Ventilation Solutions for Hospitality Applications

A presentation on the unique ventilation challenges today’s multi-unit, high variable occupancy buildings present, and the solutions that address these challenges.

- Hospitality buildings’ unique challenges and opportunities.
- Solutions for saving energy and improving IAQ
- Addressing existing buildings
American ALDES Ventilation Corporation

Leaders in Ventilation Energy Efficiency

- Invented low-cost passive control solutions (CARs) to control central exhaust and supply systems.
  - Millions sold for 1000’s of projects.

- Many projects independently evaluated and certified.
  - NAHB
  - PG&E
  - NYSERDA/SWA

- Provide tools to model the energy savings (AVCE Calculator)

- Invented Demand Control Terminal Solutions (ZRTs, OSG, etc.) boosting energy savings by 50% beyond continuous operating systems.

Ventilating Hotels

Why are we concerned with hotel ventilation strategies/methods?

- Energy Efficiency
- Guest Experience
  - IAQ
  - Overall quality perception
Energy Efficiency

Ventilation (Air Renewal) contributes ~42% to total building energy consumption.

- Fan motor operation
- Heating, Cooling, Dehumidification loads.
Guest Experience

- Poor ventilation, odors, discomfort are reported as a top 3 guest complaint.
- Millions $$$ spent on deodorizers and cover-ups.
Energy Efficiency & Odor Control

Ventilation Air Control
- Precise automatic regulation is the key
- Eliminate over-ventilation which wastes energy.
- Ensure proper ventilation rates for odor and IAQ control.

Precision Airflow Challenge
- Guest control of the ventilation (bathroom fans) is unreliable and creates pressure variations between rooms (cross contamination risk).
- Central systems put the hotel in control of ventilation, but many factors affect their operation.
  - Stack effect
  - Wind effect
  - Operable windows
  - Poor installation and maintenance
**Energy Efficiency & Odor Control**

- **Goal** = to provide **balanced and regulated** exhaust and makeup air from/to each space and the allowable prescribed rate at all times.

- **Eliminate**
  - Over ventilation (energy)
  - Under ventilation (IAQ)
  - Cross contamination (IAQ)
Solution: Dynamic System Control

- A *dynamically vs. statically* controlled system can eliminate: environmental factors, occupant tampering, and recalibration concerns.
- Constant Air Regulators
Solution: Dynamic System Control

Dynamic Pressure-Independent Control

- Replaces existing “static” exhaust and supply grilles
- Automatically adjusts to changes in pressure
- Compensates for the effect of stack and other environment-related pressures
  - Allows fan operation at lower pressure. Simplifies building pressurization control
  - Eliminates cross-contamination (IAQ)
- Improves life safety system operation
- Reduces drafts
- Saves energy
### Solution: Dynamic System Control

<table>
<thead>
<tr>
<th>Configuration</th>
<th>Exhaust</th>
<th>Supply</th>
<th>Round</th>
<th>Square</th>
<th>With Grille</th>
<th>Without Grille</th>
<th>New Construction</th>
<th>Retrofit</th>
<th>Standard, Low- or High-Pressure Models</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAR-II Constant Airflow Regulator</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>CAR-SII Constant Airflow Regulator Square</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>CAR-FEA II Constant Exhaust Regulator w/FO</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>CAR-FSA II Constant Supply Regulator w/FO</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>CER-SII Constant Exhaust Register</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>CER-R II Constant Exhaust Register</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>CSR-SII Constant Supply Register</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>CSR-R II Constant Supply Register</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>CSR-FEA II Constant Exhaust Register w/FO</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>CSR-FSA II Constant Supply Register w/FO</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>CERR-B II Constant Exhaust Register Box</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>CSRB-II Constant Supply Register Box</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
</tbody>
</table>

- **CAR-II Features**
  - Made of self-extinguishing ABS/PC polymer with a flammability rating of 94 5VB
  - UL 2043 classified for discreet products inserted in ductwork

- **Available Configurations**
  - Exhaust or **Supply**
  - Round or Square
  - With or Without Grille
  - With or Without Fire Damper
  - New Construction or Retrofit
  - Standard, **Low-** or High-Pressure Models
Energy Efficiency

Dynamic Pressure-Independent Control

- How much energy can you save?

- Many factors determine actual savings (utility costs, HVAC efficiencies, etc.)

- Average annual energy savings range from $15 to $25+/CFM
### Stack Effect Calculator

**Ex. Hyatt McCormick Chicago. 400Ft. Elev 50 cfm per room.**

**Annual Savings Est. = $95.12 per room by eliminating stack effect on the ventilation system.**
Demand Control

Reducing the Ventilation Energy Impact
Does the IMC or ASHRAE require constant ventilation?

- NO????
  - Continuous mechanical ventilation is required when the space is occupied.
  - Bath and Kitchen exhaust only required when contaminants exist

According to AHLA, Hotels rooms are unoccupied 72% of the time
Solution: Demand System Control

Why Demand Control?

- Ventilate when and where you need it.
- Save Energy
- Ultimate ASHRAE Goal

Ex. 100 room hotel Boston...51% energy savings based on 30% occupancy
Solution: Demand System Control

- Key Product:
  - Zone Register Terminal (ZRT)
- Ventilate based on occupancy zone
  - Exhaust and supply air
  - Demand controlled
    - External Input
    - Timer or Switch
  - Compatible with:
    - Occupancy sensors
    - Humidity sensors
    - CO₂ sensors
Solution: Demand System Control

Damper Closed
Precisely Regulated
Low Volume

Minimum Flow CAR-II

Damper Open
Precisely Regulated
High Volume

Maximum Flow CAR-II
Solution: Demand System Control

- ZRT-Wireless (Communication)
  - Telkonet
  - InnCom (Honeywell)
  - Magnum Energy
  - ETG
15A - Mechanical Systems

2. Guestrooms Supply Ventilation:
   a. Type: Provide wall-mounted Zone Register Terminal (ZRT-1-4-120) manufactured by American ALDES (www.americanaldes.com) in the entry vestibule ceiling and connect to the guestroom control system.
   b. Set each ZRT to shut off airflow when the guestroom is unoccupied and automatically supply a regulated volume of 35 cfm when occupied.

3. Corridors: Provide a minimum 3 air changes per sensors, locate a maximum of one per 700 m² (7,500 sq ft).

K. Guest Bathroom Exhaust:
   1. Type: Provide ceiling mounted Zone Register Terminal (ZRT-1-4-120) manufactured by American ALDES in the shower compartment connected to the light switch and subducted into vertical sheet metal exhaust risers to roof-mounted exhaust fans.

   a. Set each ZRT to shut off airflow when the bathroom is unoccupied and automatically regulate the airflow at 68 m³/hr (40 cfm) when occupied.
   b. Control by light switch.
   c. Where sub ducts are not allowed, install motor operated fire/smoke damper at shaft wall.
   d. Coordinate access panel location and appearance with MJ Interior Design.

2. Roof Mounted Exhaust Fans: Size fans at 80% of the...
Energy Recovery

Further Reducing the Ventilation Energy Impact
Solution: *Energy Recovery*

Replace....

With....
Solution: Energy Recovery

Save an additional 25%-50% of the energy consumption
Solution: Energy Recovery

Recover energy and heat

- **Heat Recovery Ventilator (HRV)**: Transfers sensible heat energy from warm air to cold air.
- **Energy Recovery Ventilator (ERV)**: Transfers sensible heat energy from warm air to cold air; and transfers moisture-latent energy from moist air to dry air.
- Models range from 60 to 11,000 CFM
- Custom solutions – one size does not fit all
Existing Building Challenges

What to look for in Retrofit Projects
Ex. Boston Sheraton
Existing Buildings – (Ex. Sheraton Boston)

- Energy Savings Validated
- Prepared by DMI (Demand Management Institute) for NSTAR
- Parameters
  - Exhaust fans only run from 5am to 10pm (off at night when occupancy is highest?)
  - 7 hours of positive pressurization (supply fans to corridors run all the time)
  - Current average exhaust rate = 81 cfm per room (typical of many existing properties) Why?

Sheraton Boston Hotel
39 Dalton Street, Boston, MA 02199-3901

Engineering Services Study
Submitted to NSTAR for consideration and approval within the NSTAR – Commercial & Industrial: Retrofit Program
January 7, 2015
Existing Buildings – (Ex. Sheraton Boston)

- Recommendations
  - CER-S constant exhaust registers (Est cost $40K)
  - Reduce fan rpm to match pressure and install labor (Est cost $60K)
  - PAYBACK = 1.4 years (without rebates)

Executive Savings Summary

This report considers the energy savings associated with a ventilation reduction project at the Sheraton Boston Hotel. The hotel plans on retrofitting the bathrooms in the North Tower with constant exhaust register grilles that maintain a constant, uniform exhaust airflow of 40 CFM per room. The building currently operates at an average exhaust rate of 81 CFM per room. Energy savings will result from reduced fan demand along with reduced ventilation heating and cooling loads.

This measure is being considered under NSTAR’s retrofit program and recommendations are made based on energy savings, cost, and length of payback period.

Table 0-1 below shows a summary of the measure savings, including energy savings, cost, and payback.

<table>
<thead>
<tr>
<th>ECM</th>
<th>Measure Description</th>
<th>Utility Savings</th>
<th>Est Cost ($)</th>
<th>Payback years</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Guest Room Ventilation Reduction</td>
<td>46,230 therms</td>
<td>191,618 kWh</td>
<td>$69,225</td>
</tr>
</tbody>
</table>
Existing Buildings

- Steps to maximizing energy savings and improved IAQ potential
  - Ensuring code compliant rates (ASHRAE, IMC)
  - Site evaluation and survey
  - Product Selection
  - Installation and inspection
Existing Buildings

- Site Evaluation and Survey (available online)

**American ALDES Building Survey Form**

**PURPOSE OF BUILDING SURVEY**

American ALDES manufactures airflow regulating products for both new and existing building ventilation systems. Existing ventilation systems vary from building to building, often requiring specially adapted products to ensure proper installation and performance. In order to select the right product for an existing system, please complete the following survey and fax to 941-351-3442 or e-mail to info@americanaldes.com. If possible, please include photos that may help clarify any special circumstances that the survey form may not reveal.

Once the form has been reviewed by the factory, it may be necessary to build a sample product for trial installation in the building to ensure that all necessary installation factors are addressed.

**DISCLAIMER:** The information provided is not the responsibility of American ALDES Ventilation Corporation. Any discrepancy found among the actual building, survey information, and product provided by the factory is borne by the individual conducting the building survey.

**GENERAL INFORMATION**

<table>
<thead>
<tr>
<th>PROJECT NAME</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>LOCATION</td>
<td></td>
</tr>
<tr>
<td>CONTACT NAME/PHONE/E-MAIL</td>
<td></td>
</tr>
<tr>
<td>ESTIMATED QUANTITY NEEDED</td>
<td></td>
</tr>
<tr>
<td>BUILDING DESCRIPTION</td>
<td></td>
</tr>
</tbody>
</table>

**Wall Mount**

- Round Take-Off from Shaft/Riser
- Square or Rectangular Take-Off from Shaft/Riser
- Direct Opening into Shaft/Riser
- Sub-Duct in Shaft/Riser

**Ceiling Mount**

- Round Take-Off
- Square or Rectangular Take-Off

**Opening Dimensions**

| Widths (W) |  |
| Height (H) |  |
| Depth (D) |  |
| Nominal Diameter (ID DIA) |  |

* See page 4 if fire dampers or other obstructions are present.

Provide exact dimensions in inches.
Existing Buildings

- Completed surveys are important
- Take pictures
- Send design files, or preferably as-built drawings.
Existing Buildings

- Look for the presence of all items in the duct...

Fire Dampers

Framing
Existing Buildings

- Look for gaps, broken duct, obstructions, etc.
- Openings must be sealed in order for system to perform.
Existing Buildings
Existing Buildings

- Duct cleaning and sealing may be required.
- Contact the factory for assistance.
Existing Buildings

- Grilles upside down, clearances in expensive wall surfaces, etc
Existing Buildings

- Poor ductwork, broken fan belts, etc.
Factory Support Available

- Energy calculations
- Product Selection
- Installation Oversight/Project Management
- Local Distribution (New Construction)
- Suppliers Connection (Hilton)

Factory Contacts:

Jim Jacobson  
Strategic Account Manager  
Jim.jacobson@aldes.com

John Harrell  
President  
John.harrell@aldes.com

Phone: 941-351-3441
Website: www.Aldes.us
<table>
<thead>
<tr>
<th>Many recent project references</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ritz-Carlton Amelia Island, FL</strong></td>
</tr>
<tr>
<td><strong>Hilton Garden Chicago</strong></td>
</tr>
<tr>
<td><strong>Chicago Hilton Chicago</strong></td>
</tr>
<tr>
<td><strong>Courtyard Macon Macon, GA</strong></td>
</tr>
<tr>
<td><strong>Courtyard Norwalk Norwalk, CT</strong></td>
</tr>
<tr>
<td><strong>Courtyard West Palm Beach, FL</strong></td>
</tr>
<tr>
<td><strong>Embassy Suites Pittsburgh</strong></td>
</tr>
<tr>
<td><strong>Hampton Inn Wichita, KS</strong></td>
</tr>
<tr>
<td><strong>Hampton Inn Albuquerque, NM</strong></td>
</tr>
<tr>
<td><strong>Hilton Garden Chicago</strong></td>
</tr>
<tr>
<td><strong>Hilton Garden Inn Rochester</strong></td>
</tr>
<tr>
<td><strong>Hilton Grand Vacations NYC</strong></td>
</tr>
<tr>
<td><strong>Hilton Grand Vacations Las Vegas</strong></td>
</tr>
<tr>
<td><strong>Hilton Times Square New York</strong></td>
</tr>
<tr>
<td><strong>Hilton-Atlanta Atlanta</strong></td>
</tr>
<tr>
<td><strong>Hilton Buckhead</strong></td>
</tr>
<tr>
<td><strong>Hilton-NY/NYC NYC</strong></td>
</tr>
<tr>
<td><strong>Hilton-Orlando Orlando</strong></td>
</tr>
<tr>
<td><strong>Marriott Texas Medical Center Houston, TX</strong></td>
</tr>
<tr>
<td><strong>Hyatt Place Chicago</strong></td>
</tr>
<tr>
<td><strong>JW Marriott Austin, TX</strong></td>
</tr>
<tr>
<td><strong>JW Marriott Lasalle St., Chicago</strong></td>
</tr>
</tbody>
</table>
Recent Project References (Boston Area)

- Westin Waltham
- Sheraton Needham
- Sheraton Boston
- Hyatt Regency Cambridge
- Boston Marriott Copley Place
- Canal Lofts
- Residence Inn Rockland
- Mass Mills Rehab
- LBJ apartments
- Castle Square
- Revere Housing
- NE University Dorm
- 201 Onset Ave Apts
- Tata center MIT
- Cromwell Apartments
- Hyannis
Questions?