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## A More Energy Efficient Approach to Demand Control Ventilation

The concept is simple; vary the amount of outside air delivered within a building based on the occupancy level of a given area. This is normally accomplished by deploying a large number of individual carbon dioxide (CO<sub>2</sub>) sensors throughout the building and integrating the feedback with the building control system. When the CO<sub>2</sub> level is detected to be higher than the designed value, outside air is introduced until the building ventilation requirement is met. This ventilation requirement or rate is generally calculated by multiplying the expected number of occupants by a recommended amount of air, expressed as cubic feet per minute (CFM). No matter what the design value is for a given type of space, all outside air must be heated, cooled and distributed throughout the building – at a significant energy cost.



We will explore the major obstacles to widespread use of Demand Control Ventilation (DCV) and offer some solutions to address these problems, and in turn, save energy.

“Field experience indicated that actual occupancy levels are at least 25% to 30% lower and perhaps as much as 60% to 75% lower in some buildings than design levels.” – ASHRAE



Three major issues with conventional DCV are limiting its widespread application in buildings:

**1. Inability to appropriately address non-human pollutants.**

What is needed to make DCV healthier and more effective with less occupant complaints is a means to increase ventilation (or at least not reduce ventilation to unoccupied levels) when high levels of non-human pollutants are present.

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# More Efficient Approach to DCV

Continued from Page 1

An excellent solution to the issue is to implement DCV to vary ventilation based not only on the level of occupancy in a space using CO<sub>2</sub>, but also react to the real-time levels of multiple contaminants in an area or space. This is known as multi-parameter DCV, or MpDCV. With this concept, if the air in a space is clean and the occupancy is low, there is no reason to dilute clean indoor air with clean outdoor air. Instead, minimum ASHRAE 62.1 ventilation levels can be used. Additionally, the level of outdoor contaminants can be checked and if the source of the contaminant is from outdoors, then airflow into the building can be reduced to minimum levels to limit the entry of these contaminants.

## 2. Inaccuracy of control leading to excess use of outdoor air.

To accurately control outside air, CO<sub>2</sub> sensors need to measure both the outside and indoor levels to obtain an accurate measure of the differential CO<sub>2</sub> level. Inaccuracies result from the use of two sensors to measure indoor and outdoor CO<sub>2</sub>, which doubles the error of differential CO<sub>2</sub> measurement. A more accurate means of measuring the differential CO<sub>2</sub> levels is needed to provide a much tighter span of control.

With MpDCV, a single composite feedback signal combines differential air signals from a number of air quality based sensors with the differential CO<sub>2</sub> signal used for conventional DCV. Measurement of TVOC, particles, carbon monoxide, formaldehyde, relative humidity, and dewpoint temperature are used to determine when increased ventilation is warranted. Appropriate levels of these materials are used to establish control levels for DCV similar to those commonly used for CO<sub>2</sub>.

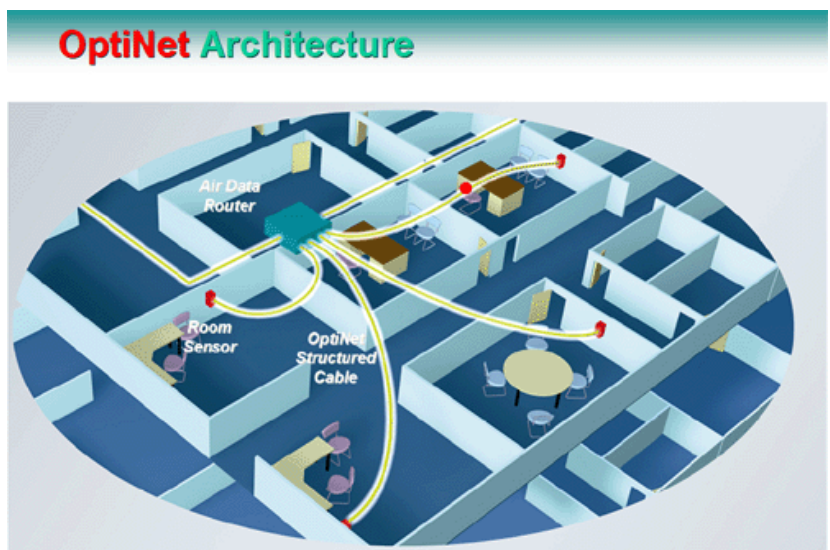
## 3. Carbon dioxide sensor calibration and maintenance considerations.

Real world experience has shown that twice a year verification and potential calibration of the CO<sub>2</sub> sensors is needed to maintain the desired levels of energy savings. For many applications, the auto-calibration is a good concept because it limits the sensor error to only a few hundred PPM or less depending on the application. Unfortunately, auto-calibration is not appropriate for DCV applications where more accurate differential readings are required to save energy. To make certain that sensor calibration and maintenance does not consume a large percentage of the expected operating savings, what is needed is a simpler, less expensive approach.

New sensing system architecture has been created. Rather than locating multiple sensors in each area or room, it routes packets or samples of air from multiple locations sequentially, in a multiplexed fashion, to a shared set of sensors. This sensing concept can also make "true" differential measurements without the accuracy concerns mentioned previously for commercial grade CO<sub>2</sub> sensors. Due to the limited number of sensors deployed, and the central location of such sensors, calibration is streamlined through an exchange program whereby a factory set of calibrated sensors periodically replaces the on site sensors, such as every 6 months.

## Summary

Demand Control Ventilation has always offered the opportunity for significant energy savings but has never realized its full potential due to the concerns mentioned above. A new approach called multi-parameter DCV provides a solution to maximize energy savings while still maintaining excellent indoor environmental quality. It does so by maintaining building ventilation at lower levels of outdoor air unless increased levels of non-human pollutants are sensed. Implementing MpDCV with a Multiplexed Sensing System (such as OptiNet by Aircuity) provides a simple, very cost effective solution that has both high differential sensing accuracy and low sensor calibration and maintenance expenses to preserve high operating savings. The result is a healthier indoor environment operating with maximum energy efficiency. •



# Touch Screen Controls for Isolation Rooms

Unlike other monitors on the market that have only LCD alphanumeric displays and LED indicator lights, **Critical Room Control (CRC)** uses a microchip intelligent processor and 5.7" color TFT/VGA touch-screen that can be custom programmed to allow the end user custom images, messages and icons tailored to their individual facility.



Background shall indicate three distinct room conditions:

- \* Infectious Room – authorized personnel only (Red / owner graphics and message)
- \* Room being Cleared – Do not enter (Amber / owner graphics and message)
- \* Room Cleared - (Green/ owner graphics and message)

Until now isolation room monitors have predominately been used as monitors only, while other companies' control the equipment that ensures proper pressure relationships for a safe condition. **CRC** believes that the company responsible for monitoring should also be responsible for maintaining the proper containment. **CRC** Room monitor not only adds to the safety with better control and display technology but also architectural esthetics.

Unique extension available with Critical Room Control systems, the CRC-CD (CRC-Condition Display) is used in conjunction with the CRC-RM (CRC-Room Monitor) for indicating the current status of the isolation room. The CRC-CD offers additional safety for hospital staff, visitors and patients. The CRC-CD indicates status of associated isolation room with change in colored background and associated owner selected message and graphics.

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## Urban Legends...

1. Urban Legend: JELL-O Brand geletin is made from bone and hides.



**Status: TRUE**

JELL-O is made from gelatin, an animal product rendered from hides and bones of animals. The production of gelatin starts with the boiling of bones, skins, and hides of cows and pigs, a process that releases the protein-rich collagen from animal tissues. The collagen is boiled and filtered numerous times, dried, and ground to a powder.

2. The restaurant chain formerly known as "Kentucky Fried Chicken" changed its name to KFC to eliminate the word "fried" from its title.



**Status: FALSE**

In 1990, the Commonwealth of Kentucky trademarked their name. Henceforth, anyone using the word "Kentucky" for business reasons — inside or outside of the state — would have to obtain permission and pay licensing fees to the Commonwealth of Kentucky. In November 2006, KFC and the State of Kentucky finally reached an undisclosed settlement over the former's use of the trademarked word "Kentucky," and the restaurant chain announced it would be resuming its former name of "Kentucky Fried Chicken."

3. The song "Happy Birthday" is protected by copyright.



**Status: TRUE**

"Happy Birthday to You" was secured by copyright in 1934. The copyright protection of the song will remain intact until at least 2030. However, singing "Happy Birthday to You" at birthday parties is not considered copyright infringement. Royalties are due only for commercial uses of the song, such as playing or singing it for profit, using it for movies, television programs, and stage shows. Royalties are also due for public performances, or at any place where a substantial number of persons outside of a normal circle of a family is gathered. So singing this song in a public setting such as a restaurant or sports arena technically requires a license!

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For more information....

Please contact us at Air Equipment Company, or feel free to visit the following websites:

Air Equipment Company – <http://www.airequipmentcompany.com>

DCV and Aircuity- <http://www.aircuity.com>

Critical Room Controls - <http://www.criticalroom.com>

Urban Legends Reference Pages – <http://www.snopes.com>



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For suggestions and comments regarding this newsletter, please contact Luke Powell.