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CO_2 Incubators with Segmented Doors: Benefits and Buying Consideration

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Executive Summary

CO_2 incubator door openings are crucial factors in maintaining a stable environment for cell cultures. The longer and more often the door of a CO_2 incubator is opened, the longer it takes for the inner atmosphere to recover to the desired setpoints again. Incubators with small segmented inner doors help to reduce the disturbance of the incubation conditions, thus improving reproducibility of culturing results. In addition, segmented inner doors decrease gas consumption and the risk of contaminants entering the CO_2 incubator.

Especially in larger cell culture laboratories, CO_2 incubators are often shared by several users. Multiple door openings during a workday cannot be avoided in most cases. Every time the door of an incubator is opened CO_2 and warm humid air escape from the incubator chamber. The larger the door and the longer the door opening time, the higher the loss of heat and CO_2. When cells are cultivated under hypoxic conditions, the same is true for N_2: the incubator is supplied with significant additional volumes of N_2 to suppress the ambient oxygen level. When working with sensitive cell cultures using a CO_2 incubator equipped with smaller segmented inner doors, as shown in Figure 1, has several advantages.

Fig. 1: CellXpert® C170i CO_2 incubators with different configurations of the inner door; with 4 segments (left) and with 8 segments (right)

Why your next CO_2 incubator should have segmented inner doors:

> Keep your cells in stable conditions for more reproducible results: reduced disturbance of the incubation environment during door openings
> Lower the risk of contamination: reduced entrance of air-born contaminants
> Save time and workload: less frequent changing of gas cylinders
> Minimize the running costs of the CO_2 incubator: decreased consumption of supplied gasses (CO_2 and N_2)
> Decrease CO_2 consumption to support possible corporate commitments and reach sustainability goals

Keeping a stable cell cultivation environment

Every time you open the door of the CO_2 incubator the atmosphere inside gets disturbed. Temperature, gas level and humidity need to equilibrate again to keep the cells in optimal conditions. This problem gets more pronounced, the more often and the longer the door is opened during the day. In addition, the size of the incubator door has a significant influence because it determines the area for atmosphere exchange. Thus, when the CO_2 incubator is equipped with small segmented inner doors, the recovery speed after door opening increases. (Figure 2). The smaller the segmented doors, the faster the CO_2 incubator can recover to the set-point to support more reproducible culturing results.

Fig. 2: Atmosphere recovery after opening the door of the CellXpert CO_2 incubator for 30 seconds (n=3):
A: Temperature recovery (setpoint 37°C)
B: CO_2 recovery (setpoint 5 % CO_2)
C: O_2 recovery (setpoint 5 % CO_2 / 5 % O_2)

Reduced gas consumption: save money, workload, time, and reach corporate sustainability goals

Segmented inner doors are valuable means to protect the atmosphere inside the CO_2 incubator and reduce disturbance of the cultured cells during door openings. Less CO_2 (and N_2 if hypoxic conditions are used) is needed to recover the inner atmosphere after opening and closing the small segmented door of the CO_2 incubator (Figure 3).

Depending on the number and duration of door openings, the life span of a standard 50 L gas bottle is prolonged 2-3 times, or even more, with a small segmented door compared to a single glass door. This not only saves money when you consider the costs for CO_2 and N_2, a significant cost factor, it also drastically decreases the workload of exchanging empty gas bottles.

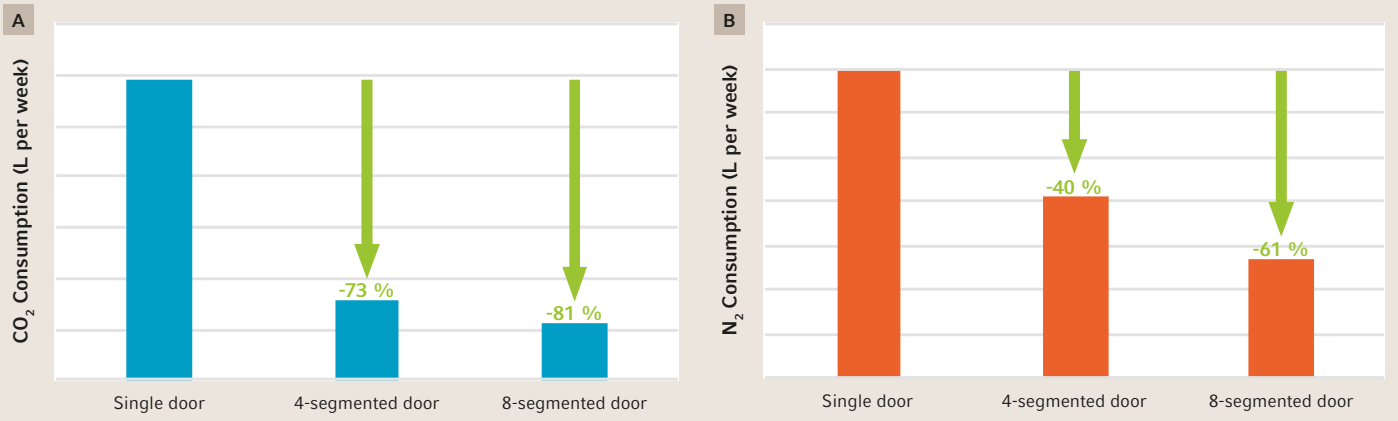

Fig. 3: The segmented inner doors lead to significantly reduced gas consumption in the CellXpert CO_2 incubator (setpoints: 5% CO_2 and 5% O_2 respectively, 37°C, 3x 30 sec door openings per day at 5 days a week)
A: CO_2 consumption
B: N_2 consumption

Calculate your gas costs and cylinder life span

Click here to calculate

Reduced risk of CO_2 incubator contamination

The entry of microorganisms through the access door is one major source of CO_2 incubator contamination. The smaller the opened door (and the shorter the door is opened) the less air-born contaminants can enter the incubator. Thus, segmented inner doors reduce the risk of contaminating the inside of the CO_2 incubator.

CellXpert CO_2 incubators – the technology behind multiple sensors, individually controlled heating circuits, and no fan

Most CO_2 incubators are equipped with one temperature probe mounted on the back wall of the inner chamber. Thus, temperature is measured locally at one spot inside the incubator. A second temperature probe is often included to avoid harmful over-temperature, but not to control for spatial homogeneity. A quick recovery of temperature and gas levels after door opening is often achieved by an internal fan. This fan-assisted heating technology leads to a forced airflow inside the incubator which may cause multiple issues, like spreading of air-borne contaminants, vibration on the shelves, and evaporation of the culture medium.

CellXpert CO_2 incubators offer three-dimensional regulation of the temperature achieved by several sensors placed directly at the different heating circuits surrounding the chamber and the door. This 3D temperature control and the direct heating technology result in highly uniform temperature distribution throughout the whole incubator. In addition, the temperature control system leads to quick temperature recovery after door opening (under 5 min without temperature overshoot). Thus, CellXpert CO_2 incubators provide optimal conditions for cell cultures independent from their location on the shelves.

More CO_2 Incubators knowledge:

Video: Your CO_2 incubator: How to minimize atmosphere disruptions - Cell Culture Do's and Don'ts

White Paper: How to reduce costs in the cell culture lab with CO_2 incubators

Online tool: Gas cost and cylinder life span calculator

White paper: CO_2 Incubator Temperature Control: What Is the Best Place For Your Cell Culture Vessels?

Visit **www.eppendorf.com/co2-incubators**

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