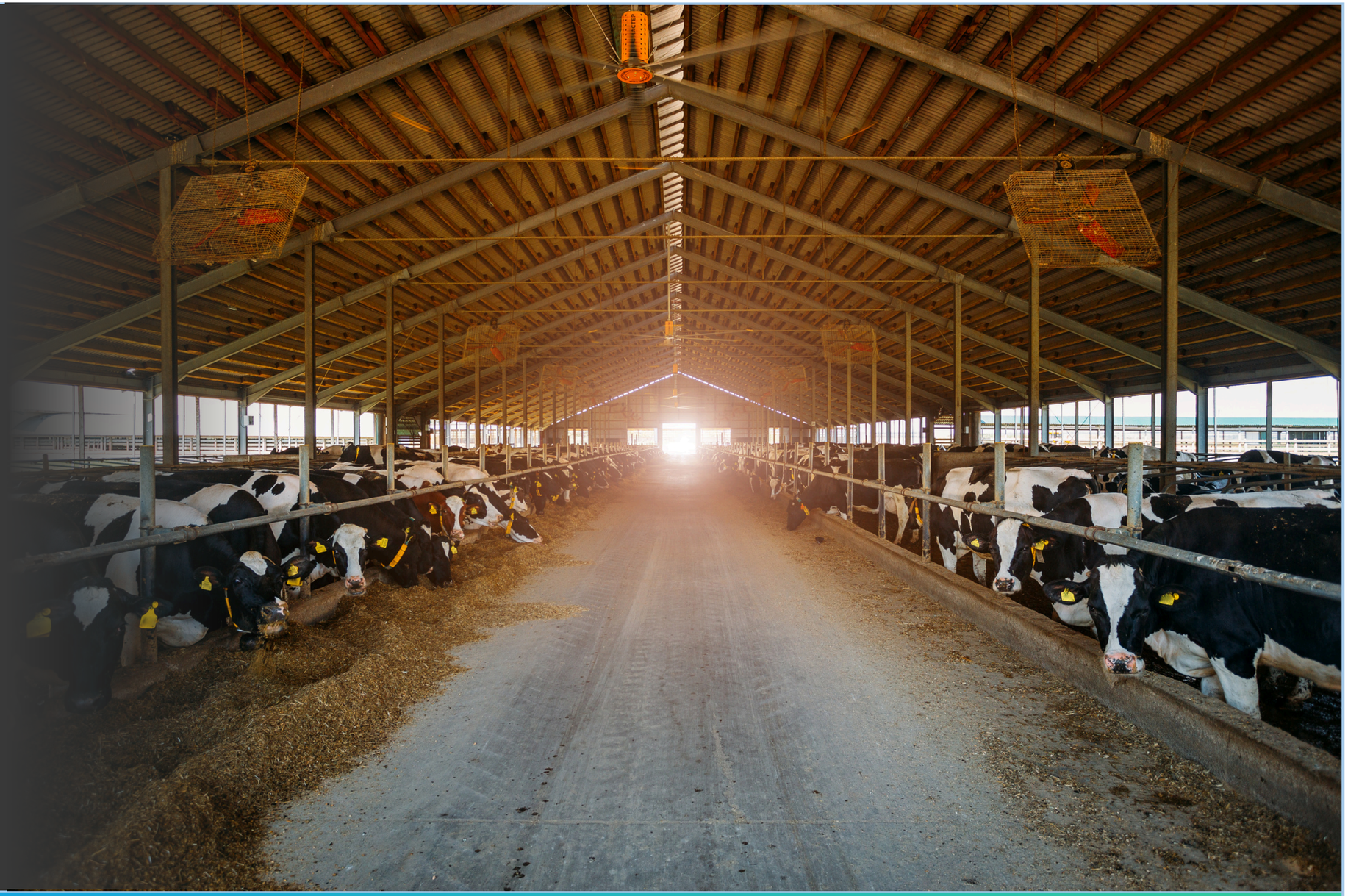
A-Q

AIR QUALITEE

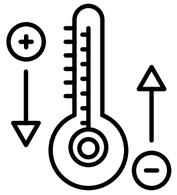
360° Clean Air Solutions



PROPOSAL FOR CONTROLLED LIVESTOCK BUILDINGS

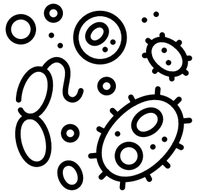
CALF AND PIG HOUSING

Airflow in controlled livestock buildings is designed to achieve several key objectives:



Temperature control

Removal of gaseous pollutants – CO_2, NH_3, humidity, and similar contaminants

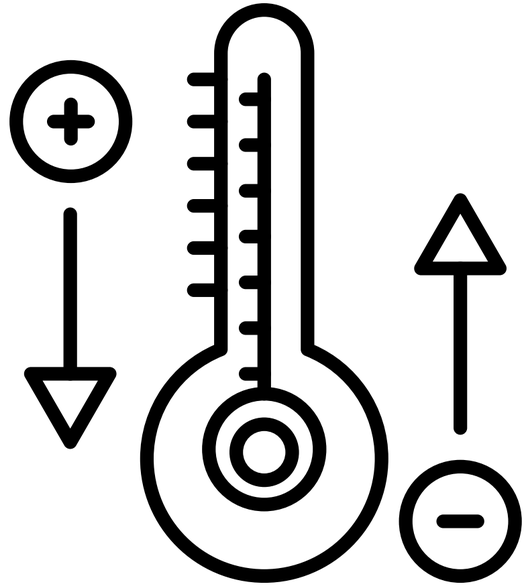


Reduction of bioaerosols – airborne bacteria, viruses, fungal and mold spores, yeasts, and related biological particles

TEMPERATURE CONTROL

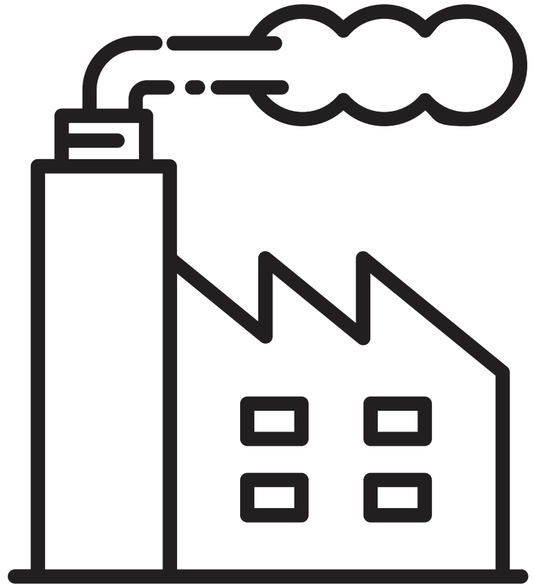
Temperature control is directly affected by the seasonal temperature delta between the required indoor conditions for animal growth and the outdoor air temperature.

From an energy perspective, this delta is significant – particularly during winter operation



REMOVAL OF GASEOUS POLLUTANTS

The removal of gaseous pollutants requires outdoor air exchange at a rate sufficient to maintain gas concentrations at or below the minimum acceptable thresholds.



REDUCTION OF BIOAEROSOL CONTAMINATION (1/2)

Reduction of bioaerosol levels can be achieved through internal air recirculation via IN-EX filtration media, without introducing additional outdoor air (recirculation air cleaning loop).

Note – Published field data indicate that airborne biological loads in livestock buildings, can reach very high concentrations, often in the order of 10^5 CFU/m^3 and above.

REDUCTION OF BIOAEROSOL CONTAMINATION (2/2)

While outdoor air ventilation is essential for gas and humidity control, its primary function is dilution rather than targeted removal of airborne biological particles. Internal air recirculation combined with targeted filtration therefore provides a technically appropriate and energy efficient method for reducing airborne biological contamination without increasing outdoor air exchange.

The added value of this approach is twofold:

1. Significant reduction of airborne biological contaminants
2. Energy savings, achieved by limiting unnecessary outdoor air exchange

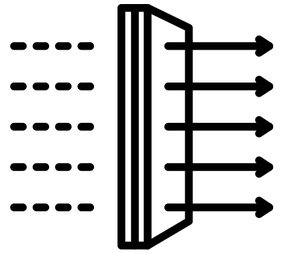
PROPOSED TECHNICAL CONFIGURATION

The proposed system integrates air circulation units (based on FCU architecture without a heat exchange coil) equipped with:

- A coarse pre-filter for dust (“Animal dust”) removal.
- Followed by an IN-EX filtration stage.

For the initial evaluation, an air circulation unit with a nominal capacity of 600 CFM (~1,020 m^3/h) is proposed, serving an air volume of approximately 200 m^3. This results in an internal air circulation rate in the range of 3–4 air changes per hour.

Unit placement will be optimized to address air quality within the animal occupied zone, where natural air exchange is generally lower than at higher elevation.



OPERATING MODEL
REDUCING VENTILATION COSTS TO “GAS REMOVAL ONLY”

1. Outdoor air ventilation (air changes) – Determined exclusively by gaseous pollutants and humidity levels - CO_2 / NH_3 / RH.

> ***Note*** *– since CO_2 is heavier than air and tend to accumulate at the bottom of the space while NH_3 and Humidity are lighter than air and rise to the top. We assume that the methods of disposing of the gases combine air movement above the animals and at their height with air movement without strong gusts of wind.*

2. Internal air recirculation (CFM) – Determined by biological load and airborne particulate levels - CFU / PM (animal health performance Indicators).
In other words, the system “purchases” only the minimum required outdoor air from an energy perspective, while air cleaning is performed more efficiently and at lower energy cost through internal air recirculation using IN-EX filtration.

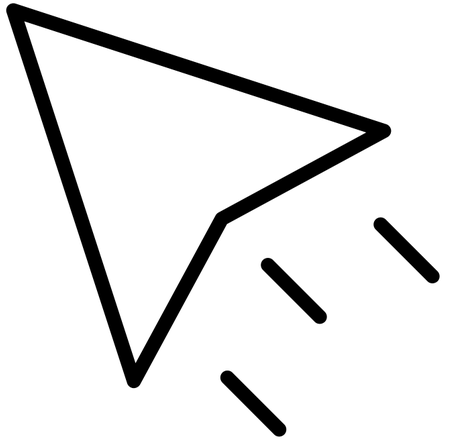
PROPOSED PILOT AND MONITORING

Proposed Pilot for 3 months with two operating modes:

1. Standard operation
2. Reduced operation at minimum ventilation levels based on CO_2/NH_3/RH.
    - Activation of IN-EX – based on internal air recirculation.

Monitoring Parameters:

- CO_2, NH_3, RH – continuous monitoring
- CFU/m^3 and PM – periodic monitoring.
- Energy consumption (kWh):
    - o Outdoor air ventilation fans
    - o Internal air circulation units



EXPECTED OUTCOME

Expected Outcome - If:

- CO_2 / NH_3 / RH remain within defined thresholds
- CFU/m^3 is significantly reduced
- Net energy consumption (kWh) is reduced

These results suggest that the model is technically valid and can be implemented under practical operating conditions.

Following the successful demonstration of commercial feasibility through the proposed pilot, an odor treatment technology may be introduced, which could potentially support a further reduction in required air exchange rates

THANK YOU

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