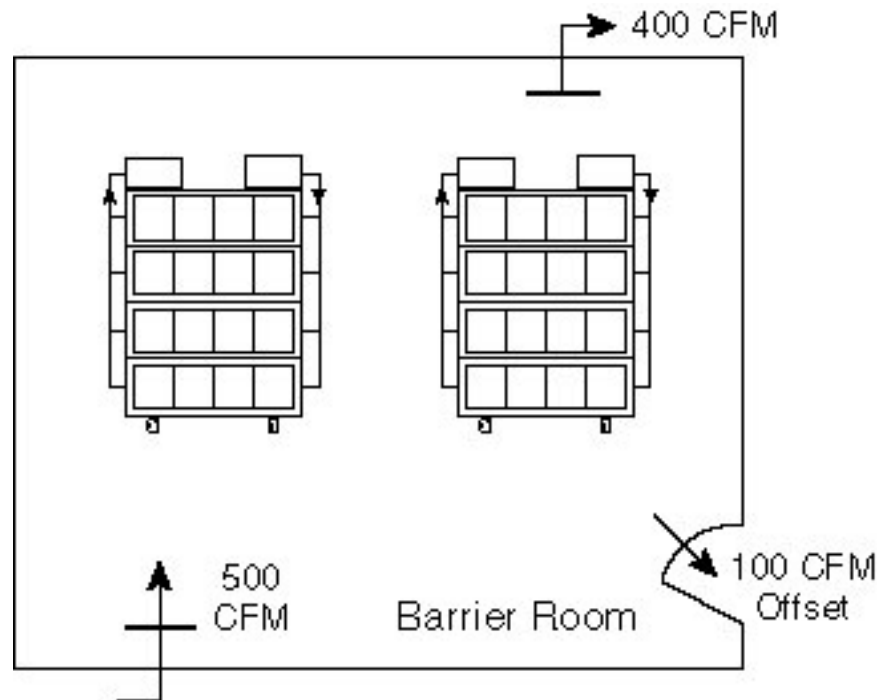


Differential Pressurization Control



Differential Pressure Sensing Control

Volumetric Offset Control



Volumetric Offset Control

Micro Cage Environments

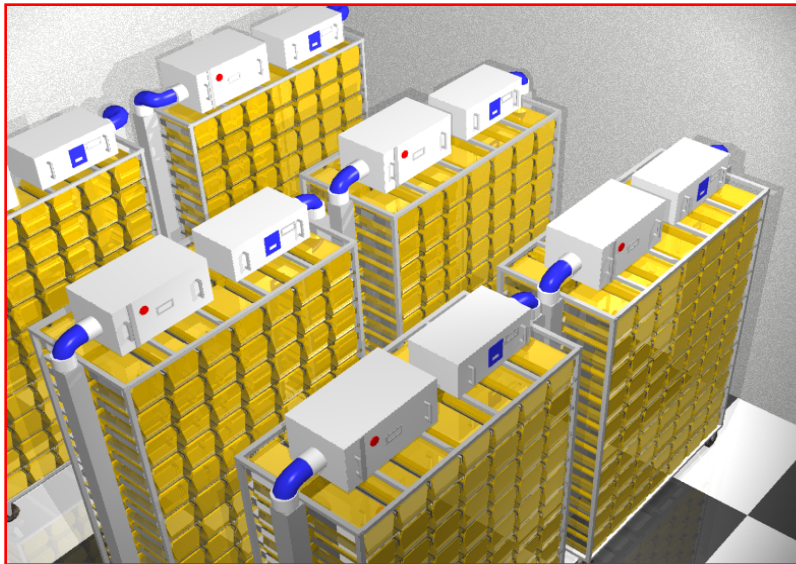


Static, filter-top cage

Micro Environment Requirement

- Stable environment for animal is critical
- Air velocity must be constant
- High air change rate: 30 - 90 ACH
- High ACH is not high flow!
 - Less than 1 CFM per cage
- Insufficient flow results in ammonia generation (keep cage RH <55%)

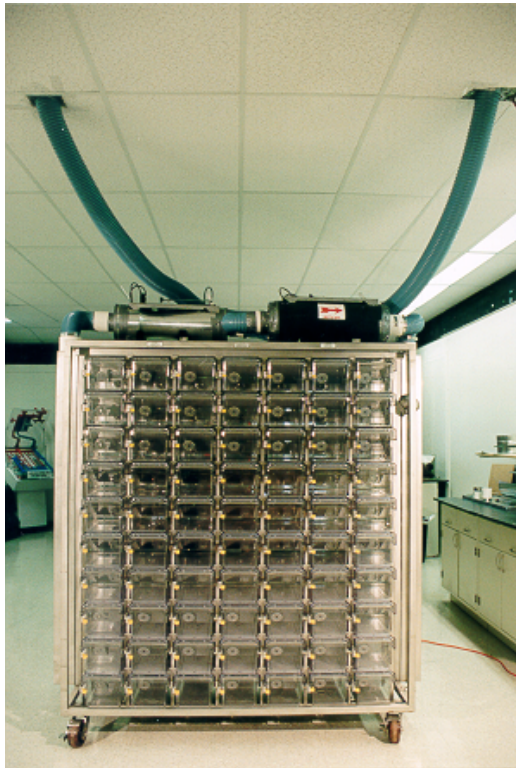
Traditional Racks with Fans



**Supply and exhaust fans
include HEPA filters.**



Why Connect Racks To The Building Ventilation System?



- Reduces odors
- Reduces transfer of pheromones
- Extremely quiet & no vibration
- Automatically adjusts for pressure changes in duct
- Does not require power or signal
- Reduces heat load in rooms
- Does not require rebalancing
- Less costly than rack fans
- Cleaner holding rooms

Cage Rack Connection Options

- Constant Volume Connects
- Thimbles
- Self-balancing valves with load simulators
- Self-balancing valves only

“Constant volume” connection to building exhaust system



Dynamic situations change flows

Thimble & Capture Hood Connections



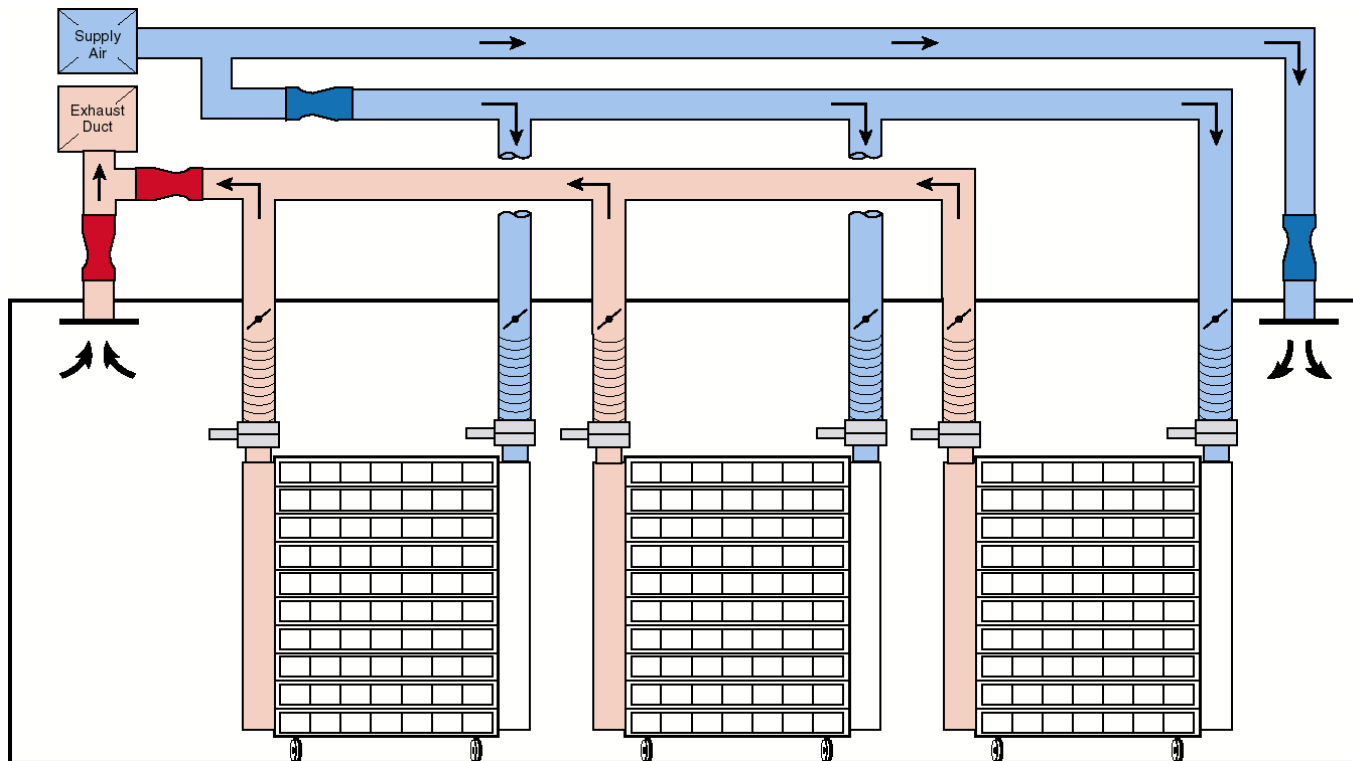
- Most expensive first & operating cost
- Lots of hardware, cords and outlets
- Noise and vibration of fans
- Heat load of fans

Automatic Self-balancing Valve

- Automatically adjusts for changes
- Does not require power or signal
- Does not require rebalancing
- Extremely quiet & no vibration

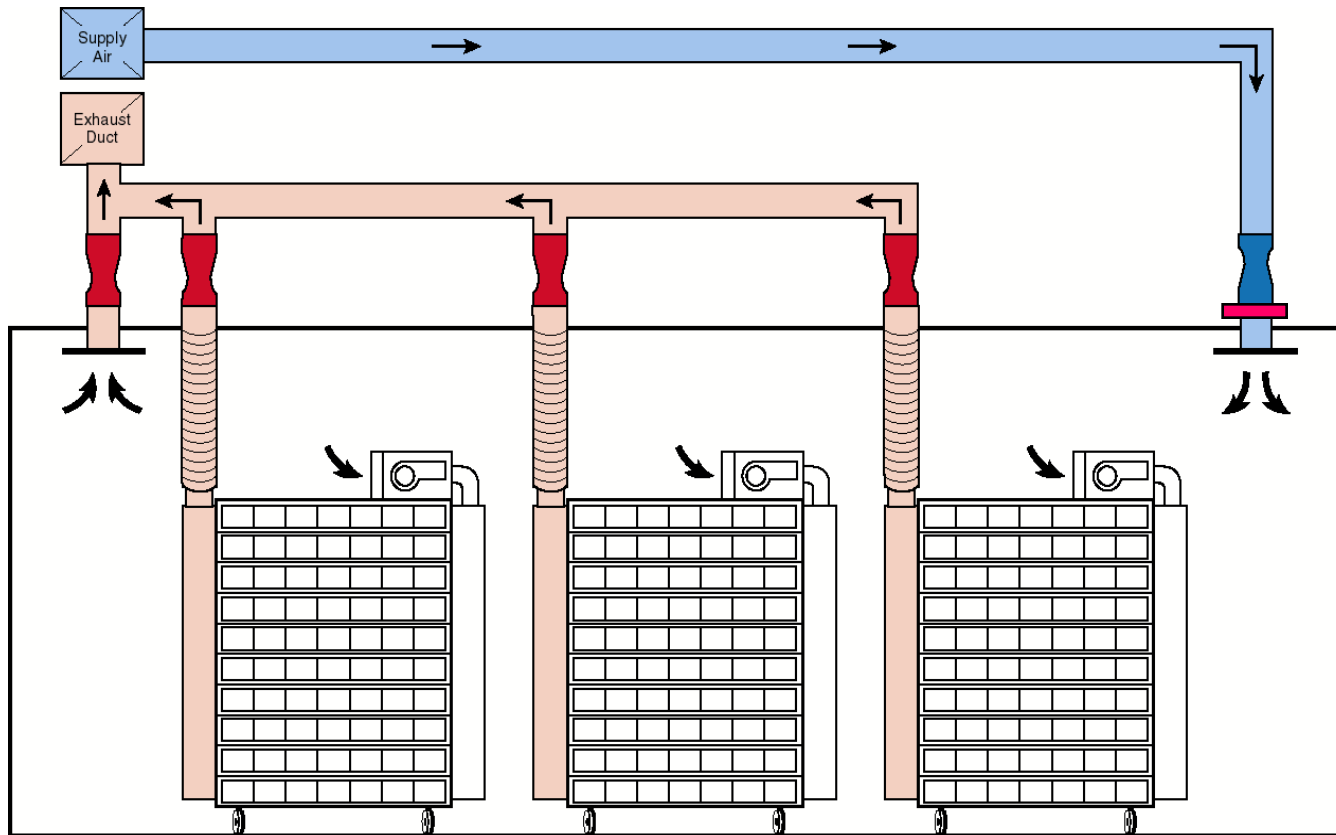


Venturi Valves w/load simulators



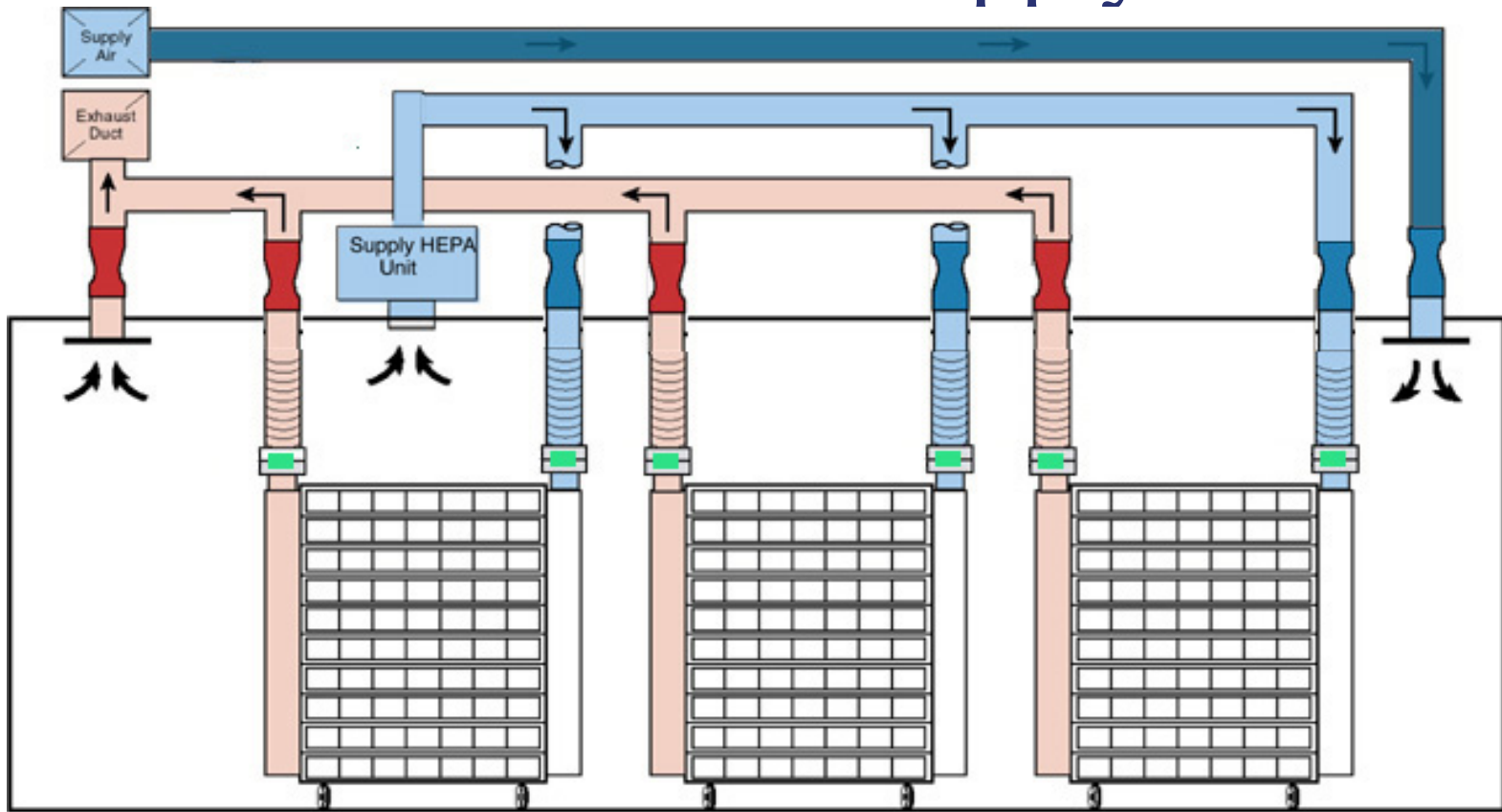
Tedious manual balancing for each drop to rack
Changes after balancing affect the whole manifold

Exhaust Only



No balancing required!

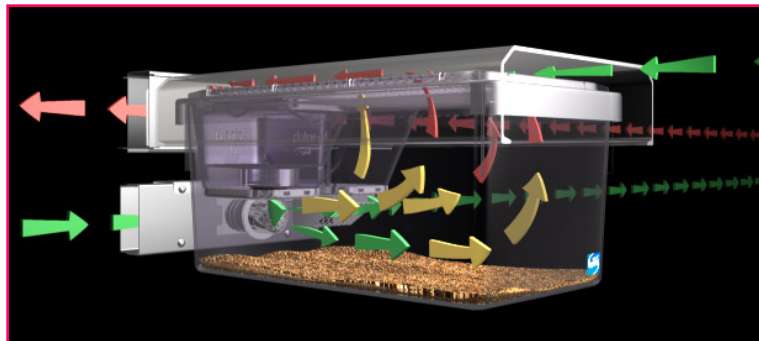
Exhaust and Supply



Stable cage control. temperature and humidity – Balanced air flow rates

Conclusion

- Industry trend is to connect racks to building ventilation
- Continuous air balance is critical
- Understand your rack performance specifications
- Determine how you will control and monitor your ventilated rack system



Thank you

Question

•Phoenix Controls—Proprietary and Confidential

ensuring environmental integrity

