CellXpert® CO_2 Incubators – Cut Costs & Deliver Results

Save up to 8300€ over five years with the new CellXpert CO_2 incubators

Did you know that running costs for a CO_2 incubator easily excel its purchase price over time?

Often hidden, costs are significant for regular replacement of fan-associated HEPA-filters or UV lamps, loss of lab space because of low vessel capacity vs. footprint ratio, high gas consumption, or lack of flexibility for future lab needs. Also, increased lab downtime risk and potential sample loss due to unreliable contamination prevention can add significant costs. CellXpert CO_2 incubators provide answers to these challenges.

Besides a biological safety cabinet and a microscope, CO_2 incubators are standard equipment of every cell culture laboratory. Before a purchasing decision for a CO_2 incubator is made, several factors must be considered carefully. One significant factor, especially in industrial segments with high economical pressure (e.g. Biotechnology or pharmaceutical companies), are the total costs of ownership that result from 24/7 operation of equipment like CO_2 incubators.

Total costs of ownership regarding CO_2 incubators can be separated into the following five main factors:

> **Vessel capacity:** usable space vs. used lab space (footprint)
> **Expendable parts:** regular replacement of HEPA filters or UV lamps
> **Gas consumption:** CO_2 and N_2
> **Future flexibility:** adapting to changing needs and experimental setups

In addition to these cost factors, a CO_2 incubator should reliably deliver cell culture results to reduce time to market or publication. Two additional factors are associated here:

> **Stable, homogeneous incubation atmosphere:** avoid irreproducible, non-marketable results due to varying cellular responses
> **Reliable anti-contamination concept including easy cleaning:** avoid significant lab downtime and sample loss due to contamination

Addressing all the above-mentioned aspects was a major focus in the development of CellXpert CO_2 incubators – to ensure delivery of consistent cell culture results.

Vessel capacity: usable space vs. used lab space (footprint)

Cell culture laboratories are often tight in valuable space. They harbor bulky equipment like biological safety cabinets, fridges and CO_2 incubators. Therefore, devices having a small footprint while providing a high usable space inside are most favorable to optimally utilize the valuable work space. Looking at CO_2 incubators, several structural factors must be considered to evaluate and compare the usable space of different incubator models with the same theoretical volume (e.g. 100-200 L incubators which are most commonly used worldwide).

For CO_2 incubators with direct heating like the CellXpert, only the space taken up by the internal racking system and the water tray must be subtracted from the theoretical volume (Figure 1). This results in a high usable space to footprint ratio compared to other heating technologies.

Figure 1: Because of minimized internal parts (e.g. no fan), the CellXpert CO_2 incubator offers significantly more usable volume in relation to the theoretical volume.

CO_2 incubators with other heating technologies sacrifice a significant amount of usable space and/or take up more valuable lab space (Figure 2 and 3). For example, CO_2 incubators with a fan-assisted heating technology include several additional interior parts: the fan itself, air ducts, HEPA filters etc. Also, CO_2 incubators with a chamber surrounding air jacket for heating suffer from reduced usable space due to the chamber-in-chamber construction.

Summary: Due to its fanless design, the CellXpert CO_2 incubator offers up to 25 % more usable space for more cell culture vessels in a small footprint.

Expendable parts: regular replacement of HEPA-filters or UV lamps

Some CO_2 incubators have interior parts like fan-associated HEPA filters or UV lamps. These expandable parts must be replaced regularly for proper functionality. This can add significant costs to the initial purchasing price and should be calculated carefully before buying a CO_2 incubator.

For example, for CO_2 incubators with fan-associated HEPA filters twice yearly replacement of this part is recommended to provide unobstructed airflow and atmosphere accuracy. Thus, the costs for HEPA-filters can easily add up to 1000 € (1100 USD) over five years – a fraction of an average CO_2 incubator life time.

Similarly, other internal expendable parts e.g. UV lamps or reagents like H_2O_2 that are used in some incubators for chamber disinfection (instead of a high-temperature cycle) also imply recurring costs for your incubator.

For the CellXpert CO_2 incubator, there are no hidden recurring costs due to internal expendable parts.

Summary: The CellXpert CO_2 incubator comes without internal expendable parts (e.g. fan-associated HEPA-filters or UV lamps).

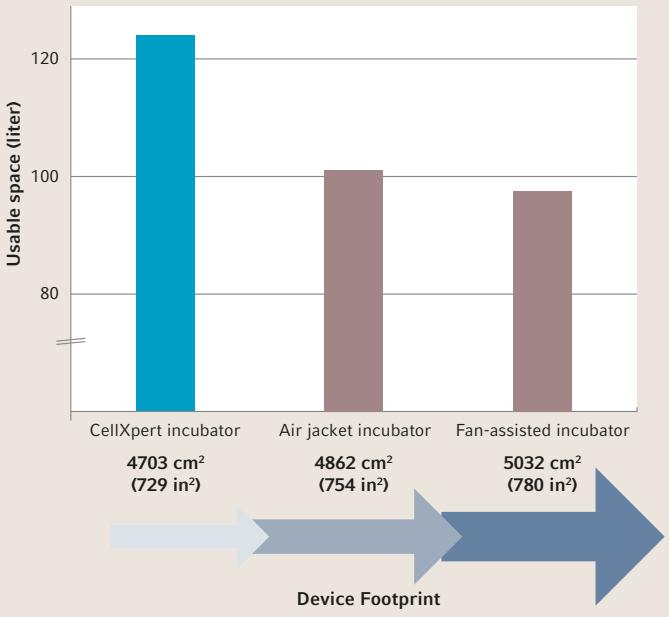

Figure 2: Usable space in different 160-170 L CO_2 incubators. Depending on the heating technology, the usable space inside the CO_2 incubator can vary. The CellXpert offers significantly more usable vessel space while taking up less valuable lab space.

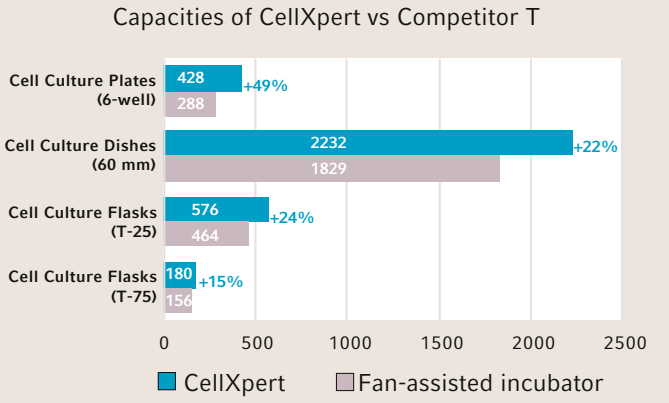

Figure 3: Comparison of capacity for various cell culture vessel formats – CellXpert CO_2 incubator vs. fan-assisted incubator.

Gas consumption: CO_2 and N_2

Often underrated, gas consumption (CO_2 and N_2 – depending on requirements) can be a significant cost factor and easily exceed the CO_2 incubator purchase price (Figure 4 and 5). 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. A smart regulated gas control, tight sealings, and precise production and fit of all door parts (clearance) are key factors to ensure low gas consumption and keep the atmosphere inside the CO_2 incubator stable. With these features, the CellXpert can significantly reduce the costs for CO_2 and N_2 compared to other devices in the market (Figure 5 , calculate gas savings and cylinder life with our online calculator).

In addition, segmented inner doors (Figure 6) 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 occasionally N_2) is needed to recover the inner atmosphere after opening and closing the small segmented door. In addition to cost savings, a segmented door can help to avoid microbial contaminations because less air-born contaminants can enter the CO_2 incubator.

A segmented inner door reduces the running costs because less gas escapes when only a small inner door is opened compared to the unsegmented inner glass door. Of course, it is also dependent on the door production accuracy (clearance) and sealing quality how much gas can escape through the closed doors. A 4-segmented inner door of the CellXpert CO_2 incubator reduces the gas consumption to roughly 25 % of an unsegmented door (Figure 4). When working under hypoxic conditions the gas and cost savings with the segmented doors are even more pronounced (Figure 5).

For applications that require oxygen levels below ambient atmosphere (20-21%), an incubator with O_2-regulation is needed (also referred to as tri-gas or multi-gas incubator). Besides regulating CO_2 these incubators reduce oxygen by supplying nitrogen to the chamber, thus suppressing the oxygen. The amount of N_2 that is needed to constantly reduce atmospheric oxygen is generally much higher than the amount of CO_2 needed to provide the typical 5 % in the chamber. As N_2 is usually much more expensive than CO_2, the CellXpert CO_2 incubator with its smart gas control, accurate door construction (clearance), and sealing quality significantly reduces the costs for applications that require hypoxic/low O_2 conditions (Figure 5).

Summary: Significant costs up to the multiple of the initial incubator investment costs can be saved with the CellXpert CO_2 incubator by significantly reduced CO_2 and N_2 consumption.

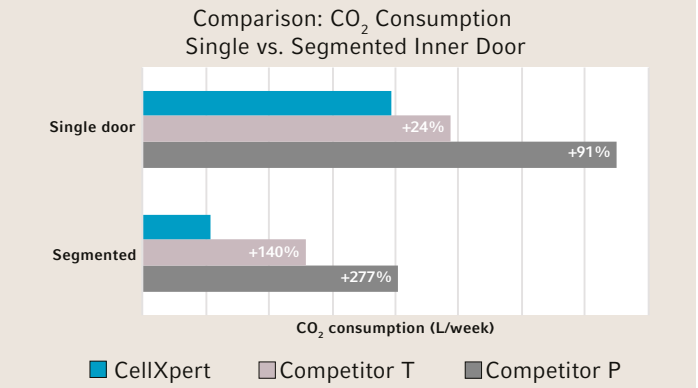

Figure 4: The CellXpert significantly reduces gas consumption compared with other CO_2 incubators. Segmented inner doors further reduce consumption (setpoints 5 % CO_2 & 37 °C 3 door openings per day at 5 days a week)

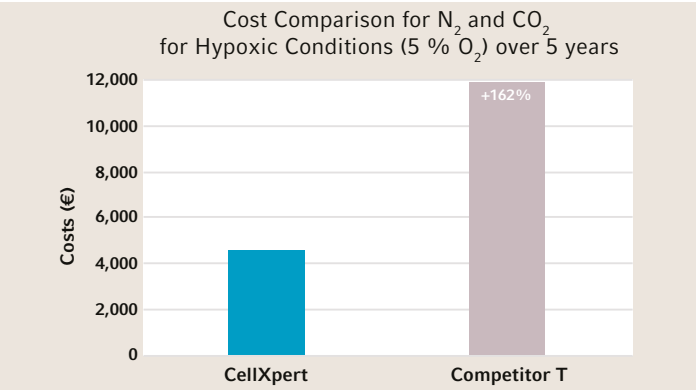

Figure 5: Representative comparison of cost (setpoints 5 % CO_2 / 5 % O_2, 37 °C, 3 door openings per day at 5 days a week , 4-segmented inner doors); Calculations based on typical prices for medium sized gas cylinders

Figure 6: Segmented inner doors significantly reduce gas consumption and the risk for contamination.

Future flexibility: adapting to changing needs and experimental setups

Over an average CO_2 incubator lifetime (15+ years), a laboratory set-up can change several times, especially in fast growing companies and ever-evolving fields of study. The experimental demands and the space in which to perform them change over time. CellXpert C170i CO_2 incubators can be tailored according to changing needs. Apply the options and features needed when they are needed. This reduces costs by allowing upgrades and accessories to be added only when the tasks and scope demand them.

The following options are available:

> Door handle changeable in-field from right to left
> Upgradeable O_2 control for hypoxic experiments (e.g. for stem cells or cancer research)
> Pre-installed access ports for in-incubator experiments with user-validated devices
> Water level monitoring
> Relative humidity monitoring

Summary: The CellXpert CO_2 incubator offers future flexibility for lab changes and changing experimental needs with various upgradeable options.

Want to learn more about the new family of Eppendorf CO_2 Incubators and compare with other manufacturers?

Video: Easy cleaning and reliable contamination prevention with the new CellXpert CO_2 incubators

Online tool: Gas cost and cylinder life span calculator

White paper: CO_2 Incubators - Making the Best Choice for Your Lab

White paper: CO_2 Incubators - Best Practices for Set-up and Care

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

Your local distributor: www.eppendorf.com/contact
Eppendorf AG · Barkhausenweg 1 · 22339 Hamburg · Germany
eppendorf@eppendorf.com · www.eppendorf.com

www.eppendorf.com

Eppendorf®, the Eppendorf Brand Design, and CellXpert® are registered trademarks of Eppendorf AG, Germany.
All rights reserved, including graphics and images. Copyright © 2020 by Eppendorf AG.