

# Laboratory Products

## Fume cupboard technology as a combination of cost reduction and safety

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Laboratories provide a safe working environment. This is exactly what fume cupboards maximise in the smallest research space in the room. The purpose of developing the EcoPlus low-energy fume cupboard from Köttermann was to operate it as cost-efficiently and sustainably as possible.

It is conceivable that laboratory work requires a lot of electricity. Harvard University has taken a closer look at energy consumption in laboratories: Their research rooms occupy about a fifth of the space, but consume almost half of the total energy. 44% of this is directly related to ventilation, which in turn is significantly influenced by the fume cupboards. This once again enclosed working space in the laboratory room is essential for the safe use of volatile organic compounds, acids or solvents [1].



However, these devices in particular draw conditioned air from the laboratory, the treatment of which is energy-intensive and thus expensive as well as environmentally harmful. It is therefore important to pay particular attention to the ecological and economic effects of fume cupboards.

Reducing air consumption while maintaining safe working conditions is thus one of the most important requirements in the development of fume cupboards. The power consumption of a fume cupboard operated at maximum level with the sash open can reach a sum equivalent to the operation of three houses combined - calculated by Evan Mills and Dale Sartor of Lawrence Berkeley National Laboratory [2].

Figure 1: Saving energy by closing the front sash of the fume cupboard.

### Saving energy with the sash

Exhaust air control systems are the keyword for fume cupboards in terms of power consumption, because they reduce the exhaust air flow when the sash is closed without jeopardising the safety of the fume cupboard. The exhaust air volume flow is controlled by a motor-driven damper depending on the sash opening. For each operating state of the fume cupboard, just as much air is extracted from the laboratory as is necessary for the safe operation of the fume cupboard. With the sash closed, the volume flow of a fume cupboard can be reduced by around 50% compared to the open state. With Köttermann fume cupboards, the sash opening is effortlessly adjusted via the TouchTronic electronic control unit using the controller on the display - precisely by sliding or selectively by tapping.



Figure 2: Safe fume cupboard control with the fume cupboard electronics TouchTronic from Köttermann.

The automatic protection mechanism AutoProtect automatically closes the sash as soon as the work in the fume cupboard ends. This saves energy and at the same time minimises the potential danger. If something should ever protrude from the fume cupboard, CloseGuard uses a light grid to ensure that the sash stops automatically.

### A fume cupboard as a sustainability ace

In addition to the sash position, the reduction of operating costs while complying with safety requirements can be achieved by a well thought-out product design. An example of this is the Köttermann fume cupboard EcoPlus, which requires a low air volume flow due to a special air technology and design.

With a recommended constant volume flow of 275 m<sup>3</sup>/h per metre of fume cupboard width, the EcoPlus consumes an exhaust air volume that is about 30% less than a standard fume cupboard on the market. This saves up to €1,000 in operating costs per year. Especially on the basis of energy savings without the installation of exhaust air controls, the EcoPlus is the ideal choice for laboratories.

The core of the EcoPlus is its unique flow technology: This reduces the air volume flow while simultaneously meeting all safety requirements. The standard is correspondingly high: in the robustness test for evaluating the performance of fume cupboards, the test gas burst of the EcoPlus is 70% below the limit value for fume cupboards required by the BG RCI.



Figure 3: The CloseGuard function stops the sash as soon as something protrudes from the fume cupboard.



Figure 4: Köttermann EcoPlus.

In summary a fume cupboard is considered safe if it corresponds to the state of the art, has been tested according to existing standards and complies with the prescribed limit values with large safety reserves. In practical laboratory use, the fume cupboard is always part of a process chain. Its safety is determined by many parameters that are influenced not only by the design of the fume cupboard but also by its use. An important question that needs to be answered is whether the air flow of the fume cupboard is disturbed by external influences at the installation site.

The greater the danger from the processes carried out in the fume cupboard, the more important it is that the airflow is not influenced by people passing by or draughts in the laboratory.

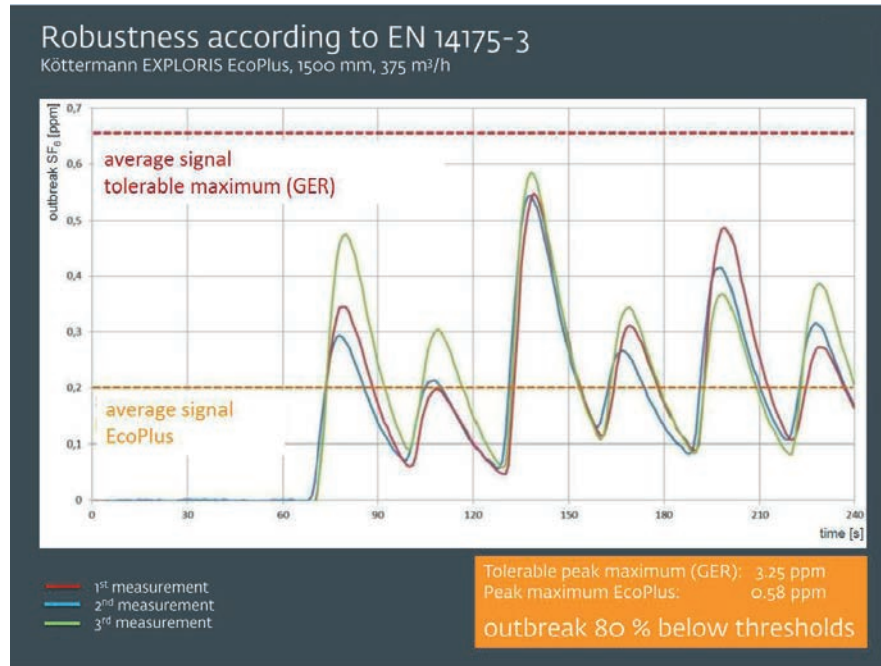


Figure 5: Test result of a 1,500 mm EcoPlus fume cupboard in the robustness test according to EN 14175 Part 3.

- Who works on the fume cupboard? Is the staff sufficiently experienced to be able to carry out the work without danger?
- Are there operating instructions and do the employees live by them in everyday life?
- How is the handling e.g. storage and disposal of hazardous substances organised?
- What emergency measures are setup in case of spillage of chemicals or accidents?

Therefore, the fume cupboard is always a centrepiece of a safe and sustainable working environment, but it must be accommodated with other essential and safety-related features in the laboratory like eye-showers or safety cabinets for flammable chemicals.

## It all depends on the material

Laboratory fume cupboards on the one hand and the type of laboratory furniture on the other hand are the basis of occupational safety for laboratory staff. Short and ergonomically planned paths, sufficient work surfaces and safe storage space are one important factor, another is the material of the furniture. Here, Köttermann's steel furniture produced in Germany has a clear advantage: steel is durable, long-lasting, water-repellent and easy to clean.

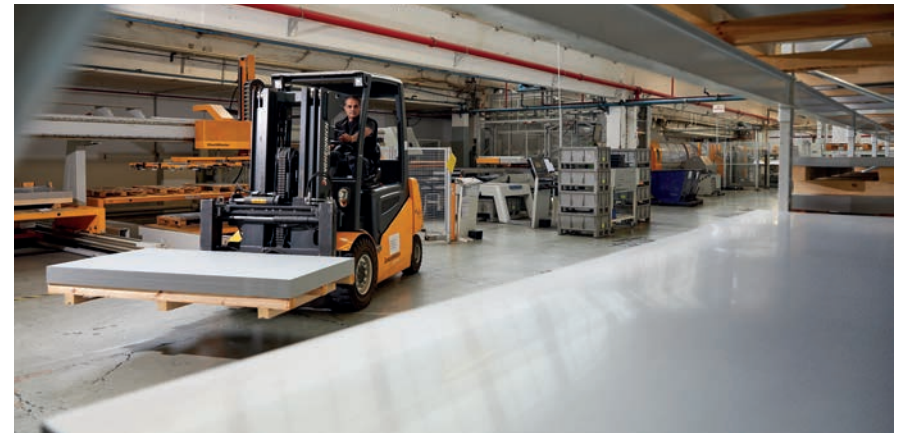


Figure 6: Durable and long-lasting: Köttermann laboratory furniture is made of steel.

In terms of sustainability, steel is 100% recyclable. In every recycling stage, the properties are retained while the quality remains the same. Even multi-recycling capability can be attributed to the material, because steel can be recycled over several life cycles and thus saves 50% percent of the original CO<sub>2</sub> emissions.

## References

1. Source: Quentin Gilly: Validating cost and energy savings from Harvard's shut the sash program. In: <https://green.harvard.edu/sites/green.harvard.edu/files/FumeHoodWhitePaper.pdf>. 27/04/2023
2. Source: Mills and Sartor: Energy Volume 30, Issue 10, July 2005, Pages 1859-1864



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