Outdoor Carbon Dioxide Measurements for Demand Controlled Ventilation

The outdoor CO$_2$ level serves as a baseline for comparison to indoor CO$_2$ concentration. The outdoor CO$_2$ level directly impacts indoor conditions if the outdoor CO$_2$ concentration level is 500 ppm, it is rarely lower indoors. Selecting an accurate outdoor CO$_2$ instrument is crucial for monitoring outdoor levels.

Demand controlled ventilation (DCV) helps to maintain good indoor air quality while optimizing energy consumption. In a typical set-up only indoor CO$_2$ levels are measured. Ventilation controls are operated based on the assumed outdoor CO$_2$ level of 400 ppm. However, locally elevated CO$_2$ levels occur due to CO$_2$ emissions from transportation, energy production and industrial manufacturing.

Ventilation guidelines, such as ASHRAE, recommend indoor CO$_2$ levels not to exceed the surrounding outdoor concentration by 600 ppm. Also, LEED guidelines suggest providing an alarm when the indoor CO$_2$ level exceeds the outdoor level by 530 ppm, or 1,000 ppm absolute. Reliable correlation between indoor and outdoor CO$_2$ levels can only be achieved by measuring both.

Measuring CO$_2$ Outdoors

Knowing outdoor CO$_2$ levels helps when assessing indoor conditions. During periods when the outdoor CO$_2$ level exceeds 400 ppm the space may be over-ventilated. In order to truly optimize energy consumption, outdoor CO$_2$ concentration should be measured. The real time differential between indoor and outdoor CO$_2$ concentration can be used as a control parameter.

High accuracy of the outdoor CO$_2$ instrument is important. Typical indoor CO$_2$ instrument accuracy of ±50 ppm is just not enough for a true reference. The outdoor instrument should have an accuracy equivalent to or better than ±2% of reading for efficient real time CO$_2$ differential control. Moreover, as there are large diurnal and seasonal variations in outdoor temperature, the outdoor CO$_2$ instrument should automatically compensate for temperature variations.
Vaisala CARBOCAP® Carbon Dioxide Probe GMP343 for Outdoor Measurements:

Outdoor CO₂ sensors need to operate in varying conditions. They have to tolerate rain, hail, snow, solar radiation, dirt and dust, as well as temperature extremes between -40 and +60 °C (−40 ... +140 °F).

Vaisala CARBOCAP® Carbon Dioxide Probe GMP343 has been specially designed to take outdoor measurements, with:

- Accuracy of ±(3 ppm + 1 % of reading) at 25 °C (77 °F)
- IP65/IP66 housing classification for harsh environments
- Operating temperature range -40 ... +60 °C (-40 ... +140 °F)
- Low maintenance need due to highly stable CARBOCAP® sensor with built-in reference measurement
- Automatic compensation of CO₂ readings for temperature variations
- Possibility to compensate for pressure (site elevation)