



Carbon dioxide enhances plant growth. In greenhouses, the growth rate and development of all plants – be they lowly cucumbers or majestic roses – can be improved by controlling the concentrations of CO<sub>2</sub>. This requires continuous, accurate measurement, however – an area in which Vaisala excels.

Optimized CO<sub>2</sub> concentrations in greenhouses translate into

# Higher Productivity and Higher Quality

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**C**arbon dioxide is perhaps better known for its harmful effects on health and as one of the 'greenhouse gases' contributing to global warming, than for its beneficial effects in the more traditional types of greenhouse. Carbon dioxide is the 'fuel' for photosynthesis, a process by which plants convert solar energy into biomass. It is an important growth factor beside warmth, light, nutrients and water in greenhouse cultivation. Consequently, carbon dioxide fertilization is essential for any greenhouse that aim for better productivity.

### First-class products with CO<sub>2</sub> fertilization

"Carbon dioxide fertilization is an efficient and safe way of ensuring high-class products and good yield," says Mr. Risto Pirinen, who has four greenhouses in Hyvinkää, Finland in which he grows cucumbers and cucumber plants. "Its principle is very simple. The carbon dioxide concentration is monitored and adjusted in each greenhouse to enhance photosynthesis in the plants. This is very important, especially in that period of the year when there is very little light," he says.

*Carbon dioxide fertilization guarantees first-class cucumbers and high productivity.*

### Better yields

According to Mr. Pirinen, optimized carbon dioxide concentrations not only raise productivity considerably (by as much as 40 % in the darkest time of the year), but also improve the quality of the cucumbers. If the CO<sub>2</sub> level is ideal in the greenhouse, the plants will produce nice cucumbers of uniform quality that will qualify for the best class.

A Vaisala GMT222 Carbon Dioxide Transmitter is used to monitor the CO<sub>2</sub> concentrations at his greenhouses. Designed for harsh and humid environments, the GMT220 Series Transmitters have a dust-proof and waterproof housing (IP65/NEMA4) with high corrosion resistance. The greenhouse control system that automatically controls and adjusts the CO<sub>2</sub> concentration is equipped with the Vaisala CO<sub>2</sub> transmitters. The greenhouses have several measurement points for CO<sub>2</sub> readings, which ensures the right concentration throughout the greenhouse.

### Ideal environment for growth - all year round

When the CO<sub>2</sub> concentration falls below the ideal level in the greenhouse, more carbon dioxide is automatically fed in through a

system of pipes and nozzles. To distribute it evenly, the nozzles are located in several points of the greenhouse at a distance of 2 meters from each other. The carbon dioxide is either produced by a liquid gas-fueled boiler or is administered in pure form. It is essential to maintain the right level, which lies in the range of 800 to 1000 ppm, as, according to Mr. Pirinen, too high concentrations can have an adverse effect on the plants. The optimal temperature in the greenhouse is 24–25 °C. Correspondingly, a relative humidity of 70 % should also be maintained. The interaction of all growth factors must be taken into account to ensure the wellbeing of the plants. For pest control, Mr. Pirinen uses biological methods – in the form of mites – rather than pesticides.

"The carbon dioxide fertilization also works in the dark season, enhancing the effect of artificial light, thus compensating for the lack of light that would otherwise hamper plant growth. This is crucial in greenhouse cultivation, especially up here in the north," says Mr. Pirinen. With the right CO<sub>2</sub> concentration, the plants will start producing cucumbers earlier than they normally do. This fertilization method produces no toxic by-products and creates no excessive moisture. Rather, it produces healthy plants and good yield. ■



*The Vaisala GMT222 gives continuous and accurate measurements of CO<sub>2</sub> concentrations - basic information for the operation of the fertilization system.*