Ventilation
The Vital Fuel For Your Hatchery

Presented by
Dr. Keith Bramwell and Phillip Perry
Ventilation

Definition:
The process by which ‘clean’ (outdoor) air is intentionally provided to a space and stale air is removed.

Purpose:
To provide oxygen for metabolism and to dilute or remove metabolic pollutants (carbon dioxide and odor).
Ventilation is fuel for Incubation.

No matter the hatchery size or the species being hatched, accurate temperature, humidity and controlled air ensures the success of hatching.

Ventilation is everything done to condition the air.
Multi-Stage Air Flow
Single-Stage Air Flow
Incubation Needs from Ventilation

**FRESH AIR**
- Supply O\(_2\)
- Room Pressure
- CO\(_2\) removal

**AIR TEMPERATURE**
- Key input to all incubators & hatchers

**HUMIDITY CONTROL**
- Humidification
- Dehumidification

**OPTIMUM CONDITIONS FOR INCUBATION**
- All these needs must be met
- A lack of balance in one area will influence others
Influence of Room Temperature

- Cabinet temperature as air is exchanged
  - Amount of cooling/heating
  - Stability of temperature
  - Humidity control
Influence of Room Humidity

- Incubator/hatcher humidity levels
  - Spray of nozzles

- Moisture loss depends on:
  - Incubation humidity levels

- Affects the ability of air to remove heat and moisture from the cabinet
  - High humidity can lead to overheating

- Dehumidification must be done correctly to avoid temperature swings in the room and correspondingly the incubator/hatcher
Influence of Room Air

- Developing embryos require oxygen
  - Requirements increase as the embryo develops

- Respiration releases water vapour and CO$_2$ which needs to be removed through air exchange

- Room supply and exhaust plenum pressures influences the airflow through the incubator or hatcher
  - Ensures adequate oxygen is present
  - Contributes to cooling
  - Removes water vapour & CO$_2$
  - Distributes air uniformly if correct; causes hot and cold spots if not

OXYGEN & FRESH AIR
- Airflow
- Pressure control
- CO$_2$ removal

The Cleaner the Air the Better
Types of HVAC Equipment

- Roof top units RTU
- Air handling units AHU
ROOFTOP VENTILATION

HOW IT WORKS

• Operates as a constant volume system

• Fans blow recycled air mixed with fresh air

• Unit ducts straight down into the room or corridor

• Return duct is installed to bring unused air back to be recycled
Rooftop Ventilation

Recirculated air mixed with clean air is blown into the corridor

Air that has not entered the incubator is recycled
Air Flow Rate = Pressure Control

1,000 cfm

4,000 cfm

= 25%

4,000 cfm
Mixed Air

1,000 cfm
OA

3,000 cfm
RA

OA (25%) + RA (75%) = Mixture (100%)
RTU Room Pressure

- Damper adjusts to meet pressure requirements
- Pressure settings vary with machine type and size
- Referenced to outside
100% Fresh Air Ventilation

HOW DOES IT WORK?

• Typically operates as a variable volume system

• No air recirculation

• Air Flow, Humidity, Room Pressure, Warm & Chilled water circulation controlled by one unit

• Room pressure controlled by VSD fan modulation
AHU Room Pressure

VSD fan modulates the air supplied to change pressure in room

Referenced to outside
AHU Delivering Fresh Air

100% FRESH AIR evenly distributed into the corridor and incubators
Sensors for Control
Temperature, Humidity, Pressure Sensors

Requirements:
• In a well mixed air stream
  – Guideline: 1 m from return air
• Protected from direct influence by HVAC equipment
  – Humidification spray main concern
• Located in the room
  – Not in a corner where a microclimate can develop
Humidification Options

- Bahnson
- High pressure Humidification
- Other options:
  - Steam Humidification
  - Air/water combo nozzles
Outside Air Reference (OAR) Location

- 12” above surrounding obstacles
- No physical or mechanical obstruction
- Not mounted under awnings or other projections within 15’
- Away from economizers, fans, dampers
- Often mounted on a roof top unit
- **Ideal: unobstructed view of the horizon**
Plenum Pressure Control

- Variable speed fans
- Pressure sensing tube in plenum
- Plenum pressure settings vary with machine type and size
- Can be referenced to machine hallway but can be referenced to outside
Plenum Pressure Measurement

Desired Difference Across the Cabinet

0.04” W.C.

Room Set point
+0.02” W.C.

Set point Referenced to Outside: -0.02” W.C.

Set point Referenced to the Room: -0.04” W.C.
Multi-Stage Plenum Control

Normally, the stale air from the Multi-Stage incubator exhausts directly to the outside atmosphere through an exhaust in the rear roof.
Exhaust Plenum Reference

Incubators

• In main air space

Hatchers

• Opposite end from fans or center of plenum
• Between two machines
A Moving Target

The fresh air requirements for the incubator and hatch rooms are not consistent but are dependent on variable factors.

- Stage of incubation/hatching
  - Damper openings

- Activity in room
  - Setting
  - Transfer
  - Hatching
  - Cleaning

- Activity in adjacent rooms
Control of HVAC

With so many variable factors, hatcheries need a control system to automatically detect changes and adjust the “Fuel Mixture”.

- Temperature
- Humidity
- Pressure
Controls designed for a hatchery
Programmable Logic Control (PLC) based system
Flexible and capable to control most commercially available HVAC equipment
Controls, Monitors, Alarms and Collects Data
Control and Monitoring

Incubator Room

Temperature: 78.0 °F
Humidity: 55.0%
Pressure: 0.010 In.wc
Damper: 30%
Jamesway Guardian

- Controls designed for a hatchery
- Controls up to **4 rooms** and **4 plenums** per panel
- Modular, expandable system
- Programmable Logic Control (PLC) based system
- Flexible and capable to control most commercially available HVAC equipment
- Monitors, Controls, Alarms and Retains Data
- Interfaced to Jamesway’s HatchCOM 4 Hatchery information tool
## Optimum Incubator Room Conditions

<table>
<thead>
<tr>
<th>Incubator Type</th>
<th>Acceptable Temperature Range (d.b.)</th>
<th>Optimum Temperature (d.b.)</th>
<th>Relative Humidity Range</th>
<th>Optimum Relative Humidity</th>
<th>Room Pressure Differential to Outside</th>
</tr>
</thead>
<tbody>
<tr>
<td>Platinum Incubators – Single Depth</td>
<td>72°F – 78°F 22°C – 26°C</td>
<td>75°F 24°C</td>
<td>40 – 50%</td>
<td>45%</td>
<td>0.005 – 0.015” W.C. 1.2 – 3.7 Pa</td>
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<td>40 – 50%</td>
<td>45%</td>
<td>0.010 – 0.020” W.C. 2.5 – 5.0 Pa</td>
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<tr>
<td>Multistage Incubators</td>
<td>78°F – 85°F 26°C – 29°C</td>
<td>80°F 27°C</td>
<td>50 – 60%</td>
<td>55%</td>
<td>0.005 – 0.015” W.C. 1.2 – 3.7 Pa</td>
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## Optimum Hatch Room Conditions

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<tr>
<td>Platinum Hatchers P10-P30</td>
<td>72°F – 78°F 22°C – 26°C</td>
<td>75°F 24°C</td>
<td>40 – 50%</td>
<td>45%</td>
<td>0.005 – 0.015” W.C. 1.2 – 3.7 Pa</td>
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<tr>
<td>Platinum Hatchers P40</td>
<td>72°F – 78°F 22°C – 26°C</td>
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### Optimum Plenum Conditions

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<th>Incubator Exhaust Plenum</th>
<th>Pressure Differential to Room</th>
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<tr>
<td>P20 Cabinets</td>
<td>negative (-) 0.020–0.030 in. w.g. 5.0–7.5 Pa</td>
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<td>P40 Cabinets</td>
<td>negative (-) 0.020–0.030 in. w.g. 5.0–7.5 Pa</td>
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<tr>
<td>P60 Cabinets</td>
<td>negative (-) 0.020–0.030 in. w.g. 5.0–7.5 Pa</td>
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<tr>
<td>P80 Cabinets</td>
<td>negative (-) 0.025–0.035 in. w.g. 6.2–8.7 Pa</td>
</tr>
<tr>
<td>P120 Cabinets</td>
<td>negative (-) 0.030–0.040 in. w.g. 7.5–10.0 Pa</td>
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<td>P40 Cabinets</td>
<td>negative (-) 0.030–0.040 in. w.g. 7.5–10 Pa</td>
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*in. w. g. (inches water gauge), Pa (Pascals)*
Essential Maintenance

• Filter Changes
  • Every hatch for hatcher, pull, and chick room
  • At least monthly for all other areas

• Belt driven – check belts monthly

• Service checkups - by licensed technicians
  • 1-2x per year, spring and fall
  • Damper position checks

• Service as recommended by manufacturer

• Check sensor calibration at least twice a year
HVAC Life Expectancy

• Ventilation type equipment typically lasts 20-25 years when well maintained.
• It usually becomes easier to replace unit rather than replace parts.
• Control systems can become outdated
Customized Ventilation

Jamesway has extensive experience with ventilation and offer expert design and support with our AirWAY Systems.
Packaged Systems designed for easy installation for the most efficient and effective hatcheries.
A flexible and expandable approach
AirWAY Systems + Guardian HVAC + Hatchcom 4 = Fuel for your hatchery

– Your entire hatchery at your fingertips
Ventilation

The Vital Fuel For Your Hatchery

• Optimum HVAC conditions increase flexibility and response of machine operation
• Reduce the number of causes of bad hatches
• Increased hatchability and quality
• Improves other indicators outside of the hatchery
  • first week mortality
  • overall health of chick
Questions?

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