ClimaVision Epidemic Mode

Minimize viral transmission and operating expense today.
Improve indoor air quality and energy efficiency tomorrow.

APPLICATION OVERVIEW

ClimaVision Epidemic Mode is a new sequence of operations designed to maintain healthy and safe indoor environments for all ClimaVision customers in the event of a global pandemic.

The sequence is based on the latest guidance from scientists, government organizations, and global industry leaders. As recommendations from these authorities evolve over time, Epidemic Mode will update over the cloud to implement the most current strategies to minimize viral transmission, all while maximizing energy efficiency and indoor air quality (IAQ).

Current recommendations for the commercial built environment include increasing outside air ventilation and flushing indoor air before and after occupancy hours. ClimaVision Epidemic Mode achieves these directives through its specific application profiles, Smart Purge and Smart Enhanced Ventilation. Both profiles are available to all ClimaVision users free of charge and are ready to use out of the box – no manual programming required.

Because the ClimaVision system implements these guidelines to the maximum extent possible for each individual piece of HVAC equipment based on its unique capacity and weather conditions, there's no risk of equipment damage from running a system outside parameters.

Once the pandemic is controlled and guidelines ease, ClimaVision's technology allows building managers to remotely turn off Epidemic Mode and return to ClimaVision's award-winning algorithms to improve comfort and energy savings.

FEATURES

- Saves energy while implementing CDC and ASHRAE guidelines for COVID-19
- System updates over the cloud as guidelines evolve
- Keeps equipment under safe operating conditions

ADVANTAGES

- Enhanced indoor air quality (IAQ)
- Integration with the user portal and app. Features include remote configuration, fault detection and diagnostics, easy scheduling, and portfolio-wide analytics
- Controls that scale from simple rooftop units (RTUs) to complex air handling units (AHUs)
- Out-of-the-box, wireless install with no special programming required
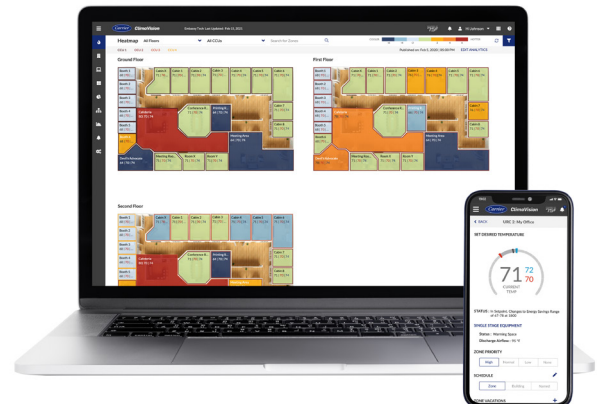
RESEARCH THAT INFORMS EPIDEMIC MODE

ClimaVision designed the Epidemic Mode sequence of operations to follow guidelines for commercial buildings issued by the Centers for Disease Control and Prevention (CDC) and the American Society of Heating, Refrigeration, and Air-Conditioning Engineers (ASHRAE).

Specifically, the CDC recommends commercial facility managers disable demand control ventilation (DCV) and maximize outdoor air ventilation by increasing minimum outdoor air damper positions. ASHRAE further recommends flushing the air in all commercial buildings for two full hours prior to first expected occupancy, and then for another two full hours post occupancy.

Recent research published through the American Society of Microbiology illustrates the reasoning behind these guidelines. Higher ratios of outside air can dilute a building's viral load – or the concentration of viral particles per cubic foot of air – thus making exposure to an infectious dose of a virus less likely.

"Proper filter installation and maintenance can help reduce the risk of airborne transmission, but it is important to understand that filters should not be assumed to eliminate airborne transmission risk," the paper says. "Higher outside air fractions and higher air exchange rates in buildings may help to dilute the indoor contaminants, including viral particles, from air that is breathed within the BE (built environment)."

Following these research-supported guidelines is seamless and free of charge when you install ClimaVision's full-stack suite of HVAC sensors and controls and activate Epidemic Mode.

SMART PURGE

ClimaVision's Smart Purge application profile works in pre- and post-occupancy settings to adhere to ASHRAE recommendations. The pre-purge activates three hours ahead of expected occupancy and runs for two hours, allowing up to one hour of preconditioning before building occupants arrive for optimal comfort. Post-purge activates when the scheduled occupied period ends and runs for two hours. Overnight between flushes, the system will keep the building at setback temperatures with minimal OA to conserve energy and ensure relative humidity levels are maintained.

The Smart Purge profile flushes air inside a building by opening the outside air (OA) dampers to 100 percent. During this time, only the system fan is activated – Stage 1 fan is on, and Analog out is set to 50 percent. Zones remain in setback

temperatures, and no conditioning is done unless the zones are reaching the threshold of the setback temperature.

If the zone temperatures drift outside the setback temperatures during either purge, system conditioning may kick in. This will ensure the building is regulated and ready for preconditioning and the humidity is maintained.

Too low a temperature could cause condensation, and too high a temperature could cause low humidity, which research indicates might promote larger carry of viral transmission.

Once the two-hour pre-occupancy purge is complete, the system will then move into standard preconditioning mode. During this time, the OA damper is set to the minimum position defined by the default OAO tuners.

The return air damper and exhaust fan will be turned on per standard configurations based on the OA damper position.

SMART ENHANCED VENTILATION

Smart Enhanced Ventilation ensures the indoor environment remains as safe as possible during a building's occupied period and reduces risk of infection from aerosolized particles. This profile only activates during a scheduled occupied timeframe.

When the building is occupied, the OA damper should move to *EnhancedVentilationOutsideDamperMinOpen*. This is defined as the maximum position allowable based on the system's ability to meet desired temperatures. This ensures the greatest amount of outside air is drawn in for dilution ventilation based on the system capacity and weather conditions.

If the building is in cooling mode and economizer conditions are right, then regular economizing action will take place and the OA damper loop may go all the way to 100 percent. The max output signal will depend on the *outsideDamperAtMaxDrive.*

MIXED AIR TEMPERATURE (MAT) SAFETY REGULATION

The ClimaVision system will close the outside air damper to maintain MAT temperatures if temperature drops below outsideDamperMixedAirTarget. In heating mode, this prevents condensation of flue gases when heater is on, and condensation that may be acidic and cause corrosion on equipment that reduces useful life.

For AHUs or commercial buildings where this is not an issue, the outsideDamperMixedAirTarget can be lowered significantly. This may result in relatively cold supply air temperature if heating is not engaged, but this should only be a temporary concern because as zone temperatures fall below the lower setback temperature conditioning will again occur.

At the end of the occupied period and after the post-Smart Purge is complete, the OA damper should reset to *outsideDamperMinOpen.* This will ensure that energy usage is minimized when no one is inside the building.

For VAV systems, supply air temperature is reset to its highest possible setting, usually 60 degrees. This will cause VAV terminal units to open their dampers to a higher position, allowing maximum ventilation rates.

No other change to regular conditioning mode or desired temperatures is incurred.

TECHNICAL SYSTEM OPERATION

ClimaVision users can remotely turn Epidemic Mode on or off and tweak its operation by using ClimaVision's building intelligence suite of web and mobile apps.

These are the profile configurations, user intent parameters, and adjustable tuners that define Epidemic Mode:

User Intent Parameters

enableSmartPrePurge = off (binary) - User provided value from systems page to determine if SmartPurge mode is enabled prior to occupancy period

enableSmartPrePurge = off (binary) - User provided value from systems page to determine if SmartPurge mode is enabled after occupancy periord

enableEnhancedVentilation = off (binary) - User provided value from systems page to determine if enhanced ventilation mode is enabled

OAO Profile Config Parameters for Smart Purge

smartPurgeOutsideDamperMinOpen = 100(%) - Parameter that determines the minimum outside air damper position during the purge period.

enhancedVentilationOutsideDamperMinOpen = 50(%) - Parameter that determines the minimum outside air damper position during the occupied period.

OAO Profile Config Standard Parameters

outsideDamperAtMinDrive = 2 (V)
outsideDamperAtMaxDrive= 10 (V)

returnDamperAtMinDrive = 2 (V)
returnDamperAtMaxDrive = 10 (V)

outsideDamperMinOpen = 0%
returnDamperMinOpen = 0%

exhaustFanStage1Threshold = 50%
exhaustFanStage2Threshold = 90%

currentTranformerType = 0-20 (A) 0-10, 0-50, 0-250
co2Threshold = 1000 (ppm)

exhaustFanHysteresis = 5(%)
usePerRoomCO2Sensing = false

OAO Profile Tuners for Smart Purge

smartPrePurgeRunTime = 120 (minutes) - Tuner that determines the how long the purge that occurs before the occupancy period will last.

smartPrePurgeStartTimeOffset = 180 (minutes) - Tuner that determines the how long before the occupancy period the pre purge will kick in.

smartPrePurgeFanSpeed = 50 (%) - Tuner that determines the at what speed the fan should be run during the purge

smartPostPurgeRunTime = 120 (minutes) - Tuner that determines the how long the purge that occurs after the occupancy period will last.

smartPostPurgeStartTimeOffset = 20 (minutes) - Tuner that determines the how long after the occupancy period the post purge will kick in.

smartPostPurgeFanSpeed = 50 (%) - Tuner that determines the at what speed the fan should be run during the purge

OAO Profile Standard Tuners

co2DamperOpeningRate = 10 (%/100ppm)
enthalpyDuctCompensationOffset = 0 (BTU/lb)

economizingMinTemperature = 0 (°F)
economizingMaxTemperature = 70 (°F)

economizingMinHumidity = 0 (%)
economizingMaxHumidity = 100 (%)

outsideDamperMixedAirTarget = 50 (°F)
outsideDamperMixedAirMinimum = 44 (°F)

economizingToMainCoolingLoopMap = 30 (%)